A-CR-CCP-803/PF-001

National Defence / Défense nationale

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE
INSTRUCTIONAL GUIDES

(ENGLISH)

(Supersedes A-CR-CCP-803/PF-001 dated 2015-09-01)

Cette publication est disponible en français sous le numéro A-CR-CCP-803/PF-002.

Issued on Authority of the Chief of the Defence Staff

Canada

National Defence / Défense nationale

ROYAL CANADIAN AIR CADETS

BOOK 1 OF 2

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OPI: D Cdts & JCR 4 – Senior Staff Officer Youth Programs Development **2016-09-14**

Canada

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Dates of issue for original and changed pages are:

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FOREWORD AND PREFACE

1. **Issuing Authority.** This Instructional Guide (IG) A-CR-CCP-803/PF-001 was developed under the authority of the Director Cadets and Junior Canadian Rangers, and issued on the authority of the Chief of Defence Staff.

2. **Development.** Development of this IG was in accordance with the performance oriented concept of training outlined in the A-P9-050 Series, Canadian Forces Individual Training and Education System, with modifications to meet the needs of the Canadian Cadet Organization.

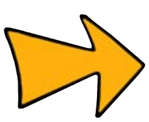
3. **Purpose of the IG.** The IG is to be used by Royal Canadian Air Cadet Squadrons in conjunction with other resources to conduct the Proficiency Level Three Program. The IG provides instructors with the base means from which to deliver training. Individual IGs are to be reviewed in conjunction with the Lesson Specifications (LSs) found in A-CR-CCP-803/PG-001, *Royal Canadian Air Cadet Level Three Qualification Standard and Plan*, Chapter 4, before instructing, so that each instructor can adequately plan for and prepare each lesson. Instructors may be required to develop instructional materials to support training in addition to any that may be provided, eg, posters, videos, handouts, models, etc, supplemental to training control and support documents. Suggested instructional activities are included in most IGs to maximize learning and fun. Instructors are also encouraged to modify and/or enhance the activities, as long as they continue to contribute to enabling objective achievement.

4. **Use of the IG.** Throughout these instructional guides, a series of information boxes are used to highlight information; they include:

Note to the Instructor.

Key information to pass along to cadets.

Refer to the following CF regulations and policies.



Points of interest or special instructions the instructor should pass along to cadets.

5. **Suggested Changes.** Suggested changes to this document may be sent directly to cadettraining@canada.ca.

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CHAPTER 1

PO X01 – PARTICIPATE IN CITIZENSHIP ACTIVITIES

COMMON TRAINING

ALL TRAINING LEVELS

INSTRUCTIONAL GUIDE
CITIZENSHIP

PO X01 – PARTICIPATE IN CITIZENSHIP ACTIVITIES

Total Time:

For the following EOs, refer to the lesson specifications located in A-CR-CCP-801/PG-001, *Royal Canadian Air Cadets Proficiency Level One Qualification Standard and Plan*:

- MX01.01A – Participate in a Citizenship Tour,
- MX01.01B – Attend a Presentation by a Community Organization,
- MX01.01C – Attend a Presentation by a Citizen-of-Interest,
- MX01.01D – Participate in the Canadian Citizenship Challenge,
- MX01.01E – Host a Citizenship Ceremony, and
- CX01.01 – Participate in Citizenship Activities.

For the following EOs, refer to the instructional guides located in A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Proficiency Level One Instructional Guides*:

- MX01.01F – Participate in an Election,
- MX01.01G – Participate in Heritage Minutes Video Activities, and
- MX01.01H – Participate in Citizenship Learning Stations.

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CHAPTER 2

PO X02 – PERFORM COMMUNITY SERVICE

COMMON TRAINING

ALL TRAINING LEVELS

INSTRUCTIONAL GUIDE
COMMUNITY SERVICE

PO X02 – PERFORM COMMUNITY SERVICE

Total Time:

For the following EOs, refer to the instructional guides located in A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Proficiency Level One Instructional Guides*:

- MX02.01 – Perform Community Service, and
- CX02.01 – Perform Community Service.

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CHAPTER 3

PO 303 – PERFORM THE ROLE OF A TEAM LEADER

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M303.01 – DEFINE THE ROLE OF A TEAM LEADER

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts located at Annexes A and B for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to the leadership team model, core leadership competencies and leadership opportunities for a Proficiency Level Three cadet.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have defined the role of a team leader.

IMPORTANCE

It is important for cadets to define the role of a team leader so they understand how and where they fit within the leadership team model and within the leadership team at the squadron. Being aware of the core leadership competencies, and the expectations within each of the competencies, may assist the cadets' developing leadership abilities while adapting to their developing role as a leader in their squadron.

Teaching Point 1	**Explain the Leadership Team Model and the Position the Year Three Cadet Holds Within the Leadership Team**
Time: 10 min	Method: Interactive Lecture

Distribute the Leadership Team Model handout located at Annex A.

LEADERSHIP TEAM MODEL

Although leadership is usually thought of as an individual pursuit, in the Cadet Program, leadership is based on a team model.

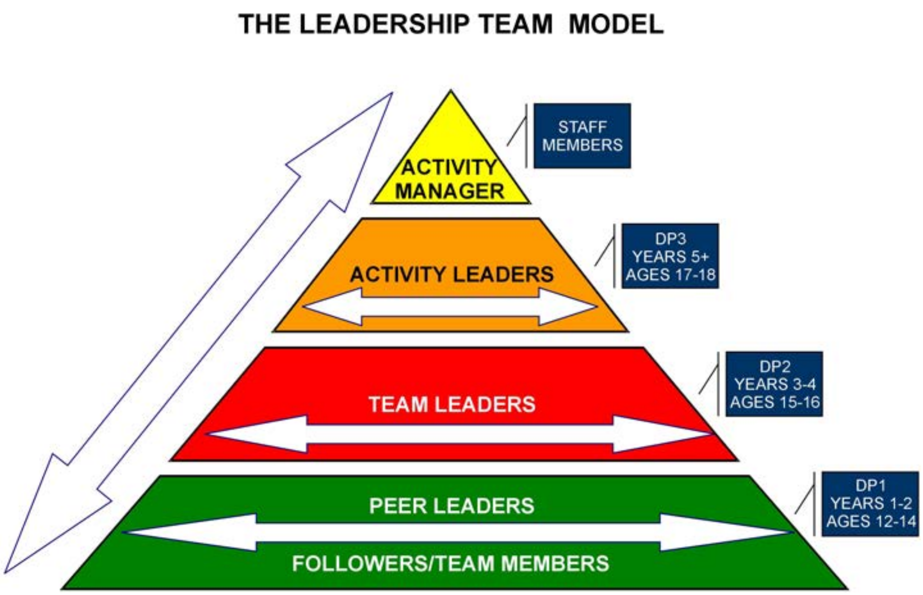
The Leadership Team Model is a fluid model that is dependent on the situation to which it is applied. The personnel in each category of the model will change based on the activity/situation.

During year one, the cadet is expected to be a follower/team member. During year two, the cadet becomes a peer leader. In years three and four, the cadet moves up the model to become a team leader. In years five and beyond, the cadet becomes an activity leader.

The final level of the model is populated by the squadron staff, who act as the activity managers.

As each cadet moves through the leadership team model, there are increased expectations of the cadet. Accordingly, there will be an increase in the cadet's leadership responsibilities.

Within the leadership team model, communication moves across each level, and up and down each level. Within this model, cadets on every level should be mentored by someone in the level above.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3-1-1 Leadership Team Model

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. The Cadet Program is based on what kind of leadership model?

Q2. What is expected of the cadets in the bottom level of the leadership team model?

Q3. As the cadet moves up the leadership model, what happens to their leadership responsibilities?

ANTICIPATED ANSWERS

A1. The Cadet Program is based on a leadership team model.

A2. Cadets are expected to be followers/team members and peer leaders.

A3. Responsibilities increase as the cadet moves up the leadership team model.

Teaching Point 2	**Describe Core Leadership Competencies**
Time: 5 min	Method: Interactive Lecture

Distribute the Expectations of a Proficiency Level Three Cadet handout located at Annex B.

CORE LEADERSHIP COMPETENCIES

To become an effective and capable leader in the Cadet Program, there are six areas where knowledge and skills should be demonstrated. These areas are called core leadership competencies. They include:

- intrapersonal management,
- interpersonal management,
- teamwork,
- effective communication,
- applied leadership, and
- mentorship.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. To become an effective and capable leader in the Cadet Program, there are six areas where knowledge and skills should be demonstrated. What are these called?

Q2. List the six core leadership competencies.

ANTICIPATED ANSWERS

A1. Core leadership competencies.

A2. The six core leadership competencies are:

- intrapersonal management,
- interpersonal management,
- teamwork,
- effective communication,
- applied leadership, and
- mentorship.

Teaching Point 3 **Explain the Components of Intrapersonal Management**

Time: 5 min Method: Interactive Lecture

Have cadets follow along using the Expectations of a Proficiency Level Three Cadet handout for TPs 3 to 8.

COMPONENTS OF INTRAPERSONAL MANAGEMENT

Intrapersonal management is how cadets maintain control of themselves. There are five parts to intrapersonal management:

Identifying and Satisfying Personal Needs. Cadets should distinguish and accept responsibility for fulfilling their personal needs. Some examples of personal needs include filling basic needs like food and water, feeling safe, feeling like they belong, and having self-confidence. Once cadets know what needs they have, they should work toward satisfying them.

Exercising Self-Control. Cadets should practice self-restraint. It may be difficult but cadets should try not get too upset by situations in which they have no control. When cadets become irate or lose their temper, they give the power in the situation to someone else. If cadets keep their cool, better decisions are usually made.

Exercising Self-Management. Cadets should take charge of their own lives. Cadets need to be organized and direct themselves. Becoming independent (eg, being punctual, being dressed correctly, etc) is a natural part of becoming an adult.

Pursuing Self-Improvement. Cadets should strive for self-improvement. Always trying to be better than one was yesterday is a worthwhile goal. Whether one is a better cadet, better at school or a better friend, one should always strive for excellence.

Establishing a Positive Identity. Cadets should gain self-esteem. It is important to be proud of one's accomplishments. Knowing that one is a person that others look up to and want to spend time with, should make one feel proud of oneself.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is intrapersonal management?

Q2. What are the five components of intrapersonal management?

Q3. How may cadets exercise self-management?

ANTICIPATED ANSWERS

A1. Intrapersonal management is how cadets control themselves.

A2. The five components of intrapersonal management are:

- identifying and satisfying personal needs;
- exercising self-control;
- exercising self-management;
- pursuing self-improvement; and
- establishing a positive identity.

A3. Cadets may exercise self-management by taking charge of their own lives.

Teaching Point 4	**Explain the Components of Interpersonal Management**
Time: 5 min	Method: Interactive Lecture

COMPONENTS OF INTERPERSONAL MANAGEMENT

Interpersonal management is how cadets behave and get along with others. There are three parts of interpersonal management:

Interacting Positively Within the Cadet Community. Cadets should work together with staff, parents, volunteers, etc in a respectful and helpful manner.

Interacting Positively With Others. Cadets should build positive social relationships by being supportive and encouraging while interacting with other cadets.

Dealing With Interpersonal Conflict in a Respectful Way. Cadets should resolve disagreements with others at the lowest possible level and come up with a mutually satisfactory solution where a “win-win” outcome is achieved.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is interpersonal management?

Q2. What are the three components of interpersonal management?

Q3. How should cadets resolve disagreements?

ANTICIPATED ANSWERS

A1. Interpersonal management is how cadets behave and get along with others.

A2. The three components of interpersonal management are:

- interacting positively within the cadet community;
- interacting positively with others; and
- dealing with interpersonal conflict in a respectful way.

A3. Cadets should resolve disagreements with others at the lowest possible level and come up with a mutually satisfactory solution where a "win-win" outcome is achieved.

Teaching Point 5 **Explain the Components of Teamwork**

Time: 5 min Method: Interactive Lecture

COMPONENTS OF TEAMWORK

Teamwork is how cadets create effective and efficient action in a group of people. There are three parts of teamwork:

Participating in the Stages of Team Development. Cadets should take part in the stages of team development. The stages are forming, storming, norming, performing and adjourning.

Displaying Positive Team Dynamics. Cadets should demonstrate positive team dynamics by following the team leader, including all participants, encouraging team members, contributing to team morale and esprit de corps, contributing to the accomplishment of team goals, contributing to group decisions, trusting the team, supporting team members, appreciating team members, and celebrating team successes.

Participating in Team-Building Activities. Cadets should take part in team-building activities. These activities will build positive team dynamics and they allow cadets to practice leadership skills.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What is teamwork?

Q2. What are the three components of teamwork?

Q3. How may cadets display positive team dynamics?

ANTICIPATED ANSWERS

A1. Teamwork is how cadets create effective and efficient action in a group of people.

A2. The three components of teamwork are:

- participating in the stages of team development;
- displaying positive team dynamics; and
- participating in team-building activities.

A3. Cadets may display positive team dynamics by following the team leader, including all participants, encouraging team members, contributing to team morale and esprit de corps, contributing to the accomplishment of team goals, contributing to group decisions, trusting the team, supporting team members, appreciating team members, and celebrating team successes.

Teaching Point 6	**Explain the Components of Effective Communication**
Time: 5 min	Method: Interactive Lecture

COMPONENTS OF EFFECTIVE COMMUNICATION

Effective communication is how cadets relay information successfully. There are three parts of effective communication:

Receiving Information. Cadets should be given or obtain instructions or facts. This information may be received verbally or in writing.

Interpreting Information. Cadets should comprehend the instructions or facts. To interpret information correctly, questions may be asked to the deliverer of the information to ensure clarity.

Responding to Information. Cadets should react to the instructions or facts. Responding to information may include passing on information to others, solving problems, etc.

CONFIRMATION OF TEACHING POINT 6

QUESTIONS

Q1. What is effective communication?

Q2. What are the three components of effective communication?

Q3. In what ways may information be received?

ANTICIPATED ANSWERS

A1. Effective communication is how cadets relay information successfully.

A2. The three components of effective communication are:

- receiving information;
- interpreting information; and
- responding to information.

A3. Information may be received verbally or in writing.

Teaching Point 7	**Explain the Components of Applied Leadership**
Time: 5 min	Method: Interactive Lecture

COMPONENTS OF APPLIED LEADERSHIP

Applied leadership is how cadets practice influencing and managing others. There are six parts of applied leadership:

Setting an Example for Others to Follow. Cadets should establish themselves as a model for others. If cadets set an example in the core leadership competencies, others will want to imitate them.

Participating in Leadership Assignments. Cadets will take part in given tasks or jobs. This gives cadets chances to practice influencing and managing others. Some of these tasks or jobs will be evaluated by the staff and some will not be evaluated. Cadets should practice reflection and self-assessment after leading each assignment.

Conducting the Leadership Assignment While Supervising the Team. Cadets will observe and guide a team while the leadership assignment is taking place. Supervising others is one of the responsibilities of a leader. Cadets will ensure the leadership assignment is conducted in a safe manner and completed as instructed by the staff.

Leading Team-Building Activities. Cadets should direct team-building or creative games. This gives cadets chances to practice influencing and managing others. Again, cadets should practice reflection and self-assessment after leading team-building activities.

Debriefing the Team. Cadets should review and discuss with the team the completion and outcome of a leadership assignment or a team-building activity. Cadets should practice effective communication while speaking to the team.

Presenting an After-Assignment Report to Their Leader. Cadets should review and discuss with their leader/supervisor the completion and outcome of a leadership assignment or a team-building activity. Cadets should practice effective communication while speaking to their leader/supervisor.

CONFIRMATION OF TEACHING POINT 7

QUESTIONS

Q1. What is applied leadership?

Q2. What are the six components or parts of applied leadership?

Q3. Why is setting an example for others to follow important?

ANTICIPATED ANSWERS

A1. Applied leadership is how cadets practice influencing and managing others.

A2. The six components or parts of applied leadership are:

- setting an example for others to follow;
- participating in leadership assignments;
- conducting the leadership assignment while supervising the team;
- leading team-building activities;
- debriefing the team; and
- presenting an after-assignment report to their leader.

A3. Setting an example for others to follow is important because if cadets establish themselves as a model, others will want to imitate them.

Teaching Point 8	**Explain the Components of Mentorship**
Time: 5 min	Method: Interactive Lecture

COMPONENTS OF MENTORSHIP

Mentorship is how cadets participate in a professional association between two people that focuses on self-development. There are two parts to mentorship:

The Role of a Cadet Being Mentored. Cadets will assume the role of a cadet being mentored. This is the trainee in the relationship. Cadets being mentored should enhance their knowledge and skills of leadership. Learning from the mentor’s example will be an important element of the mentoring relationship.

The Role of a Mentor. Cadets will assume the role of a mentor. This is the advisor/guide in the relationship. Cadets mentoring should enhance their leadership abilities, coaching skills and communication skills. As a mentor, cadets may see things from a different perspective than the cadet being mentored.

CONFIRMATION OF TEACHING POINT 8

QUESTIONS

Q1. What is mentorship?

Q2. What are the two components of mentorship?

Q3. Who is the trainee in the mentoring relationship?

ANTICIPATED ANSWERS

A1. Mentorship is how cadets participate in a professional association between two people that focuses on self-development.

A2. The two components of mentorship are:

- the role of a cadet being mentored; and
- the role of a mentor.

A3. The trainee in the mentoring relationship is the cadet being mentored.

Teaching Point 9	Identify the Proficiency Level Three Team Leader Opportunities
Time: 5 min	Method: Interactive Lecture

PROFICIENCY LEVEL THREE TEAM LEADER OPPORTUNITIES

In year three, cadets will have team leader opportunities. These include:

Performing the Role of a Mentor. Performing the role of a mentor may be as simple as partnering up with a year one cadet. This buddy system may help the year one cadet gain skills and knowledge about the squadron and should assist the year three cadet in their leadership and communication skills.

Completing a Leadership Assignment. Each year three cadet will be given occasions in which they will complete a leadership assignment. These assignments may include classroom set ups, ensuring building clean up, or assisting with a survival exercise. Some of the leadership assignments will be evaluated by the staff.

CONFIRMATION OF TEACHING POINT 9

QUESTIONS

Q1. What are the Proficiency Level Three training opportunities?

Q2. What is one simple way to perform the role of a mentor?

Q3. What are some examples of leadership assignments?

ANTICIPATED ANSWERS

A1. The Proficiency Level Three training opportunities include:

- performing the role of a mentor; and
- completing a leadership assignment.

A2. One simple way to perform the role of a mentor is to use the buddy system.

A3. Some examples of leadership assignments include classroom set up, ensuring building clean up, or assisting with a survival exercise.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What position does a Proficiency Level Three cadet hold in the leadership team model?

Q2. List the six core leadership competencies.

Q3. What are the Proficiency Level Three training opportunities?

ANTICIPATED ANSWERS

A1. The Proficiency Level Three cadet holds the position of team leader.

A2. The six core leadership competencies are:

- intrapersonal management,
- interpersonal management,
- teamwork,
- effective communication,
- applied leadership, and
- mentorship.

A3. The Proficiency Level Three training opportunities include:

- performing the role of a mentor; and
- completing a leadership assignment.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Cadets should know and understand their role within the leadership team at the squadron. When cadets know what is expected of them it is much easier for them to set and reach their goals. Higher expectations lead to greater results. Being aware of the core leadership competencies and the components for each may assist the cadets' developing leadership abilities while adapting to their developing role as a leader in their squadron.

INSTRUCTOR NOTES/REMARKS

N/A.

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C0-270 Maslow, A. H. (1943). A Theory of Human Motivation. *Psychological Review*, Vol. 50, No. 4, pp. 370–396.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M303.02 – PARTICIPATE IN A MENTORING RELATIONSHIP

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Prepare questions for the group discussion.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to orient the cadets to the mentoring relationship, to generate interest and present basic material.

A group discussion was chosen for TP 2 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about the mentoring relationship.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to participate in a mentoring relationship.

IMPORTANCE

It is important for cadets to participate in a mentoring relationship to assist in the development of their leadership abilities. The mentoring relationship expands leadership knowledge and skills of participants, enhances communication skills, resolves conflict and promotes constructive feedback, and should aid in the leadership development of all cadets.

Teaching Point 1	**Explain the Mentoring Relationship**
Time: 15 min	Method: Interactive Lecture

Begin the lesson by asking the cadets if they know what the word mentoring means. Do the cadets have any examples of mentoring?

THE MENTORING RELATIONSHIP

A mentoring relationship is a professional association between two people that focuses on self-development. One is the mentor; the other is the cadet being mentored. The mentor is the experienced and trusted advisor or guide; however, both individuals are expected to learn from the relationship.

The mentoring relationship for a year three cadet may be as simple as partnering up with a year one cadet. This buddy system may help the year one cadet gain skills and knowledge about the squadron and should assist the year three cadet in their leadership and communication skills. A year three cadet may also be mentored by a year five cadet.

Recognizing the Purpose of a Mentoring Relationship

The purpose of the mentoring relationship is to share experiences between the mentor and the cadet being mentored, so the cadet being mentored is better prepared to move forward through the program with knowledge and confidence.

Identifying the Benefits of Participating in a Mentoring Relationship

The benefits of participating in a mentoring relationship are numerous. The basic benefit for a cadet being mentored is to show growth in skills and become a more independent and effective cadet. The most significant benefit for the mentor is the realization that they have inspired the cadet to perform at higher levels than the cadet would have without a mentor.

Contributing to a Mentoring Match

Contributing to a mentoring match means that both the mentor and the one being mentored will have some say with whom they are matched. The mentoring relationship is based on trust; ensure a long-term and valuable connection can be made with the person you choose.

Being Open to New Things

For a mentoring relationship to be successful, both individuals must be willing to try new things. Expanding your horizons and increasing your knowledge are foundations of the mentoring relationship. Being receptive to new ideas and experiences takes courage.

Being Responsive to Suggestions and Constructive Criticism

The cadet being mentored should be responsive to suggestions made by the mentor. The mentor should use constructive criticism and will attempt to provide feedback that will assist the cadet being mentored. This may include feedback that is positive in nature or feedback that assists in finding solutions for poor performance. The task of the cadet being mentored is to be receptive to recommendations being made.

Providing Feedback to the Mentor

Mentoring is a two-way relationship, so it is important that the cadet being mentored provides feedback to the mentor. This feedback should be based on feelings, both positive and negative, and observations. If the cadet being mentored does not express their feelings to their mentor about the relationship, then progress may be hindered.

Learning From the Mentor's Example

It is up to the mentor to set an example that the cadet being mentored would want to emulate. This example should be in all facets of the program (eg, drill, dress, deportment, leadership, academics, etc). The cadet being mentored should learn not only from the mentor's successes but from the mentor's failures.

It is important to remember that failure is not necessarily a negative thing. As long as cadets fail forward (learn from their mistakes) there is an advantage to any failure because a learning opportunity has been created.

Participating in Mentoring Activities

To get the most benefit from a mentoring relationship, the cadet being mentored must be prepared to participate in some mentoring activities. These activities may include reflection, self-assessment, and discussions about successes, problems and failures. The mentor must also be prepared for each mentoring session. They need to have an agenda of what will be discussed and ensure that the discussions stay on track.

Appreciating the Mentoring Relationship

An effective mentoring relationship must be respected by both people involved. Each person should have a high regard for the other in the relationship. Appreciating the other person for their effort, time and accomplishments will ensure a long-lasting and mutually beneficial partnership.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the basic benefit of a mentoring relationship for the cadet being mentored?

Q2. Why should the mentor and the cadet being mentored be open to new things?

Q3. What are some examples of mentoring activities?

ANTICIPATED ANSWERS

A1. The basic benefit is that the cadet being mentored will grow in their skills and become a more independent and more effective cadet.

A2. The mentor and the cadet being mentored should be open to new things because each should wish to expand their horizons and increase their knowledge of the mentoring relationship. Being receptive to new ideas and experiences takes courage.

A3. Mentoring activities may include reflection, self-assessment and discussions about successes, problems and failures.

Teaching Point 2 | **Conduct a Group Discussion About Mentoring**

Time: 10 min | Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw information about the mentoring relationship from the group using the tips for answering/facilitating discussion and the suggested questions provided.

This group discussion focuses on self-reflection, self-assessment, recording in a journal, and mentoring sessions.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What is self-reflection?

Q2. Why do you think self-reflection is useful when participating in a mentoring relationship? Give some examples when self-reflection may be used by the cadet being mentored. Give some examples when self-reflection may be used by the mentor.

Q3. What is self-assessment?

Q4. Is there a difference between self-assessment and self-reflection?

Q5. Why do you think self-assessment is useful when participating in a mentoring relationship? Give some examples when self-assessment may be used by the cadet being mentored. Give some examples when self-assessment may be used by the mentor.

Q6. Why record in a journal?

Q7. Is there a difference between recording in a journal, self-assessment and self-reflection?

Q8. Why do you think recording in a journal is useful when participating in a mentoring relationship? Give some examples when recording in a journal may be used by the cadet being mentored. Give some examples when recording in a journal may be used by the mentor

Q9. When a mentoring session takes place, what do you think it looks like?

Q10. What does it sound like?

Q11. What do you think a mentoring session feels like?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the group discussion will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the group discussion will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being mentored and mentoring others is one way to enhance skills and knowledge of leadership. The mentoring relationship develops trust and trust is the foundation of leadership. Using self-reflection, self-assessment, and recording in a journal are excellent methods to track advancement through the Cadet Program.

INSTRUCTOR NOTES/REMARKS

After this lesson each year three cadet will choose at least one year one cadet to mentor. Each year three cadet will also be asked which year five cadet they would like to mentor them.

REFERENCES

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M303.03 – PRACTICE SELF-ASSESSMENT

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handout located at Annex C for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to define reflection and self-assessment.

An in-class activity was chosen for TP 2 as an interactive way to provoke thought, to stimulate an interest among cadets and to conduct self-assessments.

A group discussion was chosen for TP 3 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about the benefits of seeking feedback and assistance.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to practice self-assessment.

IMPORTANCE

It is important for cadets to practice self-assessment as it is an excellent method to identify areas for self-improvement and assessment for learning. Self-assessment is a cornerstone of assessment for learning. It enables cadets and staff to ensure individual and program/organizational goals are being met.

Teaching Point 1 | **Define Reflection and Self-Assessment**

Time: 5 min | Method: Interactive Lecture

Reflection and self-assessment will be used in many performance objectives of the Cadet Program to enable the cadet and staff to track development and progress of different skills and knowledge.

Reflection. Long and careful consideration. Reflection can take place at any time and does not necessarily have to be about oneself. Usually reflection takes places directly after an action is taken.

Self-Assessment. Assessment or evaluation of oneself, or one's actions, attitudes or performance. In order to perform self-assessment correctly, reflection about oneself must take place before the self-assessment.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Define reflection.

Q2. Define self-assessment.

Q3. In order to perform self-assessment correctly, when must reflection take place?

ANTICIPATED ANSWERS

A1. Long and careful consideration.

A2. Assessment or evaluation of oneself, or one's actions, attitudes or performance.

A3. Reflection about oneself must take place before the self-assessment.

Teaching Point 2 | **Have the Cadet Conduct Self-Assessment Activities**

Time: 10 min | Method: In-Class Activity

Reflection and self-assessment, in all their forms, are enhanced by providing context for each activity. The objective of this particular reflection and self-assessment is to have cadets find a baseline level of their core leadership qualities and their positive team dynamics.

Providing the time, environment and opportunity for reflection and self-assessment, allows the cadet to complete an assessment for learning and should be the spark that lights the fire of learning.

Ask cadets to reflect on their last three years in the program before completing the rubrics.

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets conduct self-assessment activities.

RESOURCES

- Self-assessment rubric for core leadership qualities, and
- Self-assessment rubric for positive team dynamics.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute the self-assessment rubrics located at Annex C to each cadet.
2. Explain that each cadet should reflect on each category on the rubric before completing it.
3. Give cadets eight minutes to complete the two rubrics.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the in-class activity will serve as the confirmation of this TP.

Teaching Point 3	**Conduct a Group Discussion on How and When to Seek Feedback and Assistance**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

Seeking feedback after self-assessment may be necessary. Feedback from others, in the form of advice, should give the cadet ideas to help improve performance.

Assistance after self-assessment may be necessary. Assistance from others, in the form of collaboration, should help the cadet improve performance.

Feedback and assistance should guide the cadet to ensure all goals, both personal (eg, improving PACER time) and professional (eg, becoming a better instructor), are being met.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. Should you seek feedback after completing self-assessment? Why or why not?

Q2. When is a good time to seek feedback? Why?

Q3. Should you seek assistance after completing self-assessment? Why or why not?

Q4. When is a good time to seek assistance? What may seeking assistance look like?

Q5. Is seeking assistance different than seeking feedback? If it is different, how is it different?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce the answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the group discussion will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the group discussion will serve as the confirmation of this lesson.

Advise cadets to take their self-assessment rubrics home and place them somewhere safe because they will need to look at these rubrics again to track their progress.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Self-assessment is one method to help improve leadership skills. Regular practice of reflection and self-assessment will assist the cadet in measuring and tracking improvement of skills and knowledge. Self-assessment also helps cadets set, strive for and maintain goals.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO M303.04 – COMMUNICATE AS A TEAM LEADER

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy a Communication Puzzle located at Annex D for each cadet. Using half of the copies, cut out the puzzle pieces and place each set of pieces in a resealable plastic bag. With the other half, place each full puzzle in an envelope.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 to 4 to orient the cadets to communicating as a team leader.

An in-class activity was chosen for TP 5 as an interactive way to provoke thought and stimulate interest among cadets about the process of communication and the barriers to communication.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have communicated as a team leader.

IMPORTANCE

It is important for cadets to understand the process of communication. People communicate everyday as a way to share knowledge, interests, attitudes, opinions, feelings and ideas with others. After understanding ways to communicate, cadets must become familiar with the process of communication and when and how to use it. Communication skills are a fundamental part of leadership because they permit the flow of ideas from one individual to another or to a group, and vice versa. Effective communication helps people break down barriers between themselves and others.

Teaching Point 1	**Explain Verbal and Non-Verbal Communication**
Time: 5 min	Method: Interactive Lecture

Every form of communication must have a sender and a receiver.

VERBAL COMMUNICATION

When individuals speak to each other, verbal communication is being used. Much of what a person receives from a conversation is picked up through words. Verbal communications are used during conversations, meetings, interviews, speeches and more.

NON-VERBAL COMMUNICATION

When individuals communicate, body language and gestures are very useful. Body language and gestures act as communication shortcuts that convey messages previously learned by both the sender and the receiver.

Have the cadets give examples of body language and gestures. Ensure the examples are non-controversial.

Written communications such as memos and e-mail are considered non-verbal communications. Written communications are used in the cadet organization because they are accessible and usually permanent.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Every form of communication must have what?

Q2. When is verbal communication used?

Q3. List three types of non-verbal communications?

ANTICIPATED ANSWERS

A1. A sender and a receiver.

A2. Verbal communications are used during conversations, meetings, interviews, speeches and more.

A3. Body language, gestures, and written communications.

Teaching Point 2	Explain Hearing and Listening and Their Impact on Communication
Time: 15 min	Method: Interactive Lecture

Before beginning this TP, ask the cadets if they think there is a difference between hearing and listening.

Do not spend a lot of time on the question since it will be elaborated throughout this TP.

THE DEFINITION OF HEARING

Oxford dictionary defines “hear” as:

- perceive (sound, etc) with the ear;
- listen to as a member of an audience; and
- be told or informed.

Hearing occurs naturally everyday, whether a person wishes to hear or not.

THE DEFINITION OF LISTENING

Oxford dictionary defines “listen” as:

- to make an effort to hear something;
- pay attention to; and
- give attention with the ear.

When people listen, they are making an effort to hear something. In order to listen effectively, a listener must pay attention to the person who is speaking.

ACTIVE LISTENING

Active listening is difficult because it demands that the listener put aside any internal reactions and turn their attention to the speaker without judging what is being said.

By withholding judgment, a person communicates respect by acknowledging that the other person is important and deserves to be heard and understood. Active listening encourages people to talk about facts and feelings without a risk of being put down. The goal of active listening is not only to hear what the speaker is saying but also to allow them to focus on themselves so that they can accurately communicate how they feel. There are many situations in which active listening can be used and practiced. Some of these situations are explained in Figure 3-4-1.

Ask the cadets to think about some real-life examples of times when they have tried to be good listeners while sharing some of the comparisons below.

ACTIVE NON-LISTENING	ACTIVE LISTENING
Give the other person your version.	Repeat conversationally back to them, in your own words, your understanding of the meaning.
Give your own opinions and advice. Talk about yourself at every point.	Do not talk about yourself.
Introduce new topics to get off the subject if it is uncomfortable.	Let the speaker take the lead. Encourage them back to the issue when they digress. Do not allow the person to drift to a less significant topic because they feel that you do not understand.
Think of what you are going to say next while the speaker is talking.	Concentrate fully on what the person is saying.
Do not let the speaker know if you do not know what they are talking about.	Ask for clarification when you do not understand.
Reassure by saying “It’s not that bad” or talk them out of it.	Let them come to their own answer since your answer may not be theirs. Do not offer advice.
Agree with generalizations such as “Yes, it’s hopeless” or “There’s nothing you can do.”	Let them find their answer. Reflect back to them so that they know you understand but also so they can hear and understand themselves.
Dismiss their feelings by saying things such as “You’ll feel better tomorrow” or “It’s not the end of the world.”	Support their feelings by saying things such as “You feel hopeless about it right now” or “You can’t find anything that will fix it yet.”
Fill silences.	Allow silences.

E. Colver & M. Reid, Peacebuilders 2: Peer Helping, YouCAN (p. 13)

Figure 3-4-1 Active Listening Examples

POOR LISTENING HABITS

People often need to feel heard before they can hear. When listening, focus on the speaker. Affirmative listening (nodding and giving quick answers) shows the speaker that the listener is paying attention, consequently encouraging them to continue communicating.

Care should be taken to maintain focus and concentration when having a conversation. The following are some examples of poor listening habits:

- formulating replies while the other person is speaking;
- letting the mind wander;
- tuning out a point of view that differs from the listener’s preconceived ideas;
- interrupting speakers;
- finishing a speaker’s sentence for them;
- talking while other people are speaking;
- jumping to conclusions; and

- hearing only what the listener wants to hear or expects to hear or assuming what will be said.

The Chinese character for listen, pronounced *ting*, is made up of four characters: the heart, the mind, the ears and the eyes.

K. Cole, The Complete Idiot's Guide to Clear Communication, Alpha Books (p. 130)

Figure 3-4-2 Chinese Listen Character

THE IMPACT THAT LISTENING AND HEARING HAVE ON COMMUNICATION

Noises are easy to hear but because a person can hear what is happening, does it mean that they are listening? Sometimes the listener must stop the person who is talking and ask them to start over. It is possible to hear a person speak but have no idea what they are saying.

Ask the cadets to think about some lessons or conversations that occurred recently in which they could hear what was happening but were not listening.

In order to communicate effectively, it is vital that those who are receiving the information are listening; a speaker must have the attention and focus of the listeners.

Listeners should involve themselves in communication physically, mentally and verbally. Using body language will help keep the attention of listeners. Those listening should focus their attention solely on the speaker. If the topic is important, a good way to stay focused is to take notes. When the speaker is finished, ask questions to make sure the message you received is right.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the definition of "listen"?

Q2. List some examples of poor listening habits.

Q3. In what ways should listeners involve themselves in communication?

ANTICIPATED ANSWERS

A1. Oxford dictionary defines “listen” as:

- to make an effort to hear something;
- pay attention to; and
- give attention with the ear.

A2. The following are examples of poor listening habits:

- formulating replies while the other person is speaking;
- letting the mind wander;
- tuning out a point of view that differs from the listener’s preconceived ideas;
- interrupting speakers;
- finishing a speaker’s sentence for them;
- talking while other people are speaking;
- jumping to conclusions; and
- hearing only what the listener wants to hear or expects to hear or assuming what will be said.

A3. Listeners should involve themselves in communication physically, mentally and verbally.

Teaching Point 3	**Describe the Process of Communication**
Time: 5 min	Method: Interactive Lecture

PROCESS OF COMMUNICATION

Communication skills are a fundamental part of leadership because they permit the flow of ideas from one individual to another or to a group, and vice versa. Effective communication helps people break down barriers between themselves and others. Giving careful thought, not only to what people want to express but also to how they want to express it, is an important part of communication. Communication involves a complex interaction of habits, attitudes, knowledge, information and bias.

The process of communication consists of three steps:

1. receiving;
2. interpreting; and
3. responding.

Receiving Information

Receiving a message will depend directly on what information was sent by the sender and how it was sent. When receiving, listening is of the utmost importance.

Messages may be simple or complex. When receiving a complex message, the receiver must be prepared to write down important information. If there is a lack of understanding or any confusion, the receiver should ask questions.

Interpreting Information

After a message has been received, it must be reflected on and interpreted. Simple messages may not require much interpretation.

Receivers of a message will translate what they heard based on their own set of definitions, which may differ greatly from those of the sender.

Responding Information

A response will let the sender know that the message has been received and interpreted and is now being acted on. The response may be to the sender or it may be to another person or a group to act on the message. When responding to information, being able to communicate what was interpreted from the message is important.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What step of communication occurs after the message has been received?

Q2. What should be done if there is a lack of understanding or any confusion?

Q3. Who may receive a response in the communication process?

ANTICIPATED ANSWERS

A1. Interpreting is the next step.

A2. Questions should be asked.

A3. The response may be to the sender or it may be to another person or a group in order to act on the message.

Teaching Point 4	**Identify the Barriers to Effective Communication**
Time: 10 min	Method: Interactive Lecture

BARRIERS TO COMMUNICATION

When sending a message, the sender must understand that there are barriers to communication – ways in which communicating can lead to misinterpretation. In order to communicate effectively, these barriers must be overcome or managed. Keep in mind that the real communication is the message others receive, not the message intended.

When the receiver has to overcome barriers to communication, there may be effects such as:

- defensiveness, confusion, resistance and resentment;
- dependency on others to explain and inform;
- withdrawal from conversations;
- feelings of defeat or inadequacy; or
- decreased likelihood of problem solving.

Barriers to communication can be divided into three categories: intrapersonal factors, distraction factors and delivery factors.

INTRAPERSONAL FACTORS

The following barriers to communication are intrapersonal factors:

- **Stress.** When feeling the effects of stress, both the sender and the receiver may easily lose focus of the goal of the message. When experiencing stress, it may be difficult for a person to concentrate on messages.
- **Emotion.** When the sender of a message has high emotion, such as worry, fear or even excitement, the intent of the message may be lost. When the receiver has strong, negative emotions about the sender or disagrees with the message, interpretation may be difficult.
- **Misinterpretation.** The meaning of the message may be misinterpreted by the receiver. Sometimes a word can mean two different things and different words have different meanings for different people. When the sender uses complex words, they must ensure that the receiver is capable of understanding them. Be aware that a person may use a particular word in a different way than others understand it.
- **Poor Listening Habits.** When the receiver has poor listening habits, the meaning and intent of the message may be lost. It is important for the sender to look for cues to make sure that receivers are listening and paying attention.
- **Closed-Mindedness.** People sometimes only hear what they want to hear. When new ideas or change are brought to a situation, some people may have a difficult time accepting the message.
- **Prejudice.** Prejudice can occur between the sender and receiver. When the ability to understand is questioned or the intent is misjudged due to preconceived opinions, the effectiveness of the message may be weakened.

DISTRACTION FACTORS

The following barriers to communication are distraction factors:

- **Visual.** When sending or receiving a message, it is easy to become distracted by sights in the area. Even when the participants seem extremely focused, seeing something out of the corner of the eye can distract and confuse them.
- **Auditory.** Noise is also a distraction when sending or receiving a message. When noise occurs, participants can become distracted and confused. The sender may have to stop sending the message, wait for the noise to stop and then begin to send again. It is important that the receivers have an environment free of distractions.

DELIVERY

The following barriers to communication are delivery factors:

- **Language.** The language a person speaks may have a significant affect on the effectiveness of a message. Trying to understand a message that is being sent in another language is extremely difficult. Also, when a person uses complex wording to explain a concept, meaning can be lost. Using simple language to explain concepts will ensure that everyone understands the message and will avoid possible confusion.
- **Mixed Messages.** Mixed messages occur when the sender sends a variety of messages, all indicating different ideas or meanings. Mixed messages may be interpreted through body language and tone of voice used by the sender. If the receiver interprets mixed messages, the intent of the message may become lost.
- **Overload.** When bombarded with information, understanding a message is difficult. When given extra information, the receiver has to sort through and pick out the key pieces. Being overloaded may cause a person to hear only part of a message or distort a message. As a sender, only send the information that the receiver needs to know.

Teaching Point 5 | **Conduct an Activity That Demonstrates the Barriers to Effective Communication**

Time: 15 min | Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets experience barriers to communication.

RESOURCES

- Stopwatch,
- Paper,
- Scissors,
- Resealable plastic bags (one per two cadets),
- Envelopes (one per two cadets), and
- Communication puzzle located at Annex D (one per cadet).

ACTIVITY LAYOUT

Set up an area in which the cadets can sit back to back.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs. Within each pair, have the cadets decide who will be “A” and who will be “B”.
2. Explain to the cadets that they will have to sit back to back. Cadet “A” will have to try to get cadet “B” to use cut-out shapes to replicate the given design. There will be three rounds consisting of:
   (a) During the first round, only Cadet “A” can speak.
   (b) During the second round, Cadet “B” may ask questions but Cadet “A” can only answer with yes or no.
   (c) In the third round, both cadets may speak freely.

If at any time the cadets think that the puzzle has been solved, Cadet “A” may look at their partner’s puzzle. If correct, Cadet “A” should rotate (turn) the puzzle so that it is different from previous tries and begin again until time has run out.

3. Distribute the puzzle in an envelope to each Cadet “A”. Distribute the cut-out pieces in a resealable bag to each Cadet “B”.
4. Have the cadets sit back to back and begin the first round. Start the stopwatch.

If there is enough room, have all of the “A” cadets face one direction and all of the “B” cadets face the opposite direction to ensure that none of the “B” cadets can see another cadet’s puzzle.

5. After three minutes, stop the cadets. Have them begin the second round. Start the stopwatch.

6. After three minutes, stop the cadets. Have them begin the third round. Start the stopwatch.

7. After three minutes, have the cadets compare puzzles with other pairs.

8. Bring the cadets together for a debriefing. Ask questions such as:

   (a) Why was it frustrating not being able to fully communicate throughout the activity?

   (b) What communication did you have to try to overcome during the activity?

   (c) Can you think of a real-life situation in which you were trying to solve a problem but did not have all of the “pieces” needed? What would have changed in that situation if you had received more information or if others had communicated more clearly?

   (d) What happens when one team member has a specific goal in mind but cannot clearly communicate it to the team? How can the team improve the way information is communicated?

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 5

The cadets participation in the in-class activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets participation in the in-class activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

People communicate everyday as a way to share knowledge, interests, attitudes, opinions, feelings and ideas with others. Communication skills are a fundamental part of leadership because they permit the flow of ideas from you to another person or to a group, and vice versa. Communication skills will increase with experience which is why you should take every opportunity to communicate with others.

INSTRUCTOR NOTES/REMARKS

N/A.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO M303.05 – SUPERVISE CADETS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to introduce the cadets to supervision.

A group discussion was chosen for TPs 3 and 4 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to supervise cadets.

IMPORTANCE

It is important for cadets to understand the purpose of supervision and how to supervise because effective supervision is a fundamental element of becoming a leader. Proficiency Level Three cadets will be expected to supervise their teams while conducting leadership assignments.

Teaching Point 1 | **Explain the Purposes of Supervision**

Time: 10 min | Method: Interactive Lecture

THE PURPOSES OF SUPERVISION

There are three main purposes of supervision.

To Provide Protection. Supervision ensures the safety and well-being of personnel.

Safety is the number one issue in every aspect of the Cadet Program. When situations are not safe, they are stopped immediately.

CATO 14-31, *Director Cadets and Junior Canadian Rangers General Safety Program* outlines the requirements for a general safety program that must be incorporated in every aspect of cadet activities.

To Provide Support. Supervision ensures that all members of the team are assisted, provided for and encouraged during tasks. If cadets are not practicing intrapersonal management, interpersonal management, teamwork and effective communication, the supervisor must act on the situation.

To Provide Quality Assurance. Supervision ensures the outcomes of a task meet expectations for that task. If cadets are not meeting their responsibilities in completing the task, the supervisor must act on the situation.

No one likes to be over-supervised. It is important to not micromanage your team.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the purposes of supervision?

Q2. How does supervision provide support?

Q3. How does supervision provide quality assurance?

ANTICIPATED ANSWERS

A1. The purposes of supervision are to provide protection, to provide support and to provide quality assurance.

A2. Supervision ensures that all members of the team are assisted, provided for and encouraged during tasks.

A3. Supervision ensures outcomes of a task meet expectations for that task.

Teaching Point 2	**Explain How to Supervise**
Time: 70 min	Method: Game

HOW TO SUPERVISE

As team leaders, cadets will be expected to supervise others. Supervision takes place during the entire task, not just at the beginning or end of the task. Although each situation where supervision takes place is unique, there are some basic responsibilities that must be fulfilled. Team leaders shall meet these responsibilities by:

Ensuring Safety. Ensuring that every situation in the Cadet Program is carried out in a safe manner is the primary concern of all members involved.

Ensuring the Well-Being of Cadets. The welfare of cadets within the Cadet Program is a primary concern in the execution of all training and administrative tasks.

Encouraging Cadets. Encourage cadets to produce satisfactory work because they want to. Inspiring results through praise creates a positive outcome.

Adjusting Responsibilities as Required. Being able to adjust a cadet's responsibilities during tasks is important. Cadets with experience may need less supervision and may be given extra responsibilities.

Maintaining Control of Cadets. Keep cadets on task while they are producing satisfactory work. An effective supervisor will be able to keep cadets focused.

Correcting Errors as Required. If mistakes are made, effective supervisors will communicate this. They will revise what and how it needs to be done and remedy errors.

Reporting Misconduct as Required. When cadets behave in a manner that is inconsistent with the core leadership qualities of a cadet, these behaviours should be reported up the chain of command.

Ensuring Completion of Responsibilities Assigned to Cadets as Required. When supervisors delegate or assign tasks to others, it is the supervisor's responsibility to ensure all delegated tasks are completed.

Successful supervisors are usually successful leaders.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. When does supervision take place?

Q2. List the supervision responsibilities that a team leader should meet.

Q3. What is the primary concern of all members involved in the Cadet Program?

ANTICIPATED ANSWERS

A1. Supervision takes place during the entire task, not just at the beginning or end of the task.

A2. The supervision responsibilities that a team leader should meet are:

- ensuring safety;
- ensuring the well-being of cadets;

- encouraging cadets;
- adjusting responsibilities as required;
- maintaining control of cadets;
- correcting errors as required;
- reporting misconduct as required; and
- ensuring completion of responsibilities assigned to cadets as required.

A3. Ensuring that every situation in the Cadet Program is carried out in a safe manner.

Teaching Point 3 **Conduct a Group Discussion on Supervision**

Time: 15 min Method: Group Discussion

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What do you think the responsibilities of an effective supervisor are? Are they different from the list in TP 2?

Q2. Which responsibility is the most important? Why?

Q3. Which responsibility is used the least? Why?

Q4. List some examples where you have seen leaders use the various responsibilities.

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the group discussion will serve as the confirmation of this TP.

Teaching Point 4 — **Discuss the Supervision Requirements at the Squadron**

Time: 15 min — Method: Group Discussion

The point of the group discussion is to draw information about supervision at the squadron from the group using the tips for answering/facilitating discussion and the suggested questions provided.

Cadets are supervised in various locations at the squadron. These locations may include stairways, doorways, hallways, parade square, classrooms, canteen, etc. They are supervised to provide protection and support for cadets and quality assurance during the task.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. Name some locations around the squadron where the cadets will need to be supervised for safety reasons.

Q2. How will you supervise these areas?

Q3. Is supervision of cadets different in these areas than in the rest of the building?

Q4. How will you supervise the areas in the rest of the building?

Q5. Is supervision of cadets different when they are not in the building?

Q6. Give some examples of how to encourage cadets during supervision.

Q7. Give some examples of misconduct that you would report up the chain of command.

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the group discussion will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the group discussions will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 1 (303 PC).

CLOSING STATEMENT

Successful supervisors are usually successful leaders. Supervisors safeguard others, encourage others, and empower others to use their skills, expertise and ideas to produce results.

INSTRUCTOR NOTES/REMARKS

N/A.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO M303.06 – SOLVE PROBLEMS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the problem-solving scenarios located at Annex E.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1, 2 and 3 to review logical analysis and orient the cadets to additional problem-solving methods.

An in-class activity was chosen for TP 4 as an interactive way to provoke thought and stimulate interest among cadets about problem solving.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have solved problems.

IMPORTANCE

One important skill that a team leader must have is the ability to solve problems. As cadets become team leaders, they will use this skill more often. Cadets have a greater chance of success in solving problems if they have a variety of problem-solving methods from which to choose.

Teaching Point 1	**Review the Steps for Logical Analysis**
Time: 5 min	Method: Interactive Lecture

LOGICAL ANALYSIS

The eight steps in logical analysis were taught in the previous year (M203.06 Employ Problem Solving, A-CR-CCP-802/PF-001, *Royal Canadian Air Cadets, Level Two Instructional Guides*, Chapter 3, Section 6). They are:

1. confirming the task;
2. identifying the problem;
3. determining the critical factor;
4. developing alternative solutions;
5. comparing alternative solutions;
6. determining the best solution;
7. implementing the solution; and
8. evaluating the plan and the implementation.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the first step in logical analysis?

Q2. What is the third step in logical analysis?

Q3. What is the last step in logical analysis?

ANTICIPATED ANSWERS

A1. Confirming the task.

A2. Determining the critical factor.

A3. Evaluating the plan and the implementation.

Teaching Point 2	**Explain the Steps in the IRISE Method of Problem Solving**
Time: 10 min	Method: Interactive Lecture

The IRISE method of problem solving is much like logical analysis but has fewer steps to remember.

The IRISE method of problem solving was developed for adolescents.

IRISE is an acronym. The IRISE method of problem solving has five steps. They are:

1. **Identifying the Problem.** To be able to solve a problem, cadets must understand what the problem really is. If the problem is not clearly identified, a problem may be solved but it may not be the “real” problem. Questions that should be asked in step one include:

   - What do we wish to accomplish?
   - How much time will we need?
   - What resources do we have?
   - What resources do we need?

2. **Researching All of the Options.** This step involves “brainstorming” options to solve the problem. Cadets will have to research each option. Some options will need to be discussed outside the team and some options will need to be critically and methodically investigated. There will be some options which will solve the problem easily and some options will be more difficult. Some questions may need to be asked, such as:

   - Which option is the simplest?
   - Which option is the safest?
   - What is the worst possible outcome?
   - Which option is the most flexible?
   - Which option uses available resources in the most economical manner?

3. **Identifying the Consequences of the Options.** Each option will have consequences. Ensuring the cadets know what the consequences may be before putting a decision into action, may help to eliminate options with undesirable consequences. There may be consequences to options that will not be known, but these should be very limited.

4. **Selecting the Most Appropriate Option.** This is the step where the option is selected and implemented. Once an option is selected, a plan for implementation should be created. It is now time to put the plan into action.

5. **Evaluating the Decision.** Once the plan is implemented, evaluate the decision. Examine the implementation of the option and the needs that may not have been anticipated. Questions may include:

   - Was the option a good one?
   - Was the plan to implement the option a success?
   - What can we do to improve the plan or the implementation for the next time?
   - What lessons were learned?

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. For whom was the IRISE method of problem solving developed?

Q2. The IRISE method of problem solving is similar to what other method of problem solving?

Q3. What are the steps in the IRISE method of problem solving?

ANTICIPATED ANSWERS

A1. For adolescents.

A2. Logical analysis.

A3. The steps in the IRISE method of problem solving are:

(1) identifying the problem;

(2) researching all of the options;

(3) identifying the consequences of the options;

(4) selecting the most appropriate option; and

(5) evaluating the decision.

Teaching Point 3	Explain the Steps in the TEACH Method of Problem Solving
Time: 10 min	Method: Interactive Lecture

The TEACH method of problem solving is much like the IRISE method, which is like logical analysis.

The TEACH method of problem solving was developed for a team approach. The TEACH method of problem solving is another situation where positive team dynamics should be displayed.

TEACH is an acronym. The TEACH method of problem solving has five steps. They are:

1. **Time.** This first step involves spending time to discover the real issue or problem. With the assistance of the team the “real” problem must be identified. Questions that should be asked in the “time” step should be the same as the identifying the problem questions for the IRISE method.

2. **Exposure.** This second step involves uncovering what others have done in a similar situation. By using information gathered from others, the number of options that may be created to solve the problem should increase.

3. **Assistance.** This third step involves having your team study all the information from different perspectives. The team will be a great asset because differing views, based on knowledge and experience of the same issue, will lead to a better result and a more collaborative environment.

4. **Creativity.** This fourth step involves having the team “brainstorm” options and the consequences of those options. Again, the team will be a great asset because of differing views based on knowledge and experience.

5. **Hit it.** This last step involves implementing the best option. The team will help develop a plan to implement the selected option. After the option has been implemented, evaluation of the option and its implementation will need to take place. Questions to evaluate the implementation should be the same as the IRISE method of problem solving.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. For what kind of approach was the TEACH method of problem solving developed?

Q2. The TEACH method of problem solving is much like what other method of problem solving?

Q3. List the five steps to the TEACH method of problem solving.

ANTICIPATED ANSWERS

A1. For a team approach.

A2. The IRISE method.

A3. The five steps to the TEACH method of problem solving are:

- time,
- exposure,
- assistance,
- creativity, and
- hit it.

Teaching Point 4	Conduct an Activity Where Cadets Will Select a Problem-Solving Method and Apply it to a Scenario
Time: 25 min	Method: In-Class Activity

Use all four scenarios located at Annex E. Distribute evenly among cadets (eg, four cadets receive scenario 1, four cadets receive scenario 2, three cadets receive scenario 3 and three cadet receive scenario 4).

ACTIVITY

OBJECTIVE

The objective of this activity is for cadets to select a problem-solving method and apply it to a scenario.

RESOURCES

- Scenario, and
- Pen/pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute one scenario to each cadet.
2. Cadets shall choose a problem-solving method and apply its steps to the scenario. Cadets will write down their method and steps on the scenario paper.

Cadets may choose any method to solve the problem including Logical Analysis, IRISE or TEACH.

3. After 10 minutes, have the cadets find everyone else in the class who has the same scenario. Cadets will share their ideas within the group.
4. After 5 minutes, have each group present their scenario to the class with the problem-solving methods and their possible solutions.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the problem-solving activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 1 (303 PC).

CLOSING STATEMENT

It is important to practice the skill of problem solving. Learning to solve problems is a leadership skill. Cadets have a greater chance of success in solving problems if they have a variety of problem-solving methods to choose from.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 7

EO M303.07 – LEAD CADETS THROUGH A LEADERSHIP ASSIGNMENT

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Review the assessment instructions located at A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 1 (M303 PC).

Become familiar with the Rearrange Classroom Space leadership assignment located at Annex G.

Make a sketch of the classroom for the Rearrange Classroom Space leadership assignment which will be used throughout the lesson.

Photocopy the Leadership Assignment Format handout located at Annex H for each cadet.

Photocopy the After-Assignment Report and 303 PC Assessment Rubric located at Annex I for each cadet.

Photocopy the Leadership Assignment Assessment Rubric located at A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 1 for each cadet.

Leadership assignments will require different levels of planning and experience from the cadets. Select a leadership assignment for each cadet based on their ability. Ensure the sample stretches located at Annex K are photocopied for those cadets who are completing leadership assignments involving warming up or cooling down muscles.

Photocopy the Leadership Assignment Planning Guide located at Annex M for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A demonstration was chosen for TPs 1 to 4 as it allows the instructor to explain and demonstrate the format of a leadership assignment in a safe, controlled environment.

An interactive lecture was chosen for TP 5 to give direction on the procedure for completing an after-assignment report.

An in-class activity was chosen for TP 6 as it is an interactive way to provoke thought and stimulate interest among cadets.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to lead peers through a leadership assignment.

IMPORTANCE

It is important for cadets to understand the steps involved in completing leadership assignments as they occur many times throughout cadet training. All cadets will be required to complete at least two leadership assignments during Proficiency Level Three. When given an assignment, every cadet must know the steps involved for successful completion. An effective leader will merge together all of the pieces learned throughout leadership training, such as solving problems and supervising, to successfully lead a team through an assignment.

During Proficiency Level Three, each cadet will be required to complete at least two leadership assignments. A list of Possible Year Three Leadership Assignments is located at Annex F.

Teaching Point 1	**Discuss and Demonstrate the Process of Preparing for a Leadership Assignment**
Time: 10 min	Method: Demonstration

Discuss the aspects of preparing for a leadership assignment.

Use the sample leadership assignment located at Annex G to demonstrate the preparation stage.

Distribute copies of the Leadership Assignment Format handout located at Annex H and the After-Assignment Report and the 303 PC Assessment Rubric located at Annex I to each cadet. Distribute copies of the Leadership Assignment Planning Guide located at Annex M. Encourage the cadets to view each section as it is explained throughout this lesson.

PREPARE FOR A LEADERSHIP ASSIGNMENT

Ensure the Goal is Understood

Always ask questions to the directing staff, especially when there is doubt about any portion of the assignment. Before spending any time planning, the leader must ensure that what they think needs to happen is actually the goal of the assignment.

Ensure the Required Resources are Available

Make sure that all the resources required to complete the assignment are available. Complete a reconnaissance by looking around the area. Try to locate other resources that may be used. If boundaries have been determined, locate them.

Complete a Time Appreciation

Be aware of the time given for the completion of the assignment. If the assignment must be broken down into stages, the leader must determine how much time must be allocated to each. Sometimes tasks can be done concurrently, which will save time in the end.

When completing a time appreciation, check the time. All members involved in the assignment must be aware of the current time and the expected time of completion.

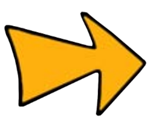
Make a Plan

Using the planning guide (located at Annex M), make a plan to accomplish the goal of the assignment by:

- determining the tasks that need to be completed;
- developing a process to accomplish all tasks; and
- allocating resources.

The plan will include the answers to who, what, when, where, how and why. Who will do what? Who does it involve? What is going to be done? When does it start? When does it end? Where will it take place? How will it take place? Why must it be done? What will happen if it is not done?

Tasks can be assigned to individuals or teams. All members must have something to do.



If the leader is given an unfamiliar assignment, ask questions to the directing staff to help clarify. If the leader has no experience with what is involved in the assignment, they may also ask a fellow cadet to clarify and then continue to make the plan. The more complex tasks may go to a cadet who has had previous experience with the requirements of the assignment.

A sample process for preparing the "Rearrange Classroom Space" leadership assignment could be:

1. Read the assignment.
2. Ask a question or two to ensure the assignment is understood. For example, "Which way will the classroom face?" or "So I can use more than four cadets?"
3. Look around the area to make sure all of the required resources are available.
4. Complete a time appreciation by checking and analyzing the time. For example, it will take three minutes to prepare and introduce the assignment, it will take approximately five minutes to complete the assignment and it will take approximately two minutes to carry out a debriefing.
5. Make a plan for the completion of the leadership assignment. The plan could include:
   (a) dividing the team members into three teams (Team A, Team B and Team C);
   (b) showing a brief sketch of what the classroom should look like at the end of the assignment;
   (c) assigning Team A to rearrange the chairs;
   (d) assigning Team B to rearrange the desks/tables; and
   (e) assigning Team C to put the whiteboard and any electronic equipment in place.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How can the leader make sure the goal is understood?

Q2. What must be considered when completing a time appreciation?

Q3. When making a plan, what must the leader do in order to accomplish the goal of the assignment?

ANTICIPATED ANSWERS

A1. Ask questions of the directing staff.

A2. Be aware of the time given for the completion of an assignment. If the assignment must be broken down into stages, the leader must determine how much time must be allocated to each. Sometimes tasks can be done concurrently, which will save time in the end.

A3. The leader must determine all tasks, develop a process to accomplish all tasks and allocate resources.

Teaching Point 2	Discuss and Demonstrate the Process of Introducing a Leadership Assignment
Time: 10 min	Method: Demonstration

Discuss the aspects for introducing a leadership assignment.

Use the sample leadership assignment located at Annex G to demonstrate the introduction stage.

INTRODUCE A LEADERSHIP ASSIGNMENT

When giving the introduction, the leader must ensure they have the attention of all of the team members. If one cadet is not paying attention, it could affect the end state of the leadership assignment.

When introducing a leadership assignment, the leader must speak loudly, clearly and concisely, to let everyone know that they have faith in their plan. A leader who speaks with authority will capture the attention of team members and make them want to participate in the assignment.

State the Assignment to be Completed

Tell the team members the “big picture” of what is going to be done.

This statement could simply include the title of the leadership assignment.

State the Goal of the Assignment

What is the end state? If there is a reason for completing the assignment (eg, a guest speaker is coming, to begin summer biathlon, etc) it should be stated. If a sketch is included, it should be shown here so that everyone has a sense of what the result should be. When stating the goal, time requirements should be included.

Identify the Resources Required for the Assignment

Ensure that all of the cadets are aware of the resources that are required to complete the assignment and where these resources are located.

Communicate the Overall Plan

Explain how the assignment will be conducted. All members should know what is to be done, but will find out what their specific part is in another step. If boundaries exist, include them in the plan.

Assign Tasks to Team Members as Applicable

Assign all team and individual tasks needed to complete the assignment. Every member must have something to do.

Ensure the Team Members Understand the Assignment

Ask the team if they have any questions. The leader should also ask a few questions to various members of the team to ensure comprehension. When members are given specific tasks, it is extremely important that they are completely aware of what is expected of them.

Asking “What are you going to do?” is more effective than “Do you understand?”

Never ask yes/no questions when ensuring that team members understand the assignment. Some may be too embarrassed or timid to admit that they do not completely understand, which will jeopardize the effectiveness of the plan.

After the introduction stage, all of the cadets should know where they fit into the overall plan and how, by working together, they will accomplish much more than they could as individuals.

A sample introduction for the “Rearrange Classroom Space” leadership assignment could be:

1. “Today we will be rearranging this classroom space for a guest speaker presentation.”
2. “The goal of this assignment is to rearrange the classroom by turning it around to face the opposite direction. We have five minutes to complete the assignment once we begin.” Show the sketch to the cadets.
3. “Resources required include chairs, tables, a whiteboard and a liquid crystal display (LCD) projector.”
4. “In order to turn the classroom around, the team will be divided into three teams; A, B and C. One team will be in charge of chair placement, another in charge of table placement and the other in charge of whiteboard and LCD projector placement. Each team will complete their task concurrently.”
5. Divide the cadets into three teams.
6. “Team A will rearrange the chairs, Team B will rearrange the tables and Team C will put the whiteboard and LCD projector in place.”
7. Ask two or three cadets to state what their task is to ensure understanding.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are the steps to introduce a leadership assignment?

Q2. What is the goal of the assignment?

Q3. How can the leader make sure team members understand the assignment?

ANTICIPATED ANSWERS

A1. The steps are:

- state the assignment to be completed;

- state the goal of the assignment;
- identify the resources required for the assignment;
- communicate the overall plan;
- assign tasks to team members as applicable; and
- ensure the team members understand the assignment.

A2. The end state.

A3. Ask the group if they have any questions. The leader should also ask a few questions to various members of the team.

Teaching Point 3 **Discuss and Demonstrate the Process of Conducting a Leadership Assignment**

Time: 10 min Method: Demonstration

Discuss the aspects of conducting a leadership assignment.

Use the sample leadership assignment located at Annex G to demonstrate the conducting stage.

CONDUCT A LEADERSHIP ASSIGNMENT

Supervise Peers

When an assignment is being conducted, the leader must constantly supervise the team members. The most important aspect of supervision is to ensure that the assignment is being conducted safely. If cadets are completing aspects of the assignment unsafely, stop the task immediately.

The cadets must remain focused on the goal. If mistakes occur, correct them as soon as possible. If members are experiencing difficulty, take time to reanalyze and reassign tasks. Asking questions throughout the completion of the assignment will ensure that all team members remain focused and that those (if any) who are experiencing difficulty are identified.

Maintain Team Control

Ensure that all team members understand that the leader is in charge and that everyone is following the plan laid out in the introduction stage. When members are not completing what was asked of them, correct it immediately.

A way to maintain team control is to motivate throughout the task and encourage team members to motivate each other. This will help create a positive environment.

Ensure the Assignment is Progressing According to the Time Allotted

Keep checking the time. If tasks are not being completed as planned, whether too slow or too fast, the plan may need to be reanalyzed.

Modify the Plan as Required

If the plan is not working, take time to modify it. If help is required from team members, ask for it. Changing aspects of the plan partway through the assignment may benefit the outcome; however always keep time limits in mind. Once a new plan has been developed, have the team stop what they are doing, communicate the new plan to the members and then have them implement it.

A sample process for conducting the “Rearrange Classroom Space” leadership assignment could be:

1. Have the cadets begin the assignment.
2. Supervise the cadets by walking around, visually inspecting work and ensuring the assignment is being completed safely. Correct any mistakes or errors and ask questions (eg, “Are you having difficulty with your assigned task?”) to ensure everyone remains focused on the assignment.
3. Ensure the teams are working together toward the same goal.
4. Motivate the cadets throughout the assignment.
5. Check the time occasionally to make sure the assignment is progressing according to the time limits set.
6. Modify the plan as required.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is the most important aspect of supervision?

Q2. What should the leader do if members are not completing what was asked of them?

Q3. If a plan needs to be modified, what should happen once the new plan has been developed?

ANTICIPATED ANSWERS

A1. The most important aspect of supervision is to ensure that the assignment is being conducted safely.

A2. When members are not completing what was asked of them, correct it immediately.

A3. Once a new plan has been developed, have the team stop what they are doing, communicate the new plan to the members and then have them implement it.

Teaching Point 4	**Discuss and Demonstrate the Process of Debriefing a Team Following a Leadership Assignment**
Time: 10 min	Method: Demonstration

Use the sample leadership assignment located at Annex G to demonstrate the debriefing stage.

DEBRIEF A TEAM FOLLOWING A LEADERSHIP ASSIGNMENT

Review the Goal

After the completion of a leadership assignment, it is important to review what the goal of the assignment was with the cadets.

Provide Feedback

The leader should first ask for feedback on the assignment from the team. This can be done using general questions about leadership assignments, such as:

- Was there anything learned from the assignment?
- How did you feel about the assignment?
- Was the goal met?
- How did everyone interact during the assignment?
- Were there behaviours that helped and/or hindered the assignment?
- Were there any cadets who were not motivated to participate in the activity? How did this affect the morale of the remainder of the team?
- Were there leaders that emerged within the team?

It is important to know how the cadets felt about their participation in the completion of the assignment.

It is also important to give feedback to the cadets. It is vital for the leader to spend time focusing on how the team worked together to achieve a common goal.

Re-Motivate the Team

The final step in debriefing a team after a leadership assignment has been completed is to re-motivate the cadets. The cadets need to be reminded of the importance of working together to accomplish an assignment.

A sample debriefing for the "Rearrange Classroom Space" leadership assignment could be:

1. Bring all of the cadets together.
2. Review the goal. For example "Great job team, we rearranged the classroom. It looks exactly like the sketch!"
3. Ask feedback questions to the team such as:
   (a) How did you feel about the completion of the assignment?
   (b) Were there behaviours that helped and/or hindered the assignment?
   (c) Were there leaders that emerged within the team?
4. Re-motivate the team by reminding them of the importance of working together to accomplish an assignment.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What are the three steps of a leadership assignment debriefing?

Q2. What are some questions that can be asked to get the team to provide feedback?

Q3. Why is it important to re-motivate the team?

ANTICIPATED ANSWERS

A1. The three steps of a leadership assignment debriefing:

- reviewing the goal;
- providing feedback; and
- re-motivating the team.

A2. Some questions could include:

- Was there anything learned from the assignment?
- How did you feel about the assignment?
- Was the goal met?
- How did everyone interact during the assignment?
- Were there behaviours that helped and/or hindered the assignment?
- Were there any cadets who were not motivated to participate in the activity? How did this affect the morale of the remainder of the team?
- Were there leaders that emerged within the team?

A3. The cadets need to be reminded of the importance of working together to accomplish an assignment.

Teaching Point 5	**Explain the After-Assignment Report**
Time: 5 min	Method: Interactive Lecture

> It is important for the cadets to construct their own learning and decide the importance of the assignment that was conducted. This may not be the same for every leader.

AFTER-ASSIGNMENT REPORT

The after-assignment report is a tool for cadets to use to reflect on their performance after completing a leadership assignment. It is used by the cadet (the leader) during the feedback session with the directing staff to help guide the discussion. The feedback session will take place the day after the assignment was completed.

Each cadet will complete an after-assignment report before attending the feedback session for the leadership assignment.

LEADERSHIP ASSIGNMENT ASSESSMENT RUBRIC

The leadership assignment Assessment Rubric is the form the directing staff will use to assess each cadet's performance as a peer leader when conducting a leadership assignment.

Each cadet will be required to complete their own leadership assignment assessment in conjunction with their after-assignment report and bring it to the debriefing. This form will be used as a self-assessment tool for reflection and discussion with the directing staff.

> The results that a cadet reveals on the assessment form shall not affect the results given by the directing staff.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What is the after-assignment report?

Q2. To whom is the after-assignment report presented?

Q3. How long after the leadership assignment will the debriefing occur?

ANTICIPATED ANSWERS

A1. The after-assignment report is a tool for cadets to use to reflect on their performance after completing a leadership assignment. It is used by the cadet (the leader) during the debriefing with the directing staff to help guide the discussion.

A2. The directing staff.

A3. The debriefing will take place the day after the assignment was completed.

Teaching Point 6	**Discuss How to Plan for a Leadership Assignment**
Time: 5 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadets to complete the preparation stage of a leadership assignment.

RESOURCES

- Leadership assignment located at Annexes J and L,
- Leadership Assignment Planning Guide located at Annex M, and
- Pen/pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain that this step is normally completed directly before the leadership assignment is to be conducted. Time will be given to develop a plan for the leadership assignment when each assignment is given. Both leadership assignments will be conducted at a later time.
2. Distribute a leadership assignment to each cadet.
3. Encourage the cadets to ask questions if the goal is not understood.
4. Tell the cadets to assume that all required resources are available.
5. Ensure the cadets are aware that there are aspects of planning that must still be completed when leading a team through the leadership assignment. For example, questions must still be asked to make sure the goal is understood, resources must still be checked and a time appreciation must still be completed. At

this point during the actual leadership assignment, some cadets may wish to revisit/reanalyze the plan developed during this activity.

6. Have the cadets develop a plan to conduct their leadership assignment. The cadets may work in small teams if desired for answering questions and assisting with planning.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 6

The cadets' participation in the in-class activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the five main steps to complete a leadership assignment?

Q2. What is one way to maintain team control?

Q3. What is an after-assignment report?

ANTICIPATED ANSWERS

A1. The five main steps are:

- preparing for the assignment;
- introducing the assignment;
- conducting the assignment;
- debriefing the team; and
- presenting an after-assignment report.

A2. A way to maintain team control is to motivate throughout the assignment and encourage team members to motivate each other. This will help create a positive environment.

A3. The after-assignment report is a tool for cadets to use to reflect on their performance after completing a leadership assignment. It is used by the cadet (the leader) during the debriefing with the directing staff to help guide the discussion.

CONCLUSION

HOMEWORK/READING/PRACTICE

Any cadets who did not complete their plans will be required to complete them as homework.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 1 (303 PC).

CLOSING STATEMENT

Leadership assignments will occur many times throughout cadet training. When given an assignment, all cadets must know and be comfortable performing the steps involved for successful completion. Being able to combine all of the segments of leadership training such as solving problems and supervising, into one cohesive unit in order to lead a team through an assignment is a special achievement for which all cadets should strive.

INSTRUCTOR NOTES/REMARKS

N/A.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 8

EO C303.01 – LEAD A TEAM-BUILDING ACTIVITY

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy one team-building activity per group from the activities located at Annex N for the activity in TP 7.

Photocopy handouts of two team-building activities for each cadet – one activity from Annex O and one from Annex P. Cadets are to retain these for future use.

Photocopy two Team-Building Planning Guides located at Annex Q for each cadet.

Photocopy the Self-Assessment Form located at Annex R for each cadet.

Prepare the activity for TP 3 by:

- gathering two colours of sticky notes and a marker;
- writing each consonant of the alphabet (minus Q, X and Z) on one colour of sticky notes (one letter per note);
- writing each vowel on the second colour of sticky notes (one letter per note); and
- ensuring there are enough letters for every cadet (if there are more cadets than letters, create duplicates of common letters [eg, A, E, N, R, S, T, etc]).

Ensure one or two assistant instructor(s) are available for the activity in TP 7 (depending on the number of cadets).

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TPs 1, 3 and 5 as it is an interactive way to provoke thought and stimulate interest among cadets.

A group discussion was chosen for TPs 2, 4 and 6 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about the components of team-building activities.

A practical activity was chosen for TP 7 as it is an interactive way to allow the cadets to experience team-building activities in a safe and controlled environment.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have led team-building activities.

IMPORTANCE

It is important for cadets to know how to lead team-building activities to ensure that they are fun, challenging and achievable for every cadet. Each cadet will be given the opportunity to lead two team-building activities. Team-building activities are a great way to relieve boredom, lift team spirit, increase morale, re-energize cadets and accomplish goals. Therefore, every cadet in a leadership role should be able to lead activities focusing on these things. Once an activity that meets the needs of the group has been selected, it is the role of the leader to ensure the activity is completed in a manner that allows the group to learn. A meaningful and enjoyable team-building experience will occur for every cadet when the right activity is conducted in an appropriate fashion.

There are three components to leading a team-building activity. The individual leading a team-building activity should:

- introduce the activity;
- conduct the activity; and
- debrief the cadets on the activity.

To ensure the cadets understand how to lead a team-building activity, they will participate in each component separately as the instructor leads them through a sample team-building activity. Each component will then be discussed as it is completed to ensure understanding.

TPs 1 to 6 are to be conducted in the following manner:

- In TP 1 the cadets will participate as the instructor introduces a sample team-building activity.
- In TP 2 the cadets will participate in a group discussion that allows them to analyze the elements of an introduction as it was completed in TP 1.
- In TP 3 the cadets will participate as the instructor conducts a sample team-building activity.
- In TP 4 the cadets will participate in a group discussion that allows them to discuss the responsibilities of the leader while conducting a team-building activity as it was completed in TP 3.
- In TP 5 the cadets will participate as the instructor debriefs the cadets on the sample team-building activity conducted in TP 3.
- In TP 6 the cadets will participate in a group discussion that allows them to discuss the elements of a debriefing as it was completed in TP 5.

Teaching Point 1	**Demonstrate and Have the Cadets Participate in an Introduction to a Team-Building Activity**
Time: 5 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadets to participate in an introduction to a team-building activity as it is led by the instructor.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Get the attention of the cadets. Inform the cadets that they will be participating in an activity called “Alphabet Soup” (***Get the Team’s Attention***).

2. Explain that the goal of the team-building activity is to energize the cadets and get them moving (***Explain the Goal of the Activity***).

3. Explain the activity and allow time for the cadets to ask questions for clarification (***Explain the Activity and Assign Tasks as Necessary***), to include:

   (a) every cadet gets a letter and sticks it to the front of their shirt;

   (b) the cadets get a few minutes to form appropriate words using at least four letters; and

   (c) once the cadets get used to forming small words, create longer words or small sentences.

4. Set a time limit of 10 minutes for the activity (***Set Time Limits***).

5. Motivate the cadets to participate in the activity (***Motivate the Team***).

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the introduction to "Alphabet Soup" will serve as the confirmation of this TP.

Teaching Point 2	**Have the Cadets Analyze the Elements of an Introduction**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

ELEMENTS OF AN INTRODUCTION

Getting the Team's Attention

In order to introduce a new activity, the leader must first get the attention of the team. The leader should get the team's undivided attention before continuing to introduce the activity. If one cadet is not paying attention they could miss an important point that could affect their participation in the activity or the activity's outcome.

Explaining the Goal of the Activity

The goal of the activity should be explained to the team in general terms of what will be learned or accomplished. The context of the activity should be explained so the cadets know why their participation is essential and why the activity is a part of the day's agenda. It is important not to give too much detail at this point, as the leader should draw some points on the purpose of the activity from the cadets after the activity's completion.

Explaining the Activity

The activity must be explained to the team prior to participating in the activity. The rules of the activity must be clearly outlined and understood by all cadets prior to commencement. The leader should give step-by-step instructions to ensure the activity is clearly understood.

Assigning Tasks as Necessary

If any specific tasks need to be performed throughout the activity, the leader should assign cadets to these tasks during the introduction of the activity.

Setting Time Limits

The leader is to set a time limit for the cadets to participate in the activity. The leader must factor in time for debriefing the cadets after completion of the activity. The team must be told how long they have to participate in or complete the assigned activity.

Relaying Safety Concerns as Necessary

If there are any safety concerns, the leader must pass these on to the team prior to the start of the activity.

Motivating the Team

Prior to the start of the activity, the leader must motivate the team. The leader should be enthusiastic and share this enthusiasm with the cadets. The goal of the activity is important and there is a reason the activity is being performed. The cadets should be informed of this reason and be motivated toward achieving the goal.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What was the first thing that was done in the introduction to "Alphabet Soup"? Are there different ways to start a team-building activity? What is the first thing you should do?

Q2. Should the goal of the activity be explained prior to commencing the activity? Why or why not? Will the activity be as successful if the goal is not explained?

Q3. Why is it important to inform the cadets how much time they have to complete the activity? When would you tell them how much time they have?

Q4. During the introduction to "Alphabet Soup" were you motivated to begin the activity? What effect did this have on you? Did it make you more interested in completing the activity?

Q5. What other considerations should be passed on during an introduction? Should safety concerns be passed on to the team or should they be left to figure them out as they proceed through the activity?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the group discussion will serve as the confirmation of this TP.

Teaching Point 3 — **Demonstrate and Have the Cadets Participate in the Selected Team-Building Activity**

Time: 10 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity, "Alphabet Soup", is for the cadets to participate in a team-building activity led by the instructor.

RESOURCES

- A large open space,
- Large sticky notes (two different colours), and
- Marker.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a letter to each cadet.
2. Have the cadets stick the letter to the front of their shirts.
3. Give the cadets approximately three minutes to form small words, using at least four letters.
4. Check the words the cadets have formed.

5. Give the cadets approximately five minutes to form longer words or small sentences.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in "Alphabet Soup" will serve as the confirmation of this TP.

Teaching Point 4	**Discuss the Responsibilities of the Leader While Conducting a Team-Building Activity**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

RESPONSIBILITES OF THE LEADER WHILE CONDUCTING THE ACTIVITY

Start the Activity

The leader must inform the cadets when to start the activity.

Supervise the Team

Throughout the duration of the activity, the leader must supervise to ensure the following:

- there are no unsafe practices being followed;
- the cadets remain focused on the activity; and
- the rules are being followed.

Ensure the Goal is Achieved

It is important that the goal of the activity is achieved. If the goal is not achieved, the team-building activity was not successful as a team-building activity, it just became a game. The goal of the activity can sometimes be met without completing the activity. If the goal is not being achieved, the leader may need to:

- refocus the cadets by clarifying the goal of the activity; or
- redirect the activity by modifying the activity to better suit the group.

Stop the Activity if Required

There are a number of reasons why a leader may be required to stop an activity. The most important reason to stop an activity prior to completion is safety. If an activity has become a safety issue, the leader must stop the activity immediately.

An activity may also be stopped if the goal is not being achieved. If the activity is moving away from the goal, the leader must either stop and refocus the cadets, redirect the activity or move on to another point.

An activity may also be stopped if the goal has been achieved prior to the time allotted for its completion. Stopping an activity as it reaches its peak will allow the leader to draw out more specific key points and concepts. Not stopping an activity that has reached its peak will cause the following:

- the energy of the team to drop;
- interest in the goal to be lost; and
- understanding of the goal to be lost.

End the Activity Within the Time Limit

A leader will need to end an activity once the time limit has been met. If the time limit has been met and the activity is not complete, it may be important to attempt the activity at another time. If the purpose of the activity is for the cadets to learn, then it is hard to end an activity until the learning has occurred. If strict time lines are being enforced, the activity can be stopped but it is very important that the leader explain this during the debriefing and perhaps revisit the activity at a later time.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. As the leader of a team-building activity, what do you think some of your responsibilities will be?

Q2. Throughout the duration of the activity, what do you think is the one thing that every leader must do to ensure safety and progression of the activity?

Q3. Under what circumstances would an activity have to be stopped? If an activity is stopped prior to its completion, can it be revisited?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the group discussion will serve as the confirmation of this TP.

Teaching Point 5 — **Demonstrate and Have the Cadets Participate In the Debriefing Component of the Selected Team-Building Activity**

Time: 5 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadets to participate in the debriefing of a team-building activity as it is led by the instructor.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets gather and refocus their attention after the completion of the activity.
2. Review that the goal of "Alphabet Soup" was to energize the cadets and get them moving.
3. Provide feedback on the activity such as:
    (a) how the cadets felt about the activity;
    (b) what the cadets felt they learned from the activity;
    (c) if the goal was met;
    (d) if the activity was completed;
    (e) how the activity could have been conducted differently;

(f) how the cadets interacted during the activity; and

(g) what behaviours helped and/or hindered the activity.

4. Re-motivate the team by:

(a) discussing the meaning of the activity;

(b) discussing how the activity and its outcomes relate to the team's everyday interactions; and

(c) discussing how the learning can affect the team on a daily basis.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in a debriefing on "Alphabet Soup" will serve as the confirmation of this TP.

Teaching Point 6	**Discuss the Elements of a Debriefing**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

ELEMENTS OF A DEBRIEFING

It is important during the debriefing to allow the cadets to construct their own learning and decide the importance of the activity that was conducted. This may not be the same for every group.

Reviewing the Goal

After the completion of a team-building activity it is important to review what the goal of that activity was with the cadets. Cadets always want to know why they had to participate in an activity or learn about a specific topic so reinforce why the learning was important.

Providing Feedback

The leader should first ask for feedback from the group on the activity. This can be done through some preset questions specifically about the activity as well as some general questions about team-building activities. It is important to find out how the cadets felt about the activity (eg, did they feel it was useful, did they learn anything from participating in the activity, etc). The leader will gain valuable insight from the cadets on the activity itself (eg, if they would use it again, how it could be conducted differently, what elements of the activity they would not change if they did the activity again, etc). The most important information to elicit from the cadets is if they felt the activity was worthwhile in that they learned something valuable by participating.

The leader must also give feedback to the cadets. Whether the goal was met is an important point to focus on during this stage. Why was the goal met or why not? Was the activity completed and did this have an effect on the goal being met?

The leader should also give and get feedback on how the group interacted throughout the duration of the activity. The leader should tell the cadets how they viewed the groups' interactions and ask how the cadets felt they interacted with each other. The leader could ask questions such as:

- Were there leaders that emerged within the group?
- Were there any individuals who did not interact well with others during the activity?
- Was there an individual who was not motivated to participate in the activity? How did this affect the morale of the remainder of the group?

Re-Motivating the Team

The final step in debriefing a group after a team-building activity has been completed is to re-motivate the cadets. The cadets need to be reminded of the importance of team-building activities and be motivated to continue participating in them to achieve new dynamics within a team environment.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What should a leader do after the completion of a team-building activity? What should be discussed with the group?

Q2. What is the purpose of reviewing the goal of the activity after completion of the activity?

Q3. What feedback should be given from the group to the leader? How can this information be obtained? What feedback should the leader give to the group?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

Teaching Point 7	**Have Small Groups of Cadets Share Responsibilities of Leading a Team-Building Activity**
Time: 30 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for small groups of cadets to share responsibilities of leading a team-building activity.

RESOURCES

- A flat, open space free from obstacles,
- Team-building activity located at Annex N (one per group),
- Resources IAW the chosen team-building activities located at Annex N, and
- Team-Building Planning Guide located at Annex Q (one per group).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

With the help of assistant instructors, observe the partnered groups and offer feedback for Steps 4 to 6.

1. Divide the cadets into an even number of groups (eg, four groups for 24 cadets or less, six groups for 30 cadets).
2. Distribute a team-building activity and a Team-Building Planning Guide to each group.
3. Allow each group approximately 10 minutes to prepare their activity. Ensure that each cadet has a role to play in conducting their activity.

4. Have each group partner with another group for the presentation of their activity (eg, Group 1 will conduct their activity with Group 3 and vice versa).
5. Within the partnered groups, have one group conduct their activity with their partnered group. Allow approximately 15 minutes to conduct the activity. Observe and offer feedback on completion.
6. Within the partnered groups, have the second group conduct their activity with their partnered group. Allow approximately 15 minutes to conduct the activity. Observe and offer feedback on completion.

SAFETY

IAW the chosen team-building activities located at Annex N.

CONFIRMATION OF TEACHING POINT 7

The cadets' participation in conducting team-building activities as a member of a small group will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the activities will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for you to know how to properly lead team-building activities to ensure that they are fun, challenging and achievable for every cadet. Each of you will be given the opportunity to lead two team-building activities. Team-building activities are a great way to relieve boredom, lift team spirit, increase morale, re-energize cadets and accomplish goals. Once an activity that meets the needs of the group has been selected, it is the role of the leader to ensure the activity is completed in a manner that allows the cadets to learn or to elicit learning from the group. A meaningful and enjoyable team-building experience will occur for every cadet when the right activity is conducted in an appropriate fashion.

INSTRUCTOR NOTES/REMARKS

A self-assessment is to be completed when the cadets lead their team-building activity. The self assessment form located at Annex R.

REFERENCES

C0-028 (ISBN 0-07-046513-4) Newstrom, J., & Scannell, E. (1998). *The Big Book of Team Building Games*. New York, NY: McGraw-Hill.

C0-238 (ISBN 0-7879-4835-7) Sugar, S., & Takacs, G. (2000). *Games That Teach Teams: 21 Activities to Super-Charge Your Group!* San Francisco, CA: Jossey-Bass/Pfeiffer.

C0-240 (ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. Beverly, MA: Project Adventure, Inc.

C0-268 (ISBN 1-57542-265-4) MacGregor, M. G. (2008). *Teambuilding With Teens*. Minneapolis, MN: Free Spirit Publishing Inc.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 9

EO C303.02 – DELIVER A PRESENTATION ABOUT A LEADER

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Distribute to cadets the outline for delivering a presentation about a leader, located at Annex S, at least two weeks before the presentation is scheduled.

PRE-LESSON ASSIGNMENT

Using the outline for delivering a presentation about a leader located at Annex S, the cadets will research a leader of their choice (a military leader, political leader, spiritual leader, teacher, etc) prior to the lesson.

Cadets will bring to the class presentation materials and information about the leader they researched in order to deliver their presentation.

Ensure cadets are familiar with material from EO M309.01 (Explain Principles of Instruction, Chapter 9, Section 1), EO M309.03 (Describe Effective Speaking Techniques, Chapter 9, Section 3), EO M309.04 (Describe Questioning Technique, Chapter 9, Section 4) and EO M309.05 (Select Appropriate Instructional Aids, Chapter 9, Section 5).

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow cadets to experience giving a presentation in a safe and controlled environment. This activity contributes to the development of leadership skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have delivered a presentation about a leader.

IMPORTANCE

It is important for cadets to deliver a presentation about a leader to assist in their leadership development. By researching and reporting on the core leadership qualities of the leader, cadets may gain an appreciation of how others put these qualities into practice. Having to make a presentation will also give the cadets another opportunity to practice their presentation skills.

Teaching Point 1 — **Supervise Cadets Delivering a Presentation About a Leader**

Time: 50 min — Method: Practical Activity

The cadets will research a leader of their choice (military leader, political leader, pastor or religious leader, teacher, etc) prior to the lesson. Cadets will bring to the class presentation materials and information about the leader they researched in order to deliver their presentation.

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets deliver a presentation about a leader.

RESOURCES

- Presentation aids (eg, whiteboard/flip chart/OHP/multimedia projector), and
- Information about the leader.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have a cadet volunteer to deliver their presentation.
2. The cadet will set up their presentation materials (if required).
3. The cadet will deliver a presentation to include an introduction of the leader, interesting points in the leader’s career, the core leadership qualities displayed by the leader, and a conclusion.
4. Cadets will be encouraged to ask questions at the end of each presentation.
5. Repeat Steps 1. to 4. until everyone has delivered a presentation.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the delivery of a presentation will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Seeing and hearing the example set by other leaders may assist the cadet in becoming a more effective leader. Leaders come from all walks of life and learning about how different leaders display core leadership qualities may help cadets further develop their leadership skills. Being given as many opportunities as possible to speak in front of groups will help develop the cadet's presentation and instructional skills.

INSTRUCTOR NOTES/REMARKS

It is recommended that this lesson be scheduled after all other lessons in PO 309 (Chapter 9).

If the squadron has more than five Proficiency Level Three cadets, divide the cadets into groups of five, if facilities are available.

REFERENCES

N/A.

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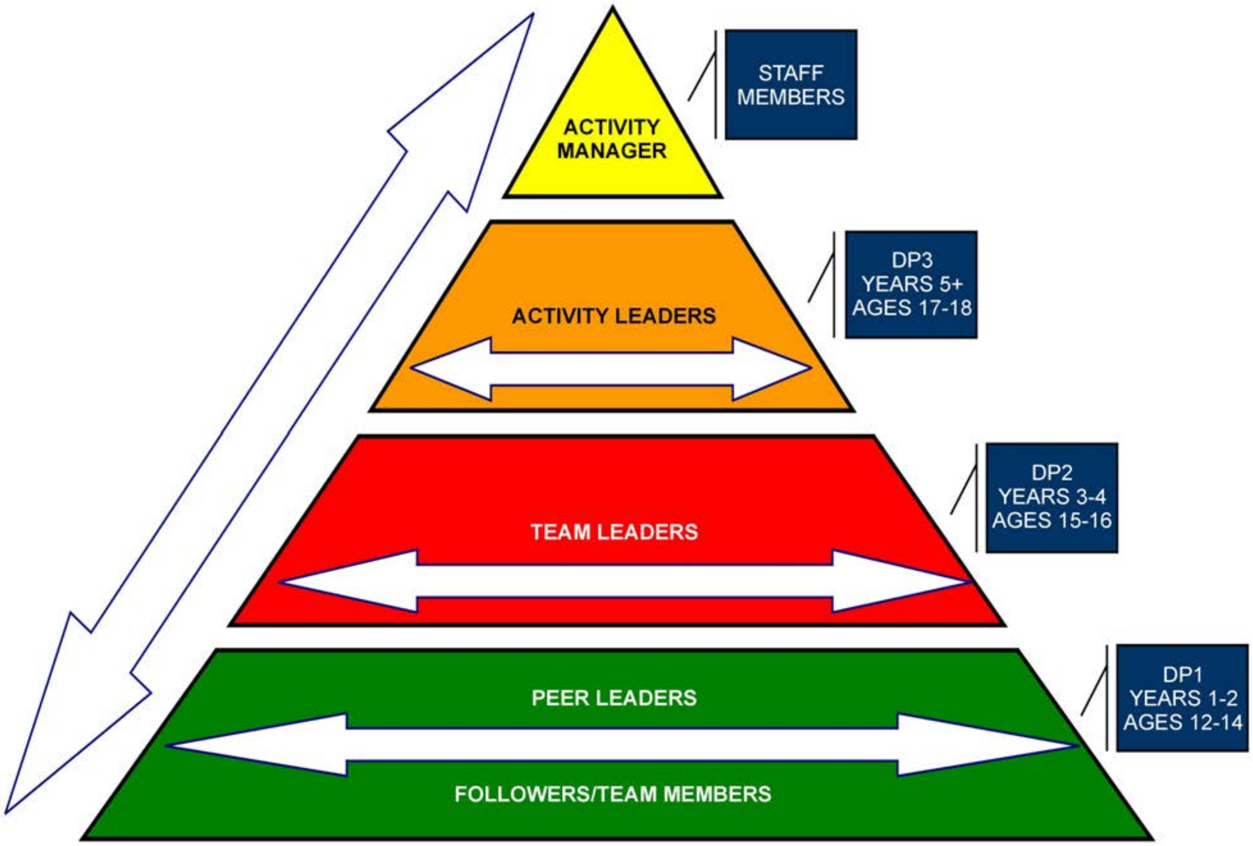
LEADERSHIP TEAM MODEL



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3A-1 Leadership Team Model

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EXPECTATIONS OF A PROFICIENCY LEVEL THREE CADET

Core Leadership Competencies

Intrapersonal Management

Interpersonal Management

Teamwork

Effective Communication

Applied Leadership

Mentorship

Components of Intrapersonal Management	• identifying and satisfying personal needs; • exercising self-control; • exercising self-management; • pursuing self-improvement; and • establishing a positive identity.
Components of Interpersonal Management	• interacting positively within the cadet community; • interacting positively with others; and • dealing with interpersonal conflict in a respectful way.
Components of Teamwork	• participating in the stages of team development; • displaying positive team dynamics; and • participating in team-building activities.
Components of Effective Communication	• receiving information; • interpreting information; and • responding to information.
Components of Applied Leadership	• setting an example for others to follow; • participating in leadership assignments; • conducting the leadership assignment while supervising the team; • leading team-building activities; • debriefing the team; and • presenting an after-assignment report to the leader.
Components of Mentorship	• fulfilling the role of a mentored cadet; and • fulfilling the role of a mentor.

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SELF-ASSESSMENT

SELF-ASSESSMENT FOR CORE LEADERSHIP QUALITIES OF A CADET

Name: ______________________________ Date: ____________________________________

Please rate your core leadership qualities by checking the correct box.

Core Leadership Quality	Never	Seldom	Often	Always
I am honest.				
I am dependable.				
I am loyal.				
I am collaborative.				
I am determined.				
I am courageous.				
I am analytical.				
I am positive.				
I am respectful.				
I am considerate.				
I am sympathetic.				

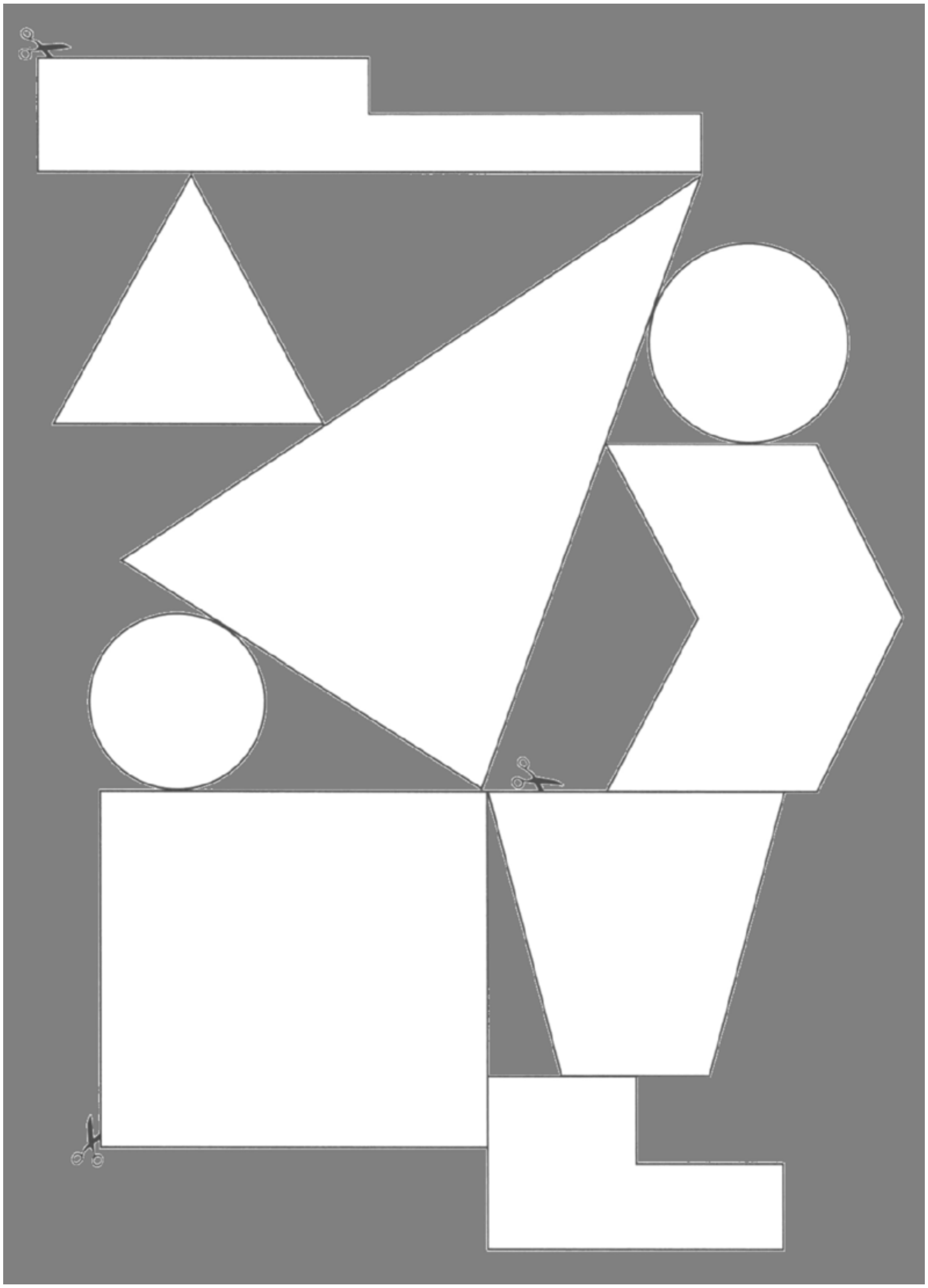
SELF-ASSESSMENT FOR POSITIVE TEAM DYNAMICS

Name: ______________________________ Date: ____________________________________

Please rate your positive team dynamics by checking the correct box.

Positive Team Dynamics	Never	Seldom	Often	Always
I follow the team leader.				
I include all participants.				
I encourage team members.				
I contribute to team morale and esprit de corps.				
I contribute to the accomplishment of team goals.				
I contribute to group decisions.				
I trust the team.				
I support team members.				
I appreciate team members.				
I celebrate team success.				

COMMUNICATION PUZZLE



M. G. MacGregor, Teambuilding With Teens, Free Spirit Publishing Inc (p. 80)

Figure 3D-1 Communication Puzzle

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PROBLEM SOLVING SCENARIOS

PROBLEM-SOLVING SCENARIO 1

You are a member of your school volleyball team and a member of your cadet squadron. This year your team is doing very well and is expected to go to the zone championship three weekends from now. You have just realized that your zone tournament may be the same weekend as your squadron tour of a Canadian Forces unit.

What do you do?

PROBLEM-SOLVING SCENARIO 2

Your squadron is conducting a tabloid sports meet tomorrow night. You have been assigned to organize the teams before the event begins.

What do you do?

PROBLEM-SOLVING SCENARIO 3

Your parents are going out of town for the weekend on business. You and your younger brother, who is 11 years old, are staying home. Your squadron is conducting its annual community service event.

What do you do?

PROBLEM-SOLVING SCENARIO 4

You arrive at your cadet squadron and you notice that your friend has extra money this week. You also know that she was working in the cadet canteen earlier that night.

What do you do?

POSSIBLE YEAR THREE COMMON LEADERSHIP ASSIGNMENTS

Recreational Marksmanship Assignments

- Set up a range for recreational marksmanship.
- Organize relays for recreational marksmanship.
- Control pellets and issue targets for recreational marksmanship.
- Conduct concurrent activities during recreational marksmanship.
- Tear down a range after recreational marksmanship.

Summer Biathlon Assignments

- Set up range for summer biathlon.
- Conduct a warm-up activity prior to participating in summer biathlon.
- Control pellets for summer biathlon.
- Conduct a cool-down activity after participating in summer biathlon.
- Tear down the range after summer biathlon.

Recreational Sports Assignments

- Set up a recreational sports activity.
- Tear down a recreational sports activity.
- Organize a team for recreational sports.
- Conduct a warm-up prior to recreational sports.
- Conduct a concurrent activity during recreational sports.
- Conduct a cool-down after recreational sports.

Weekly Parade Cadet Night Assignments

- Set up chairs for a parade.
- Set up the dais area for a parade.
- Set up flags and parade markers for a parade.
- Tear down chairs after a parade.
- Tear down dais area after a parade.
- Tear down flags and parade markers after a parade.

Weekly Cadet Night Assignments

- Set up classroom space.
- Rearrange classroom space.
- Tear down classroom space.
- Set up a canteen.
- Staff the canteen.

- Tear down a canteen.
- Set up a presentation area for a guest speaker.
- Tear down a presentation area for a guest speaker.
- Set up for an extracurricular activity.
- Conduct a concurrent activity.

Community Service Leadership Assignments

- Organize a team during a community service activity.
- Conduct concurrent activities during community service activity.
- Complete a final garbage sweep.

Other Leadership Assignment Possibilities

- Embark and disembark personnel on vehicles during transportation.
- Conduct uniform inspection of year one cadets.
- Collect and dispose of garbage after weekly parade.
- Collect, sort and dispose of recycling after weekly parade.
- Turn off lights and close windows after weekly parade.

AIR CADET SURVIVAL TRAINING LEADERSHIP ASSIGNMENTS

Prior to the Survival Training

- Distribute personal equipment.
- Label personal equipment.
- Load team equipment and supplies.

Setting Up the Bivouac Site

- Unload equipment and supplies.
- Construct a food hang.
- Set up the POL, first aid and fire points.
- Set up the female sleeping area.
- Set up the male sleeping area.
- Mark the components of the bivouac site.

Routine Tasks That Will Occur Throughout the Survival Training

- Prepare a meal for a section.
- Clean up the site after a meal.
- Prepare the bivouac site for the night.
- Organize lights out for the female cadets.
- Organize lights out for the male cadets.

Tearing Down the Bivouac Site

- Tear down the female sleeping area.
- Tear down the male sleeping area.
- Dismantle the POL, first aid and fire points.
- Load team equipment and supplies after the survival training.
- Erase signs of occupancy and complete a final garbage sweep.

After the Survival Training

- Unload equipment and supplies.
- Collect personal equipment.

AIR CADET GLIDING DAY LEADERSHIP ASSIGNMENTS

Routine Tasks That May Occur During the Gliding Day

- Organize the distribution of a meal.
- Clean up the site after a meal.
- Conduct concurrent activities.
- Complete a final garbage sweep.

AIR CADET SKILLS DAY LEADERSHIP ASSIGNMENTS

Routine Tasks That May Occur During the Skills Day

- Organize the distribution of a meal.
- Clean up the site after a meal.
- Set up a skills activity.
- Organize a team for a skills activity.
- Conduct a warm-up prior to the skills activity.
- Conduct a concurrent activity during the skills activity.
- Conduct a cool-down after skills activity.
- Tear down a recreational skills activity.
- Complete a final garbage sweep.

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CLASSROOM SPACE LEADERSHIP ASSIGNMENT

LEADERSHIP ASSIGNMENT Rearrange Classroom Space
ASSIGNMENT DESCRIPTION Organize a team of cadets to rearrange a classroom as required. Move the chairs and desks/tables to match the diagram (if provided) or as directed.
RESOURCES • Chairs, • Diagram of placement of chairs (if required), • Desks/tables, • Electronic equipment (if required), • Whiteboards (if required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

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LEADERSHIP ASSIGNMENT FORMAT

1. Prepare for the leadership assignment by:
   (a) ensuring the goal is understood;
   (b) ensuring the required resources are available;
   (c) completing a time appreciation; and
   (d) making a plan.
2. Introduce the leadership assignment by:
   (a) stating the assignment to be completed;
   (b) stating the goal of the assignment;
   (c) identifying the resources required for the assignment;
   (d) communicating the overall plan;
   (e) assigning tasks to team members as applicable; and
   (f) ensuring the team members understand the assignment.
3. Conduct the leadership assignment by:
   (a) supervising peers;
   (b) maintaining team control;
   (c) ensuring the assignment is progressing according to the time allotted; and
   (d) modifying the plan as required.
4. Debrief the team following the leadership assignment by:
   (a) reviewing the goal;
   (b) providing feedback; and
   (c) re-motivating the team.
5. Complete an after-assignment report and a self-assessment.
6. Attend a debriefing with the directing staff.

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AFTER-ASSIGNMENT REPORT

1. How did you feel after the assignment was completed?

2. How did you feel about the teamwork among the members? How is teamwork related to the outcome of a leadership assignment?

3. What aspects of the leadership assignment went well?

4. Is there anything you would do differently if you were to complete the same assignment again?

303 PC ASSESSMENT RUBRIC

Cadet's Name: ______________________________ Squadron: ___________________________

Date: _____________________________________ Flight: ______________________________

	Incomplete	**Completed With Difficulty**	**Completed Without Difficulty**	**Exceeded the Standard**
Communicate as a team leader.	Did not communicate with team members.	Communicated with team members occasionally. Team members needed clarification on many occasions.	Communicated with team members on many occasions. Team members needed few clarifications.	Communicated to the team throughout the leadership task. Team members did not need clarification.
Supervise cadets.	Did not supervise cadets.	Only supervised cadets at the beginning and/or end of the leadership assignment.	Supervised throughout the leadership assignment making some corrections when necessary.	Supervised throughout the leadership assignment making corrections as necessary.
Solve problems.	Did not solve the problem(s).		Solved the problem(s).	
Complete the leadership assignment.	Did not complete the leadership assignment.		Completed the leadership assignment.	
Perform self-assessment.	Did not complete the self-assessment.		Completed the self-assessment.	

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COMMON LEADERSHIP ASSIGNMENTS

COMMON LEADERSHIP ASSIGNMENT

Set Up a Range for Recreational Marksmanship

ASSIGNMENT DESCRIPTION

Organize a team of cadets to set up a range for recreational marksmanship. Determine the equipment required according to the number of firing lanes. Set up the area as per the diagram provided.

RESOURCES

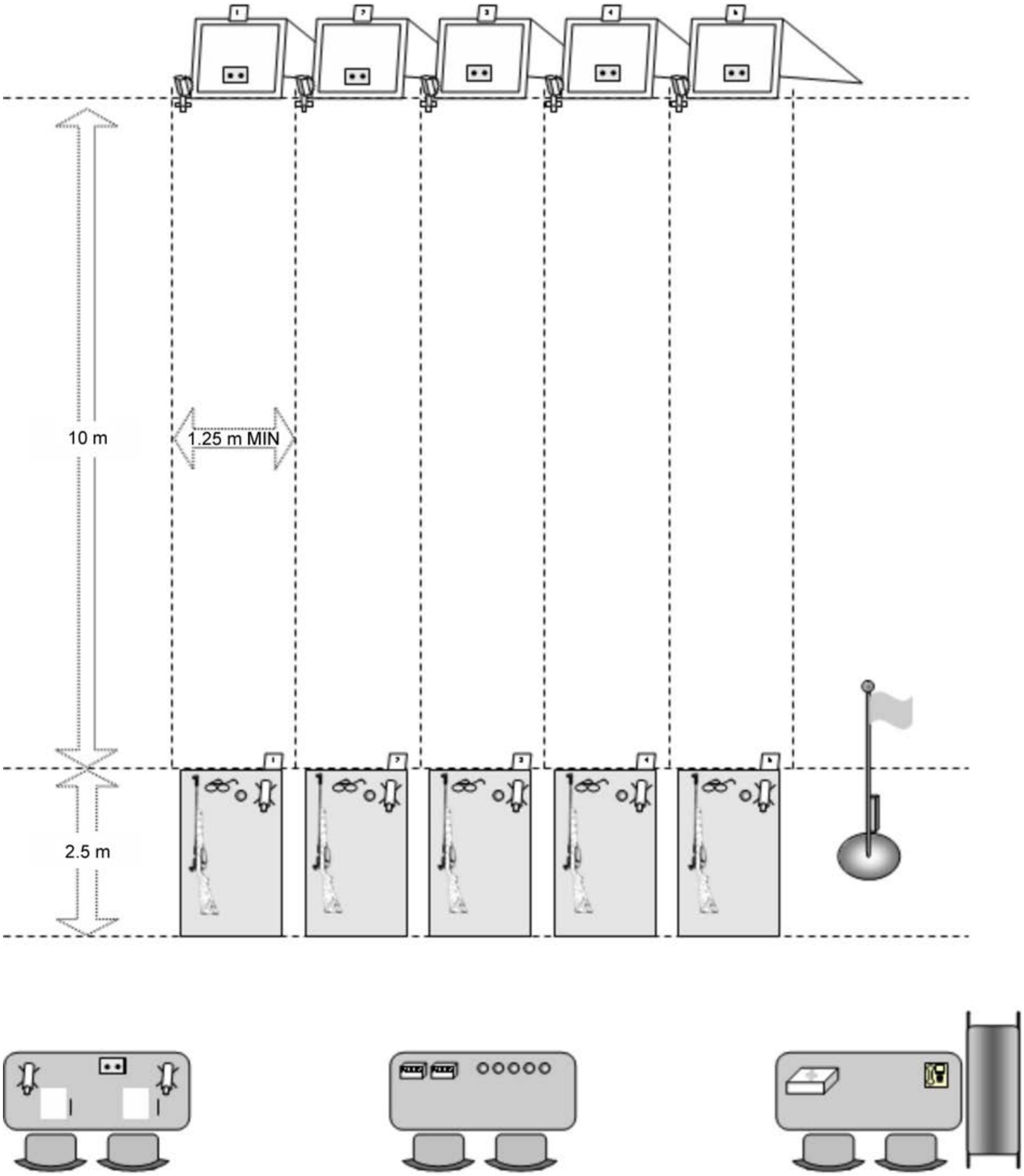
- Range area,
- Air rifle targets,
- Target frames,
- Flags (red and green),
- First aid kit,
- Stretcher,
- Shooting mats,
- Safety glasses/goggles,
- Cadet air rifles,
- Cadet air rifle slings,
- Diagram of placement for all resources, and
- A minimum of six cadets.

TIME

A maximum of 20 minutes.

SAFETY CONSIDERATIONS

Ensure safety precautions are being obeyed at all times when handling cadet air rifles.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3J-1 Sample Range Layout

LEADERSHIP ASSIGNMENT Organize Relays for Recreational Marksmanship
ASSIGNMENT DESCRIPTION Organize the cadets into relays for recreational marksmanship according to the number of firing lanes.
RESOURCES All participating cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Control Pellets and Issue Targets for Recreational Marksmanship
ASSIGNMENT DESCRIPTION Organize a team of cadets to control and distribute pellets and issue targets for recreational marksmanship. Allocate the pellets required, per relay, according to the number of firing lanes.
RESOURCES • Air rifle pellets, • Containers to hold pellets, • Suitable targets, and • A minimum of two cadets.
TIME One relay, approximately 10 minutes.
SAFETY CONSIDERATIONS Ensure all cadets wash their hands after handling pellets.

LEADERSHIP ASSIGNMENT Conduct a Concurrent Activity During Recreational Marksmanship
ASSIGNMENT DESCRIPTION Organize and conduct a concurrent activity during recreational marksmanship (eg, ground sweep, team-building activity, etc) for a small team of cadets. Ensure maximum participation of all cadets.
RESOURCES • As directed by the directing staff based on the concurrent activity, and • A small team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Tear Down a Range After Recreational Marksmanship
ASSIGNMENT DESCRIPTION
Organize a team of cadets to tear down a range after recreational marksmanship. Return all equipment to the supply area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES
• Resource checklist, and • A minimum of six cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
• Ensure safety precautions are being obeyed at all times when handling cadet air rifles. • Ensure all cadets wash their hands after handling pellets.

RESOURCES	QUANTITY RETURNED
Target Frame	
Red Flag	
Green Flag	
First Aid Kit	
Stretcher	
Shooting Mats	
Safety Glasses/Goggles	
Cadet Air Rifle	
Cadet Air Rifle Sling	
Pellets (Boxes)	

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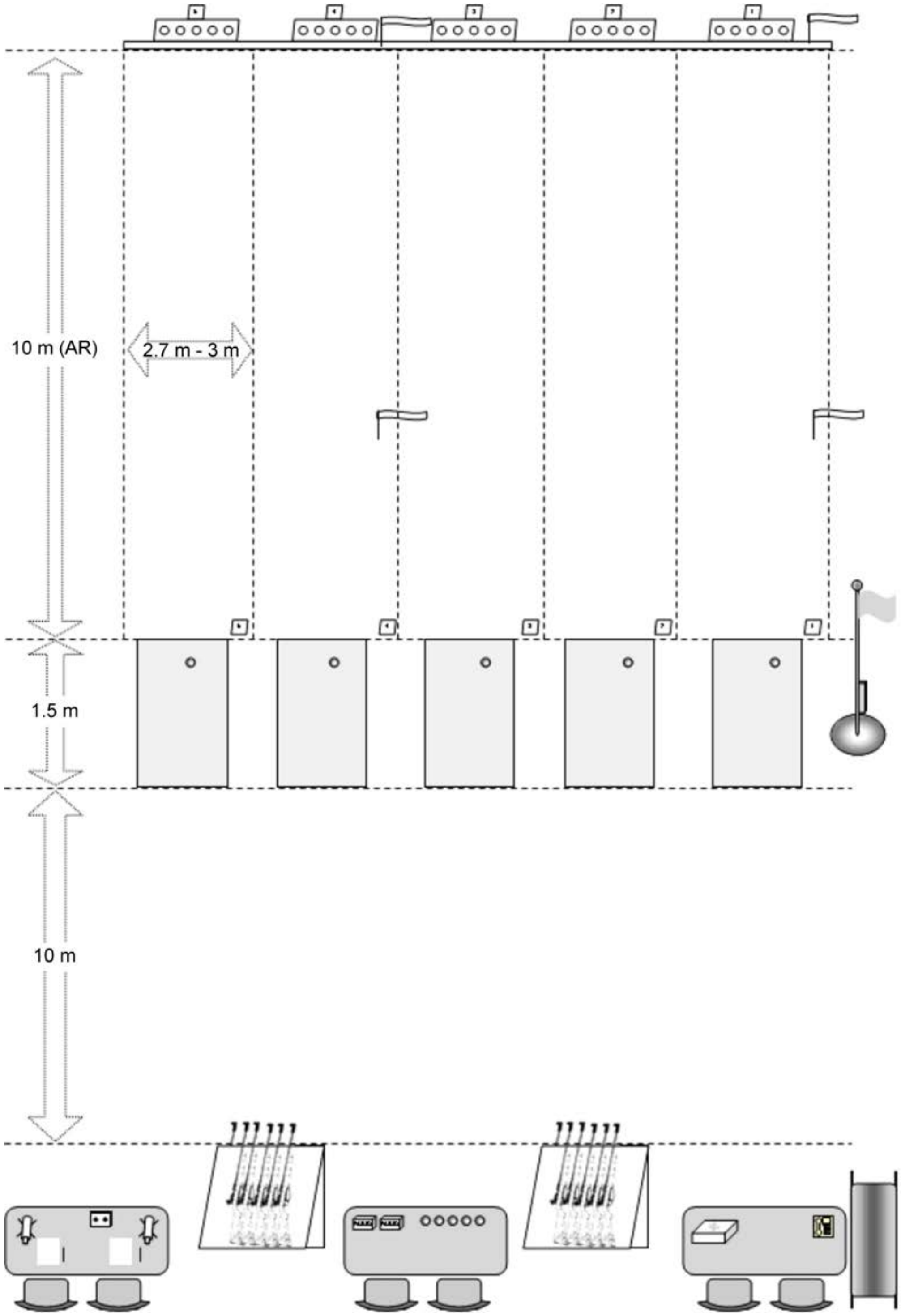
Figure 3J-2 Sample Resource Checklist

LEADERSHIP ASSIGNMENT
Set up a Range for Summer Biathlon
ASSIGNMENT DESCRIPTION
Organize a team of cadets to set up a range for summer biathlon as required. Determine the equipment required according to the number of firing lanes. Set up the area as per the diagram provided.
RESOURCES • Range area, • Biathlon air rifle targets (BART), • Flags (red and green), • First aid kit, • Stretcher, • Stopwatch, • Shooting mats, • Safety glasses/goggles, • Cadet air rifles, • Diagram of placement for all resources, and • A minimum of six cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
Ensure safety precautions are being obeyed at all times when handling cadet air rifles.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3J-3 Sample Biathlon Range Layout

LEADERSHIP ASSIGNMENT Conduct a Warm-Up Activity Prior to Participating in Summer Biathlon
ASSIGNMENT DESCRIPTION Organize and conduct a warm-up activity for a small team of cadets prior to participating in summer biathlon. Ensure maximum participation of all cadets.
RESOURCES • Handout of sample stretches (located at Annex K), and • A small team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Control Pellets for Summer Biathlon
ASSIGNMENT DESCRIPTION
Organize a team of cadets to control and distribute pellets for summer biathlon. Allocate the pellets required, for each firing bout, according to the number of firing lanes.
RESOURCES
• Air rifle pellets, • Containers to hold pellets, and • A minimum of two cadets.
TIME
As per activity.
SAFETY CONSIDERATIONS
Ensure all cadets wash their hands after handling pellets.

LEADERSHIP ASSIGNMENT Conduct a Cool-Down Activity After Participating in Summer Biathlon
ASSIGNMENT DESCRIPTION Organize and conduct a cool-down activity for a team of cadets after participating in summer biathlon. Ensure maximum participation of all cadets in the team.
RESOURCES • Handout of sample stretches (located at Annex K), and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT

Tear Down a Range After Summer Biathlon

ASSIGNMENT DESCRIPTION

Organize a team of cadets to tear down a range after summer biathlon. Return all equipment to supply area. Count all equipment and report numbers to the directing staff after completing the assignment.

RESOURCES

- Resource checklist, and
- A minimum of six cadets.

TIME

A maximum of 20 minutes.

SAFETY CONSIDERATIONS

- Ensure safety precautions are being obeyed at all times when handling cadet air rifles.
- Ensure all cadets wash their hands after handling pellets.

RESOURCES	QUANTITY RETURNED
Biathlon Air Rifle Target (BART)	
Red Flag	
Green Flag	
First Aid Kit	
Stretcher	
Stopwatch	
Shooting Mats	
Safety Glasses/Goggles	
Cadet Air Rifle	
Pellets (Boxes)	

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Figure 3J-4 Sample Resource Checklist

LEADERSHIP ASSIGNMENT
Set up a Recreational Sports Activity
ASSIGNMENT DESCRIPTION
Organize a team of cadets to set up a recreational sports activity as required. Move the scoring tables, stopwatch and any other sports equipment as directed.
RESOURCES
• Scoring tables, • Stopwatch, • Sports equipment (as required), and • A minimum of four cadets.
TIME
A maximum of 10 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT Tear Down a Recreational Sports Activity
ASSIGNMENT DESCRIPTION Organize a team of cadets to set up a recreational sports activity as required. Remove the scoring tables, stopwatch and any other sports equipment as directed.
RESOURCES • Scoring tables, • Stopwatch, • Sports equipment (as required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

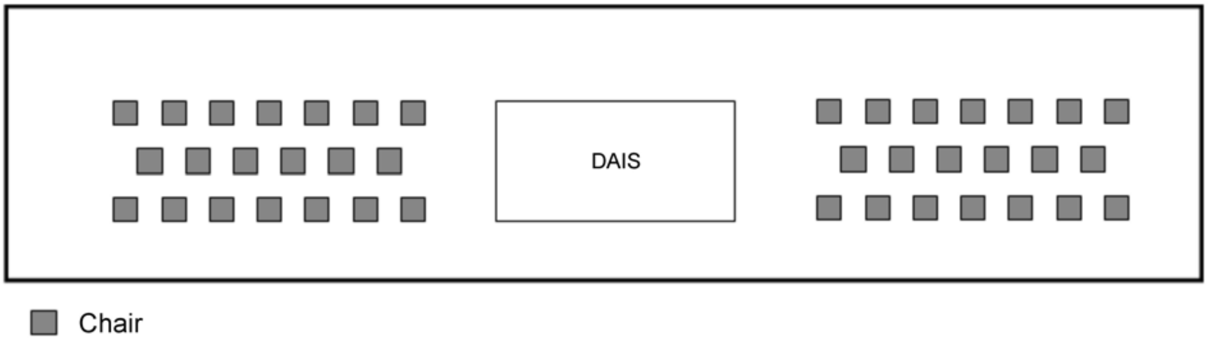
LEADERSHIP ASSIGNMENT Organize a Team for Recreational Sports
ASSIGNMENT DESCRIPTION Organize the cadets into teams for recreational sports as directed (eg, teams, scorekeepers, timekeepers, etc).
RESOURCES • Stopwatches, • Pens/pencils, and • All participating cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Warm-Up Activity Prior to Participating in Recreational Sports
ASSIGNMENT DESCRIPTION Conduct a warm-up activity for a team of cadets prior to participating in recreational sports. Ensure maximum participation of all cadets in the team.
RESOURCES • Handout of sample stretches (located at Annex K), and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Concurrent Activity During Recreational Sports
ASSIGNMENT DESCRIPTION Conduct a concurrent activity during recreational sports (eg, team-building activity, cheering, etc) for a team of cadets. Ensure maximum participation of all cadets in the team.
RESOURCES • As directed by the directing staff based on the concurrent activity, and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Cool-Down Activity After Participating in Recreational Sports
ASSIGNMENT DESCRIPTION Conduct a cool-down activity for a team of cadets after participating in recreational sports. Ensure maximum participation of all cadets in the team.
RESOURCES • Handout of sample stretches (located at Annex K), and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

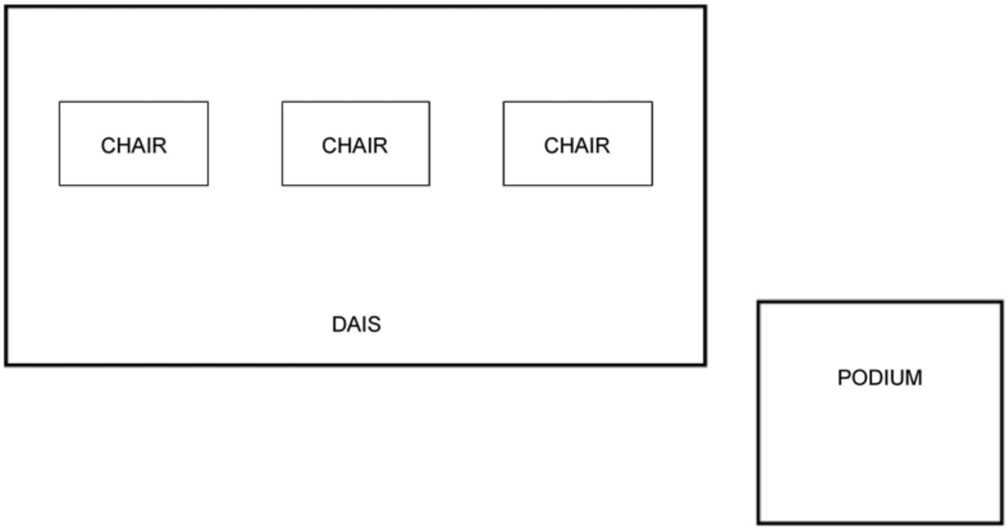
LEADERSHIP ASSIGNMENT
Set up Chairs for a Parade
ASSIGNMENT DESCRIPTION
Organize a team to set up chairs for guests of a parade. Count the chairs, which will already be on-site, then set them up as illustrated in the diagram or as directed.
RESOURCES
• Chairs, • Diagram of placement of chairs (if required), and • A minimum of four cadets.
TIME
A maximum of 10 minutes.
SAFETY CONSIDERATIONS
N/A.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3J-5 Sample Placement of Chairs

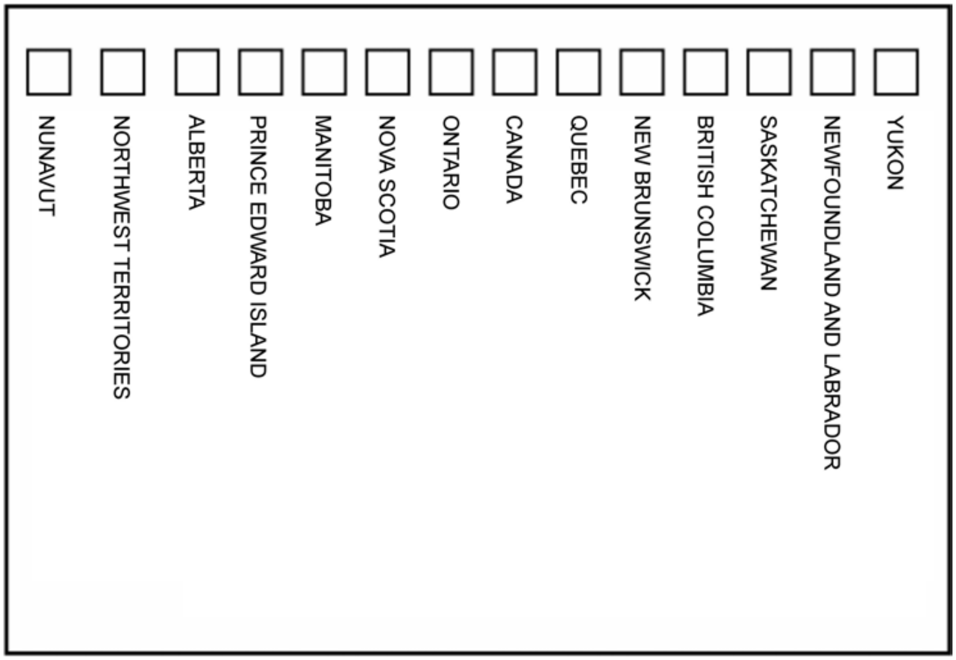
LEADERSHIP ASSIGNMENT Set up the Dais Area for a Parade
ASSIGNMENT DESCRIPTION Organize a team to set up the dais area for dignitaries attending a parade. Using the resources provided, set up the dais area as illustrated in the diagram or as directed.
RESOURCES • Dais, • Podium (if required), • Chairs (if required), • Diagram of dais area (if required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

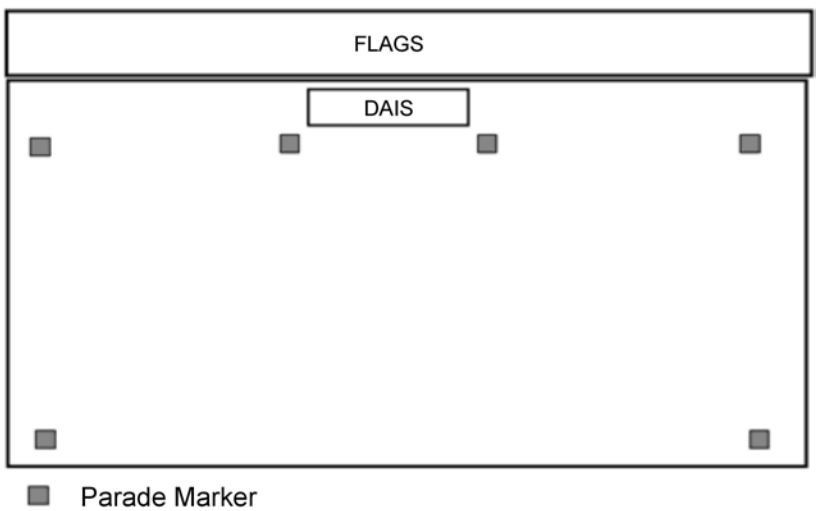
Figure 3J-6 Sample Dais Area

LEADERSHIP ASSIGNMENT
Set up Flags and Parade Markers for a Parade
ASSIGNMENT DESCRIPTION
Organize a team to set up flags and parade markers for a parade. Set them up as illustrated in the diagram or as directed.
RESOURCES
• Provincial and territorial flags, • Parade markers, • Diagram of placement of flags and parade markers (if required), and • A minimum of four cadets.
TIME
A maximum of 15 minutes.
SAFETY CONSIDERATIONS
N/A.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3J-7 Sample Placement of Flags



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3J-8 Sample Placement of Parade Markers

LEADERSHIP ASSIGNMENT Tear Down Chairs After a Parade
ASSIGNMENT DESCRIPTION Organize a team to tear down chairs after a parade. Move the chairs to the designated supply area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Paper, • Pen/pencil, and • A minimum of four cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Tear Down the Dais Area After a Parade
ASSIGNMENT DESCRIPTION Organize a team to tear down the dais area after a parade. Return all equipment to the designated supply area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Paper, • Pen/pencil, and • A minimum of four cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Tear Down Flags and Parade Markers After a Parade
ASSIGNMENT DESCRIPTION Organize a team to tear down flags and parade markers after a parade. Return all equipment to the designated supply area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Paper, • Pen/pencil, and • A minimum of four cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT

Set up Classroom Space

ASSIGNMENT DESCRIPTION

Organize a team of cadets to set up a classroom as required. Move the chairs, desks/tables and any other equipment as directed.

RESOURCES

- Chairs,
- Desks/tables,
- Electronic equipment (if required),
- Whiteboards (if required), and
- A minimum of four cadets.

TIME

A maximum of 10 minutes.

SAFETY CONSIDERATIONS

N/A.

LEADERSHIP ASSIGNMENT Rearrange Classroom Space
ASSIGNMENT DESCRIPTION Organize a team of cadets to rearrange a classroom as required. Move the chairs and desks/tables to match the diagram (if provided) or as directed.
RESOURCES • Chairs, • Diagram of placement of chairs (if required), • Desks/tables, • Electronic equipment (if required), • Whiteboards (if required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Tear Down Classroom Space
ASSIGNMENT DESCRIPTION Organize a team of cadets to tear down a classroom as required. Remove the chairs and desks/tables to match the diagram (if provided) or as directed.
RESOURCES • Chairs, • Diagram of placement of chairs (if required), • Desks/tables, • Electronic equipment (if required), • Whiteboards (if required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Set up a Canteen
ASSIGNMENT DESCRIPTION Organize a team of cadets to set up a canteen. Move the tables/counters, chairs, stock, cashbox and any other equipment as directed.
RESOURCES • Chairs, • Tables/counter, • Stock, • Cashbox, and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT

Staff a Canteen

ASSIGNMENT DESCRIPTION

Organize a team of cadets to staff a canteen. Ensure team know the price of each item to be sold.

RESOURCES

- Chairs,
- Tables/counter,
- Stock,
- Cashbox, and
- A minimum of four cadets.

TIME

A maximum of 20 minutes.

SAFETY CONSIDERATIONS

N/A.

LEADERSHIP ASSIGNMENT

Tear Down a Canteen

ASSIGNMENT DESCRIPTION

Organize a team of cadets to tear down a canteen. Remove the tables/counters, chairs, stock, cashbox and any other equipment as directed. Ensure cashbox is returned to an area that is secured.

RESOURCES

- Chairs,
- Tables/counter,
- Stock,
- Cashbox, and
- A minimum of four cadets.

TIME

A maximum of 10 minutes.

SAFETY CONSIDERATIONS

N/A.

LEADERSHIP ASSIGNMENT Set up a Presentation Area for a Guest Speaker
ASSIGNMENT DESCRIPTION Organize a team to set up a presentation area for a guest speaker. Set up the podium, chairs and electronic equipment (if required) as directed.
RESOURCES • Podium, • Chairs, • Electronic equipment (if required), and • A minimum of two cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Tear Down a Presentation Area After a Guest Speaker
ASSIGNMENT DESCRIPTION Organize a team to tear down a presentation area after a guest speaker. Return all equipment to supply area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Paper, • Pen/pencil, and • A minimum of two cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Set Up for an Extracurricular Activity
ASSIGNMENT DESCRIPTION Organize a team of cadets to set up for an extracurricular activity (eg, recreational sports, tour of a facility, field trip, summer biathlon, etc).
RESOURCES As provided by directing staff.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Concurrent Activity
ASSIGNMENT DESCRIPTION Conduct a concurrent activity (eg, ground sweep, team-building activity, singing, etc) for a team of cadets who are awaiting further direction. Ensure maximum participation of all cadets in the team.
RESOURCES • As directed by the directing staff based on the concurrent activity, and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS Cadets should be kept out of high-traffic areas.

LEADERSHIP ASSIGNMENT Organize a Team During a Community Service Activity
ASSIGNMENT DESCRIPTION Organize a team of cadets during a community service activity. Move people and equipment as directed.
RESOURCES A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS Cadets should be kept out of high-traffic areas.

LEADERSHIP ASSIGNMENT
Conduct a Concurrent Activity During a Community Service Activity
ASSIGNMENT DESCRIPTION
Conduct a concurrent activity during a community service activity (eg, ground sweep, team-building activity, singing, etc) for a team of cadets who are awaiting further direction. Ensure maximum participation of all cadets in the team.
RESOURCES
• As directed by the directing staff based on the concurrent activity, and • A team of cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
Cadets should be kept out of high-traffic areas.

LEADERSHIP ASSIGNMENT
Complete a Final Garbage Sweep After a Community Service Activity
ASSIGNMENT DESCRIPTION
Organize a team of cadets to complete a final garbage sweep after a community service activity and ensure all areas used are free of garbage.
RESOURCES
• Garbage bags, and • A minimum of 10 cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT
Embark and Disembark Personnel on Vehicles During Transportation
ASSIGNMENT DESCRIPTION
Organize a team of cadets to ensure all personnel embark and disembark vehicles in a safe manner. Count all personnel when embarking and disembarking the vehicle. Assist in supervision while personnel are being transported.
RESOURCES
• Vehicle, and • A minimum of seven cadets.
TIME
Travel time.
SAFETY CONSIDERATIONS
Cadets must sit facing the front of the vehicle and must use seat belts.

LEADERSHIP ASSIGNMENT Conduct Uniform Inspections of Year One Cadets
ASSIGNMENT DESCRIPTION Organize a team of cadets to conduct uniform inspections of year one cadets.
RESOURCES • Uniform inspection rubrics, • Year one cadets, and • A team of cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A

UNIFORM INSPECTION RUBRICS

	Incomplete	Completed With Difficulty	Completed Without Difficulty
Headdress	The cadet was not wearing a uniform	The cadet was wearing headdress, but it was either not correctly positioned or fitted, or had an incorrectly attached cap badge.	The cadet was wearing a properly fitting headdress with a properly attached cap badge.
Uniform	The cadet was not wearing a uniform	The cadet was wearing a uniform, but it was either not correctly worn or fitting, or had signs of being dirty or not having been properly pressed.	The cadet was wearing a properly fitting and properly pressed uniform.
Badges	The cadet was not wearing a uniform	The cadet had badges worn on the uniform, but some were either not correctly positioned or had missing badges.	The cadet's rank and all other badges were worn and correctly positioned.
Footwear	The cadet was not wearing a uniform	The cadet had boots, but they were either poorly maintained or poorly shone.	The cadet had well maintained boots with the entire boot shone equally.
Personal Appearance	The cadet was either not on parade or was not hygienic.	The cadet was on parade, but their personal appearance was somewhat below the standard IAW dress instructions (eg, hair, shaving, makeup, jewellery, etc.).	The cadet was on parade, and their personal appearance met the standard IAW dress instructions (eg, hair, shaving, makeup, jewellery, etc.).

UNIFORM INSPECTION CHECKLIST

Name	Headdress	Uniform	Badges	Footwear	Personal Appearance	Comments
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
I–Incomplete D–Completed With Difficulty W–Completed Without Difficulty						

LEADERSHIP ASSIGNMENT Collect and Dispose of Garbage After Weekly Parade
ASSIGNMENT DESCRIPTION Organize a team of cadets to collect and dispose of garbage and ensure all areas used are free of garbage.
RESOURCES • Garbage bags, and • A minimum of five cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Collect, Sort and Dispose of Recycling After Weekly Parade
ASSIGNMENT DESCRIPTION Organize a team of cadets to collect, sort and dispose of material to be recycled. Ensure all areas used are free of material to be recycled.
RESOURCES • Garbage bags, • Recycling containers or bags (as required), and • A minimum of five cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Turn Off Lights and Close Windows After Weekly Parade
ASSIGNMENT DESCRIPTION
Organize a team of cadets to turn off lights and close windows after weekly parade.
RESOURCES
A minimum of five cadets.
TIME
A maximum of five minutes.
SAFETY CONSIDERATIONS
N/A.

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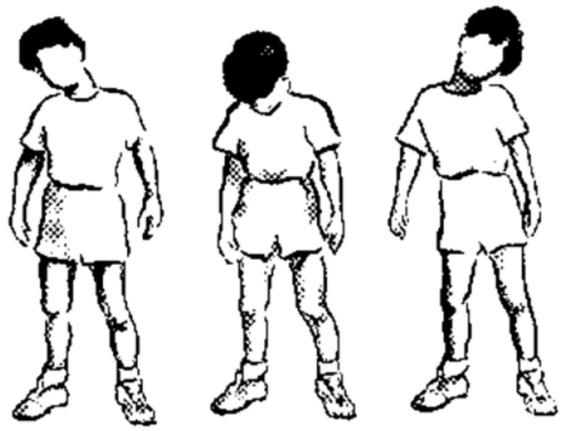
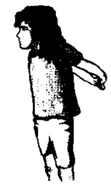
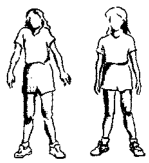
SAMPLE STRETCHES

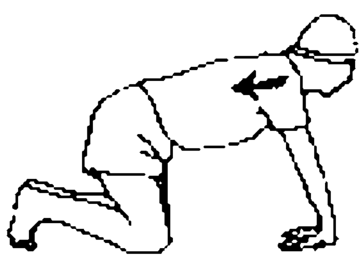
a. Neck:

 *B. Hanson, Moving on the Spot: A Collection of 5 Minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 3K-1 Neck Stretch	Slowly roll your head across your chest from shoulder to shoulder. Do not roll your head backwards.

b. Shoulders:

 *B. Hanson, Moving on the Spot: A Collection of 5 minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 3K-2 Shoulder Push	Stand and extend your arms behind you, interlocking your fingers. Push up and back with your shoulders. Hold this position for a minimum of 10 seconds.
 *B. Hanson, Moving on the Spot: A Collection of 5 minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 3K-3 Shoulder Shrug	Stand and raise your shoulders as high as possible and then lower your shoulders, stretching your neck up. Pull your shoulders back as far as possible and then round your shoulders forward by pushing your shoulders forward as far as possible. Hold each position for a minimum of 10 seconds.
 *Warm Ups, by Martha Jefferson Hospital, Copyright 2001 by Martha Jefferson Hospital. Retrieved October 26, 2006, from http://www.marthajefferson.org/warmup.php* Figure 3K-4 Arm Circles	Hold your arms straight out, palms up. Make small circles with your arms, gradually increasing the size. Reverse the direction of your circles.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-5 Shoulder Stretch	Either standing or sitting, take your right arm in your left hand and bring it across your chest, supporting the joint by holding it behind the elbow. Pull lightly on the elbow towards your chest. You should feel the stretch in your right shoulder. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

c. Arms:

 *Exercises. Copyright 1998 by Impacto Protective Products Inc. Retrieved October 26, 2006, from http://www.2protect.com/home.htm* Figure 3K-6 Wrist Rotations	Rotate your hands in circular motions at the wrist. Change direction and repeat on both sides.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-7 Triceps Stretch	Stand and bring your right arm over your head, bent at the elbow. Use your left hand to gently pull your arm down. Hold this position for a minimum of 10 seconds and repeat on the opposite side.
 *Exercise Programme for Squash, Tennis, Softball, Handball. Retrieved October 26, 2006, from http://www.physionline.co.za/conditions/article.asp?id=49* Figure 3K-8 Forearm Stretch	In a kneeling position, place your hands on the floor in front of you turned so that your fingers are pointing toward your knees, and your thumbs are pointing out. Keeping your hands flat on the floor, lean back. Hold this position for a minimum of 10 seconds.

d. Chest and Abdominals:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-9 Chest Stretch	Stand facing a wall. With your right arm bent and your elbow at shoulder height, place your palm against the wall. Turn your body away from your right arm. You should feel the stretch on the front side of your armpit and across the front of your chest. Hold this position for a minimum of 10 seconds and repeat on the opposite side.
 *B. Hanson, Moving on the Spot: A Collection of 5 minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 3K-10 Side Stretch	Stand with your left arm up over your head. Bend at your waist towards the right side of your body. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

e. Back:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-11 Lower Back Stretch	Lie on your back and bring your knees toward your chest. Grasp the back of your knees. Hold this position for a minimum of 10 seconds.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-12 Upper Back Stretch	Extend your arms straight in front of you at shoulder height crossing one arm over the other. With the palms facing each other, intertwine your fingers and press out through your arms. Let your chin fall to your chest as you exhale. You should feel the stretch in the upper back. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

f. Legs:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-13 Hamstring Stretch	Lie flat on the floor with your knees bent and your back flat on the floor. Slowly raise and straighten one leg, grasping it behind your thigh with both hands. Hold this position for a minimum of 10 seconds.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-14 Inner Thigh Stretch	Sit on the floor with your knees bent and the soles of your feet together. Grab your toes and pull yourself forward while keeping your back and neck straight. Hold this position for a minimum of 10 seconds. Grab your ankles and push your knees down toward the floor with your elbows. Hold this position for a minimum of 10 seconds.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 3K-15 Hip Flexor	Kneel on your right knee. Position your left foot in front of you, bending your knee and placing your left hand on that leg for stability. Keep your back straight and abdominal muscles tight. Lean forward, shifting more body weight onto your front leg. You should feel the stretch in the front of your hip and the thigh of the leg you are kneeling on. Cushion your kneecap with a folded towel if necessary. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

<table>
<tr><td>
Running Exercises. Retrieved October 26, 2006, http://www.physionline.co.za/conditions/article.asp?id=46
Figure 3K-16 Ankle Rotations</td><td>From a sitting position, rotate your foot in a clockwise, and then a counter-clockwise, direction.

Switch and repeat on the opposite side.</td></tr>
<tr><td>
Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/
Figure 3K-17 Calf Stretch</td><td>Stand three steps away from and facing a wall. Step in towards the wall with your right leg, bending your right knee and keeping your left leg straight. Extending your arms with your palms forward, reach out to the wall and let your body fall toward the wall. Keep your toes forward and your heels down. Lean your body into the wall with your left leg straight behind your body. You should feel the stretch in your left calf.

Hold this position for a minimum of 10 seconds and repeat on the opposite side.</td></tr>
<tr><td>
Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/
Figure 3K-18 Quadriceps Stretch</td><td>Stand with your hand against a wall for balance. Lift your left foot off the ground, bending your knee as if you are trying to kick your bottom with your heel. Do not lean forward at the hips. Grab and hold your ankle with your left hand. You should feel the stretch in your left thigh.

Hold this position for a minimum of 10 seconds and repeat on the opposite side.</td></tr>
</table>

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AIR ELEMENT LEADERSHIP ASSIGNMENTS

AIR ELEMENT LEADERSHIP ASSIGNMENT Distribute Personal Equipment
ASSIGNMENT DESCRIPTION Organize a team to distribute personal equipment required for a survival exercise to the members of their flight.
RESOURCES • Field pack (one per cadet), • Sleeping bag (one per cadet), • Air mattress (one per cadet), and • A minimum of three cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Label Personal Equipment
ASSIGNMENT DESCRIPTION Organize the cadets to label their personal equipment that was distributed for the survival exercise.
RESOURCES • Field pack (one per cadet), • Sleeping bag (one per cadet), • Air mattress (one per cadet), • Masking tape, • Markers, and • A minimum of eight cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Load Team Equipment and Supplies for a Survival Exercise.
ASSIGNMENT DESCRIPTION Organize a team to load equipment and supplies on the supply vehicle for a survival exercise.

RESOURCES

- Resources as detailed by the directing staff, such as:
  - two-person tents,
  - mallets,
  - Coleman two-burner stoves,
  - Coleman lanterns,
  - matches,
  - funnels,
  - lantern mantels,
  - stove and lantern fuel,
  - pot sets,
  - wash basins,
  - first aid kits,
  - stretcher,
  - fire extinguishers,
  - environmental spill kit,
  - axes,
  - shovels,
  - water jerry cans,
  - garbage bags,
  - Glow Sticks,
  - mine tape,
  - flashlights,
  - flashlight batteries,
  - radios,
  - radio batteries,
  - rope,
  - meals for the Survival Exercise,
  - paper,
  - markers,
  - masking tape, and
  - pens/pencils.
- Supply vehicle,
- Resource checklist,
- Pen/pencil, and
- A minimum of four cadets..

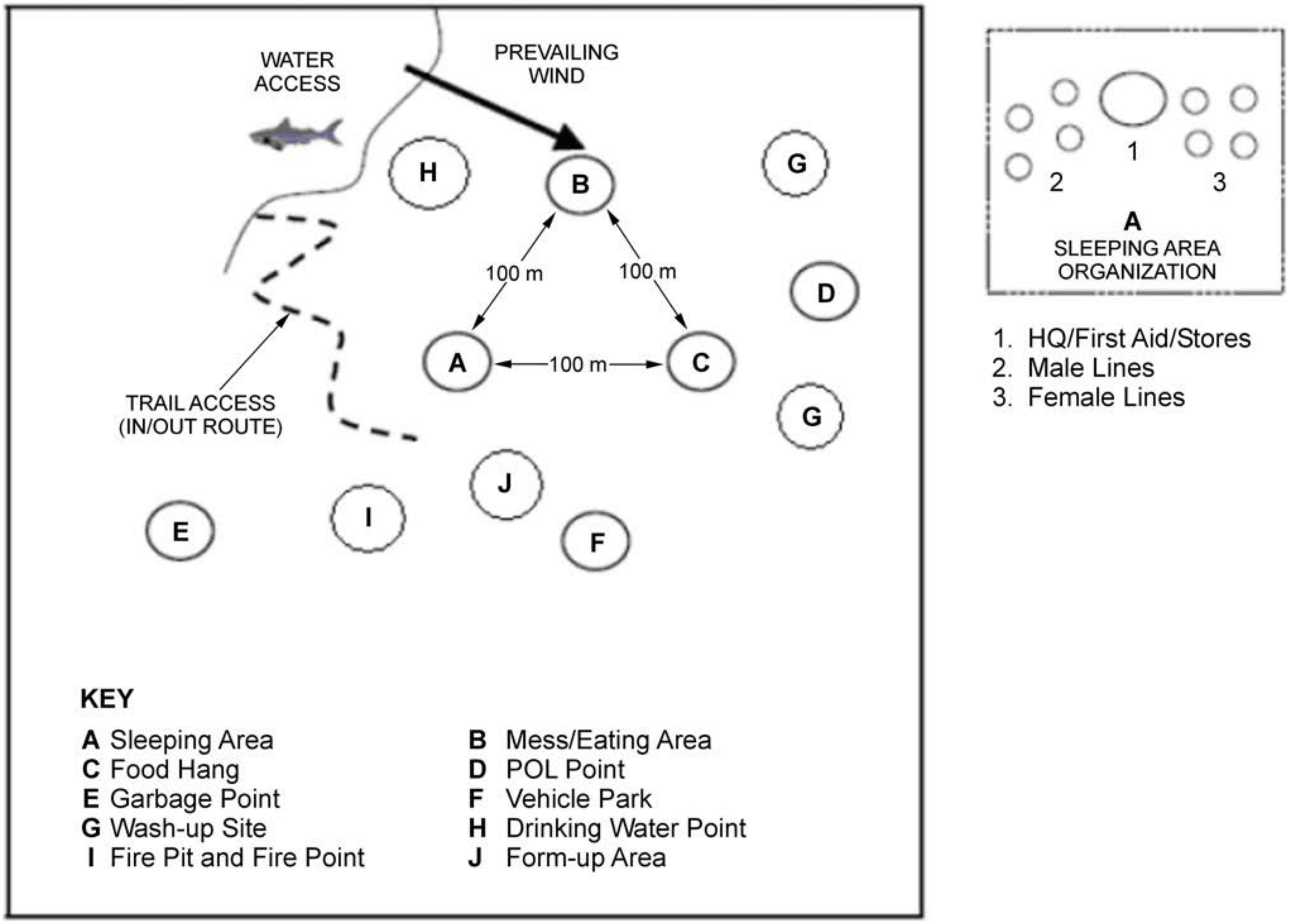
TIME
A maximum of 30 minutes.
SAFETY CONSIDERATIONS • Cadets should be kept out of high-traffic areas. • Field tools must be safely handled.

EQUIPMENT AND SUPPLIES	QUANTITY LOADED
Two-Person Tents	
Mallets	
Coleman Two-Burner Stoves	
Coleman Lanterns	
Matches	
Funnel	
Lantern Mantels	
Stove and Lantern Fuel	
Pot Sets	
Wash Basins	
First Aid Kits	
Stretcher	
Fire Extinguishers	
Environmental Spill Kit	
Axes	
Shovels	
Water Jerry Cans	
Garbage Bags	
Glow Sticks	
Flashlights	
Flashlight Batteries	
Radios	
Radio Batteries	
Rope	
Meals for the Survival Exercise	
Paper	
Markers	
Masking Tape	
Pens/Pencils	

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3L-1 Sample Resource Checklist

LEADERSHIP ASSIGNMENT Create the Bivouac Layout Plan
ASSIGNMENT DESCRIPTION Create and sketch the bivouac layout plan. Upon completion, communicate the plan to the team members. The plan will be carried out by other peer leaders as leadership assignments.
RESOURCES • Handout of sample bivouac site layout, • Paper, and • Pen/pencil.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS N/A.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3L-2 Sample Bivouac Site Layout

LEADERSHIP ASSIGNMENT Unload Team Equipment and Supplies for a Survival Exercise
ASSIGNMENT DESCRIPTION Organize a team to unload team equipment and supplies from the supply vehicle (eg, equipment required for fire point, equipment required for petroleum, oils and lubricants [POL] point, etc). Place the equipment in an area easily accessible but do not store the equipment and supplies as they will be required to set up the bivouac site.
RESOURCES • Team equipment and supplies, • Supply vehicle, and • A minimum of four cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS • Equipment should be kept out of high-traffic areas. • Field tools must be safely handled.

LEADERSHIP ASSIGNMENT Construct a Food Hang
ASSIGNMENT DESCRIPTION Organize a team to construct a food hang as per the given bivouac site layout.
RESOURCES • Area for the food hang, • Diagram and instructions for the construction, • Garbage bags, • 15 m (50 feet) of rope, and • A minimum of two cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

CONSTRUCTING A FOOD HANG

1. Find a tree with a live branch. The branch should be at least 5 m (15 ft) from the ground with no object below that a bear could stand on.
2. Separate food from other items and store them into two equal bags.
3. Throw the rope over the branch. Attach one end of the rope to one of the bags with a slipped overhand knot.
4. Raise the bag as close as possible to the branch.
5. Attach the other bag to the rope as high up on the rope as possible. Leave a loop of rope near the bag for retrieval.
6. Push the second bag up to the level of the other bag with a long stick.
7. To retrieve the bags, hook the loop of the rope with the stick and pull it down. Remove the bag and lower the first bag.

R. Curtis, The Backpackers Field Manual: A Comprehensive Guide to Mastering Backcountry Skills, Three Rivers Press (p. 186)

Figure 3L-3 Food Hang

LEADERSHIP ASSIGNMENT
Set Up POL, First Aid and Fire Points
ASSIGNMENT DESCRIPTION
Organize a team to set up POL, first aid and fire points as per the given bivouac site layout.
RESOURCES
• Areas for the points, • POL supplies, • First aid equipment, • Fire point equipment, and • A minimum of six cadets.
TIME
A maximum of 15 minutes.
SAFETY CONSIDERATIONS
Equipment and supplies must be safely handled.

LEADERSHIP ASSIGNMENT Set Up the Female Sleeping Area
ASSIGNMENT DESCRIPTION Organize the female cadets into tent teams. Ensure they are aware of the female sleeping area boundaries. Supervise the cadets as they set up their tents in the female sleeping area. Ensure personal equipment is stored.
RESOURCES • Tents (one per two cadets), • Mallets, and • All female cadets.
TIME A maximum of 30 minutes.
SAFETY CONSIDERATIONS • Tents should be placed approximately 2 m apart. • Consideration must be given to placement of guy lines.

LEADERSHIP ASSIGNMENT Set Up the Male Sleeping Area
ASSIGNMENT DESCRIPTION Organize the male cadets into tent teams. Ensure they are aware of the male sleeping area boundaries. Supervise the cadets as they set up their tents in the male sleeping area. Ensure personal equipment is stored.
RESOURCES • Tents (one per two cadets), • Mallets, and • All male cadets.
TIME A maximum of 30 minutes.
SAFETY CONSIDERATIONS • Tents should be placed approximately 2 m apart. • Consideration must be given to placement of guy lines.

LEADERSHIP ASSIGNMENT
Mark the Components of the Bivouac Site

ASSIGNMENT DESCRIPTION

Organize a team to mark the following components of the bivouac site:

- headquarters,
- first aid point,
- supply,
- wash station,
- mess/eating area,
- fire point,
- in/out route for the safety vehicle,
- form-up area,
- food hang,
- parking area,
- drinking water point,
- POL point,
- female/male sleeping areas,
- garbage point, and
- washrooms.

Glow Sticks or other lights will be used to mark areas that will be accessed at night.

RESOURCES

- Paper,
- Markers,
- Tape,
- Glow Sticks or lights, and
- A minimum of three cadets.

TIME

A maximum of 20 minutes.

SAFETY CONSIDERATIONS

N/A.

LEADERSHIP ASSIGNMENT

Prepare a Meal for a Section

ASSIGNMENT DESCRIPTION

Organize a team to prepare a meal for a section during a Survival Exercise. When using individual meal packages (IMPs), field strip as required.

RESOURCES

- IMPs (if required),
- Water,
- Pots,
- Fuelled stove,
- Matches, and
- A minimum of two cadets.

TIME

A maximum of 30 minutes.

SAFETY CONSIDERATIONS

Stoves must be safely handled and monitored at all times when lit.

LEADERSHIP ASSIGNMENT Clean Up the Eating Area After a Meal
ASSIGNMENT DESCRIPTION Organize a team to clean up the bivouac site after a meal. Ensure all equipment is stored, all garbage is disposed of and that drinking water has been replenished.
RESOURCES • Garbage bags, • Water, and • A minimum of four cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Prepare the Bivouac Site for the Night
ASSIGNMENT DESCRIPTION
Organize a team to prepare the bivouac site for night. Ensure all equipment is stored, all garbage is disposed of and that lanterns are fuelled and accessible.
RESOURCES
• Garbage bags, • Lanterns, • Naphtha, • Funnel, • Matches, and • A minimum of four cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT
Organize Lights Out for the Female Cadets
ASSIGNMENT DESCRIPTION
Organize lights out for the female cadets. Ensure that all female cadets are accounted for and that all personal equipment is stored inside the tents.
RESOURCES
A minimum of two cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT Organize Lights Out for the Male Cadets
ASSIGNMENT DESCRIPTION Organize lights out for the male cadets. Ensure that all male cadets are accounted for and that all personal equipment is stored inside the tents.
RESOURCES A minimum of two cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Tear Down the Female Sleeping Area
ASSIGNMENT DESCRIPTION
Organize a team to tear down the female sleeping area. Have the cadets strike, fold and store their tents in tent bags. Ensure all personal kit is organized and packed. Ensure all team equipment is returned to the supply area and all personal equipment is placed in the form-up area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES
• Bivouac site layout, and • All female cadets.
TIME
A maximum of 40 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT Tear Down the Male Sleeping Area
ASSIGNMENT DESCRIPTION Organize a team to tear down the male sleeping area. Have the cadets strike, fold and store their tents in tent bags. Ensure all personal kit is organized and packed. Ensure all team equipment is returned to the supply area and all personal equipment is placed in the form-up area. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Bivouac site layout, • All male cadets.
TIME A maximum of 40 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Dismantle the POL, First Aid and Fire Points
ASSIGNMENT DESCRIPTION
Organize a team to dismantle the POL, first aid and fire points. Return resources to the supply area as required.
RESOURCES
• Areas for the points, and • A minimum of six cadets.
TIME
A maximum of 15 minutes.
SAFETY CONSIDERATIONS
Equipment and supplies must be safely handled.

LEADERSHIP ASSIGNMENT Dismantle the Food Hang and Dispose of Garbage
ASSIGNMENT DESCRIPTION Organize a team to dismantle the food hang and dispose of garbage to a given location. Return resources to the supply area as required.
RESOURCES • Area for the food hang, and • A minimum of two cadets.
TIME A maximum of 15 minutes.
SAFETY CONSIDERATIONS • Ensure no cadets are standing under the food hang when it is being taken down. • Watch out for rope burns.

LEADERSHIP ASSIGNMENT
Load Team Equipment and Supplies After a Survival Exercise
ASSIGNMENT DESCRIPTION
Organize a team to load equipment and supplies on the supply vehicle after a survival exercise.
RESOURCES
• Resources as detailed by the instructional staff, • Supply vehicle, and • A minimum of four cadets.
TIME
A maximum of 30 minutes.
SAFETY CONSIDERATIONS
• Cadets should be kept out of high-traffic areas. • Field tools must be safely handled.

LEADERSHIP ASSIGNMENT
Erase Signs of Occupancy and Complete a Final Garbage Sweep
ASSIGNMENT DESCRIPTION
Organize a team to erase signs of occupancy and complete a final garbage sweep. If a fire pit was used, ensure rocks and other materials are dispersed. Ensure the cadets fill in any tent peg holes with dirt. Conduct a final garbage sweep, ensuring all areas used are free of garbage.
RESOURCES
• Garbage bags, and • A minimum of 10 cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT
Unload Equipment and Supplies After a Survival Exercise
ASSIGNMENT DESCRIPTION
Organize a team to unload team equipment and supplies from the supply vehicle (eg, equipment required for POL point, equipment required for fire point). Place the equipment in a designated area.
RESOURCES
• Supply vehicle, and • A minimum of four cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
• Equipment should be kept out of high traffic areas. • Field tools must be safely handled.

LEADERSHIP ASSIGNMENT Collect Personal Equipment
ASSIGNMENT DESCRIPTION Organize a team to collect personal equipment (eg, field packs, sleeping bags and air mattresses) after completing a Survival Exercise. Count all equipment and report numbers to the directing staff after completing the assignment.
RESOURCES • Paper, • Pen/pencil, • Cadets with personal equipment to return, and • A minimum of three cadets for collection.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Prepare a Meal for Distribution at the Gliding Site
ASSIGNMENT DESCRIPTION Organize a team to distribute a meal at the gliding site.
RESOURCES • A flat surface for food service, • Food, • Napkins, • Plates, knifes, forks, spoons (if required), and • A minimum of three cadets.
TIME A maximum of 30 minutes.
SAFETY CONSIDERATIONS Cadets should be kept in an area that does not conflict with gliding operations.

LEADERSHIP ASSIGNMENT
Clean Up the Eating Area After a Meal at the Gliding Site
ASSIGNMENT DESCRIPTION
Organize a team to clean up the eating area after a meal at the gliding site. Ensure all equipment is stored, and all garbage is disposed of.
RESOURCES
• Garbage bags, and • A minimum of four cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
Cadets should be kept in an area that does not conflict with gliding operations.

LEADERSHIP ASSIGNMENT Conduct a Concurrent Activity at the Gliding Site
ASSIGNMENT DESCRIPTION Conduct a concurrent activity (eg, ground sweep, team-building activity, singing, etc) for a team of cadets who are awaiting further direction. Ensure maximum participation of all cadets in the team.
RESOURCES • As directed by the directing staff based on the concurrent activity, and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS Cadets should be kept in an area that does not conflict with gliding operations.

LEADERSHIP ASSIGNMENT
Complete a Final Garbage Sweep at the Gliding Site
ASSIGNMENT DESCRIPTION
Organize a team of cadets to complete a final garbage sweep at the gliding site. Conduct a final garbage sweep, ensuring all areas used are free of garbage.
RESOURCES
• Garbage bags, and • A minimum of 10 cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT Prepare a Meal for Distribution During the Inter-Squadron “Cadet/Air Skills” Competition Day
ASSIGNMENT DESCRIPTION Organize a team to distribute a meal during the Inter-squadron “Cadet/Air Skills” Competition Day.
RESOURCES • A flat surface for food service, • Food, • Napkins, • Plates, knifes, forks, spoons (if required), and • A minimum of three cadets.
TIME A maximum of 30 minutes.
SAFETY CONSIDERATIONS Cadets should be kept in an area that does not conflict with Inter-squadron “Cadet/Air Skills” Competition Day.

LEADERSHIP ASSIGNMENT Clean Up the Eating Area After a Meal During the Inter-Squadron “Cadet/Air Skills” Competition Day
ASSIGNMENT DESCRIPTION Organize a team to clean up after a meal during the Inter-squadron “Cadet/Air Skills” Competition Day. Ensure all equipment is stored, all garbage is disposed of.
RESOURCES • Garbage bags, and • A minimum of four cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS Cadets should be kept in an area that does not conflict Inter-squadron “Cadet/Air Skills” Competition Day.

LEADERSHIP ASSIGNMENT

Set up a Skills Activity

ASSIGNMENT DESCRIPTION

Organize a team of cadets to set up a skills activity as required. Move the scoring tables, stopwatch and any other equipment as directed.

RESOURCES

- Scoring tables,
- Stopwatch,
- Equipment (as required), and
- A minimum of four cadets.

TIME

A maximum of 10 minutes.

SAFETY CONSIDERATIONS

N/A.

LEADERSHIP ASSIGNMENT Tear Down a Skills Activity
ASSIGNMENT DESCRIPTION Organize a team of cadets to tear down a skills activity as required. Remove the scoring tables, stopwatch and any other equipment as directed.
RESOURCES • Scoring tables, • Stopwatch, • Equipment (as required), and • A minimum of four cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Organize a Team for a Skills Activity
ASSIGNMENT DESCRIPTION Organize the cadets into teams for a skills activity as directed (eg, teams, scorekeepers, timekeepers, etc).
RESOURCES • Stopwatches, • Pens/pencils, and • All participating cadets.
TIME A maximum of 10 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Warm-Up Activity Prior to Participating in a Skills Activity (if required)
ASSIGNMENT DESCRIPTION Conduct a warm-up activity for a team of cadets prior to participating in a skills activity. Ensure maximum participation of all cadets in the team.
RESOURCES • Handout of sample stretches (located at Annex K), and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT Conduct a Concurrent Activity During a Skills Activity
ASSIGNMENT DESCRIPTION Conduct a concurrent activity during a skills activity (eg, team-building activity, cheering, etc) for a team of cadets. Ensure maximum participation of all cadets.
RESOURCES • As directed by the directing staff based on the concurrent activity, and • A team of cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

LEADERSHIP ASSIGNMENT
Conduct a Cool-Down Activity After Participating in a Skills Activity
ASSIGNMENT DESCRIPTION
Conduct a cool-down activity for a team of cadets after participating in a skills activity. Ensure maximum participation of all cadets in the team.
RESOURCES
• Handout of sample stretches (located at Annex K), and • A team of cadets.
TIME
A maximum of 20 minutes.
SAFETY CONSIDERATIONS
N/A.

LEADERSHIP ASSIGNMENT Complete a Final Garbage Sweep After an Inter-squadron “Cadet/Air Skills” Competition Day
ASSIGNMENT DESCRIPTION Organize a team of cadets to complete a final garbage sweep after an Inter-squadron “Cadet/Air Skills” Competition Day. Conduct a final garbage sweep, ensuring all areas used are free of garbage.
RESOURCES • Garbage bags, and • A minimum of 10 cadets.
TIME A maximum of 20 minutes.
SAFETY CONSIDERATIONS N/A.

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LEADERSHIP ASSIGNMENT PLANNING GUIDE

LEADERSHIP ASSIGNMENT PLANNING GUIDE
ENSURE GOAL **Questions to the directing staff (eg, time to complete the task, etc)**
REQUIRED RESOURCES **Task assignment to peers/allocating resources (eg, are all tasks accomplished, etc)**
MAKE A PLAN **Reconnaissance of area, etc**
COMPLETE THE TIME APPRECIATION
DIAGRAMS

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LESSON ACTIVITIES

List of Activities for Annex N

TEAM-BUILDING ACTIVITY | **ENERGIZER**

TOE TO TOE | **TIME**: 10 min

RESOURCES

- A large, open space free from obstacles, and
- Masking tape.

ACTIVITY LAYOUT

Place the masking tape in a straight line approximately 4.5 m (15 feet) long on the ground.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Have each pair stand facing each other as if they were standing on a tight rope (on the masking tape line). The cadets are to stand with their right foot in front of the left, with the left foot directly in line with the right and about one foot length behind.
3. Have the cadets move toward each other so the toes of their right feet are touching.
4. Have the cadets grasp right hands in a handshake.
5. Explain the following to the cadets:
   (a) The objective of the activity is to try to bring their partner off balance and try to get them to fall off the tight rope (masking tape).
   (b) At no time may the cadets let go of their partners' hand.
   (c) They are not permitted to use their feet to try to knock their partner off balance. Feet must remain positioned on the line at all times.
   (d) All movements must be made in slow motion. They are not permitted to push or shove their partner. There is to be no sharp, thrusting movements or any sudden shifts in movement.
6. On the start signal, have the cadets try to knock their partner off balance and step off the tight rope (masking tape).
7. As time permits, have the cadets switch partners and attempt the activity again.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 77–78). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
PASS THE BUCK	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles,
- Stopwatch,
- First set of objects for passing (eg, bag of potato chips, air-filled balloon, roll of masking tape, mug, small ball, newspaper, etc), and
- Second set of objects for passing (eg, bag of potatoes, mug full of water, water-filled balloon, pillow, rolled sleeping bag, large ball, large textbook, etc).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle, facing the centre.
2. Assign one cadet as the “point”. This cadet will indicate the beginning and end of each cycle.
3. Explain the following to the cadets:
   (a) The objective of the activity is to pass the set of objects around the circle three times.
   (b) Each time the last object passes the “point” a cycle is complete.
   (c) If an object is dropped, all objects must go back to the “point” to begin again.
   (d) If the objects are successfully passed around the circle three times in one minute, 15 points are awarded. Each additional item that completes a cycle, earns the group one point.
4. Start the activity by passing the objects to the “point” one at a time. At this time, start the stopwatch for one minute.
5. Continue this activity until time has lapsed or the cadets understand the objective of the activity.
6. As time allows, have the cadets follow the directions for the second set of objects.

SAFETY

N/A.

REFERENCE

(ISBN 0-7879-4835-7) Sugar, S., & Takacs, G. (2000). *Games That Teach Teams*. (pp. 139–142). San Francisco, CA: Jossey-Bass/Pfeiffer.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
TOE TAG	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into partners.
2. Have each set of partners stand apart from the other cadets.
3. Have the partners stand with their backs to one another.
4. On a start signal, have the cadets spin around in a 180-degree circle and try to “tag” the toe of their partner before they get tagged.
5. Each set of partners should attempt this two to three times.
6. Have the cadets switch partners and try the activity again.

SAFETY

Ensure the cadets remember the name of the game is “tag”, not “stomp”.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 97). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY — **ENERGIZER**

TRIANGLE TAG — **TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have one cadet volunteer to be “it”.
2. Divide the remainder of the cadets into groups of three.
3. Have each group form a circle, holding hands and facing the centre of their circle.
4. Explain the following to the cadets:
   (a) One cadet within each circle will be designated to be tagged – the “tagee”. The other two members of the group will be that cadet’s protectors.
   (b) On a start signal, the cadet who is “it” must try to tag the cadet within the circle who is designated the “tagee”.
   (c) The cadets are to protect the “tagee” by spinning in circles to avoid the cadet who is “it”.
   (d) If a cadet is tagged, they will become “it” and the former cadet who was “it” will join the group with a new cadet being designated the “tagee”.
   (e) After a couple of minutes if the same cadet is still “it” change the roles of the cadets and give someone else an opportunity to be “it”.
5. On a start signal, have the cadets begin to spin to avoid the cadet designated as “it”.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 98). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
WHAT CAN YOU DO WITH THIS?	**TIME**: 10 min

RESOURCES

- A large, open space,
- An odd object (eg, staple remover, kitchen tongs, kitchen strainer, plastic container, etc),
- Paper, and
- Pens/pencils (one per group).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups.
2. Distribute a piece of paper and a pen/pencil to each group.
3. Explain the following to the cadets:
   (a) Once they see an item they will have to list as many possible uses for the object as they can.
   (b) They will have a time limit of five minutes to make the list.
   (c) After the time is up both groups are to come back together and the lists will be discussed as a full group.
4. Pull the object out of the bag and have the cadets begin their lists.
5. After five minutes, have the groups come together and present their lists to the other groups.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (p. 25). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
PERSONAL TRIVIA	**TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles,
- Index cards (one per cadet),
- Paper (one sheet per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute an index card and a pen/pencil to each cadet.
2. Have each cadet write the following on their index card:
   (a) their name, and
   (b) five little-known facts about themselves (eg, favourite movie, favourite singer/band, favourite television show, favourite restaurant, favourite sport, etc).
3. Collect all of the index cards.
4. Distribute a piece of paper to each cadet.
5. Read out each index card, one at a time, and have each cadet write down the name of the cadet whose card they think was read.
6. After the last card was read, have the cadets read out their guesses and identify which cadets guessed them correctly.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (p. 26). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY **ICEBREAKER**

ESP **TIME**: 10–15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Demonstrate three physical gestures that will be used for the activity. The three gestures should be from a similar category. For example, three of the following sports-related gestures could be chosen:
   (a) swimming;
   (b) swinging a golf club;
   (c) swinging a baseball bat;
   (d) shooting a hockey puck; or
   (e) kicking a soccer ball.
2. Divide the cadets into pairs.
3. Have the cadets practice these gestures a couple of times.
4. Have the pairs line up back to back in a straight line with plenty of room between each set of pairs.
5. Explain the following to the cadets:
   (a) The objective of the activity is to try to perform the same gesture as your partner, without any clues, as many times as possible.
   (b) On a start signal from the leader, the cadets will turn around and face their partner while performing one of the three given gestures.
   (c) After completing each gesture, the partners will stand back to back again without giving any clues to each other as to the next gesture they will perform.
   (d) The cadets will continue to do this on each start signal from the leader until the time is complete.
   (e) The cadets should count how many times they successfully performed the same gesture as their partner.
   (f) Upon completion of the activity, have each group state how many times they were successful.
6. On a given start signal have the cadets turn around to face their partner while performing one of the gestures.
7. Have the cadets continue this until the time has lapsed.
8. Have the cadets state how many times they were successful at performing the same gesture as their partner on completion of the activity.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 57–58). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	ICEBREAKER
ONE COMMON GOAL	**TIME**: 10–15 min

RESOURCES

- A large, open space,
- Paper (one sheet per pair), and
- Pens/pencils (one per pair).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute a piece of paper and a pen/pencil to each pair.
3. Explain that each pair is to think of as many common traits (eg, hair colour, number of siblings) between them as they can and write them on the piece of paper.
4. After approximately six minutes, have the cadets come together as a group and present their common traits one pair at a time.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (p. 31). Richland, WA: Rec Room Publishing.

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ENERGIZERS AND ICEBREAKERS

List of Activities for Annex O

TEAM-BUILDING ACTIVITY	**ENERGIZER**
SHIPWRECK	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles,
- Rope (enough for 0.5 m [1.6 feet] per group), and
- Scissors.

ACTIVITY LAYOUT

Cut the rope into 0.5 m (1.6 feet) lengths and tie to make one circle per group.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of five.
2. Give each group a “ship” (rope circle).
3. With all members holding on to the sides of the “ship”, the cadets must run back and forth the length of the playing field.
4. When the leader yells “SHARK”, all members must lay the “ship” down and jump “on board” (inside the rope circle). The first group with all feet off the ground gains a point.
5. Repeat the procedure until a group reaches five points.

SAFETY

N/A.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 112). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
BALLOONS	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles,
- Balloons (a minimum of one per group),
- Funnel, and
- Water.

ACTIVITY LAYOUT

Blow up the balloons and put a small amount of water in each.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of five.
2. Have each group form a circle.
3. Give each group a balloon with a small amount of water in it.
4. Have the cadets try to keep the balloon off the ground by using their feet to hit it to the other cadets in the group.
5. Encourage teams to try to keep the balloon moving from cadet to cadet for as long as possible.

SAFETY

N/A.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 67). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
MIRROR IMAGE	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs (pairs should be close to the same height).
2. Within each pair, have one cadet initiate an action and the other imitate it, becoming the “mirror image”.
3. Encourage the initiator to make slow movements, stretches and jumps.
4. Swap roles after a few minutes.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 76–77). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
HAVE YOU EVER?	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets form a circle, either seated or standing.
2. Ask for a volunteer to sit or stand in the middle (the “questioner”).
3. Have the “questioner” ask an appropriate question to the group that is prefaced with “Have you ever….?” (eg, Have you ever stayed up for 48 hours straight? Have you ever been to another Cadet Summer Training Centre?). The question that the “questioner” asks must be something that they have actually done.
4. If there are cadets in the circle who have experienced what the “questioner” asked, they are to leave their place in the circle and find an empty place somewhere else in the circle. The “questioner” also tries to find an empty space.
5. The person who is left without a place in the circle once everyone has moved is the new “questioner”.
6. Continue the process with a new “questioner”.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 193–194). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
ZIP ZAP	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle.
2. Ask for a volunteer to stand in the middle. This cadet is the “zipper”.
3. Have the “zipper” approach someone with their hands pressed together and all fingers pointing forward, look them straight in the eye and say “zip”.
4. Once “zip” is called, the cadet being pointed at is to duck down – the “ducker”. The two cadets on each side of the “ducker” are to face in toward each other, with their hands clasped and index fingers pointing at the other person. Each cadet is to yell “zap” at the other person (this will usually occur simultaneously). These people are the “zappers”.
5. If the “ducker” does not duck quick enough or a cadet gets zapped, that cadet is to go to the middle and become the new “zipper”.
6. After two or three rounds, invite another “zipper” to the middle to create more challenge. Continue the activity with two or more “zippers”.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 58–59). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
TALL SHIP	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

Determine the bow, stern, port and starboard sides of the "ship".

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle in the centre of the "ship".
2. Demonstrate and explain the seaworthy terms and chores that the cadets will be performing:
   (a) "Bow" – move to the front;
   (b) "Stern" – move to the rear;
   (c) "Port" – move to the left;
   (d) "Starboard" – move to the right;
   (e) "Attention" – cadets stand at attention and salute;
   (f) "Swab the Deck" – cadets get on their hand and knees and scrub the deck;
   (g) "Sailor Overboard" – all cadets drop to the deck on either the port or starboard sides;
   (h) "Lifeboats" – groups of three form a single file line, sit and pretend to row a boat; and
   (i) "Rig the Sails" – groups of two join hands and pretend to set up the sails.
3. As the Captain, issue a series of commands to the cadets.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 87–88). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
CHIC-A-BOOM!	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

Look over the dance moves and the words to the Chic-a-Boom song.

ACTIVITY INSTRUCTIONS

1. Have the group stand in a circle.
2. Teach the group the following moves – with the index fingers, point up to the sky and alternate thrusts of each hand to a beat (eg, left hand up, then right hand up). Point down with alternating thrusts, point to the left while taking rocking steps and point to the right while taking rocking steps.
3. Using the dancing moves, teach the cadets the Chic-a-Boom song:

   "Hey there (enter name), you're a real cool cat.
   You've got a lot of this, and you've got a lot of that.
   So come on in and get down…
   …aaaand, up chic-a-boom, chic-a-boom, chic-a-boom.
   And down chic-a-boom, chic-a-boom, chic-a-boom.
   To the left, chic-a-boom, chic-a-boom, chic-a-boom.
   To the right, chic-a-boom, chic-a-boom, chic-a-boom."
4. Have one cadet volunteer to be the first cadet to go in the middle of the circle.
5. Have the cadets sing the song and complete the dance moves. The cadet in the middle begins to sing while looking directly at someone in the circle. When the song gets to the "*come on in and get down*" part, have the cadet in the middle sidle up to another cadet, link arms and lead them to the centre of the circle.
6. On the next turn, both cadets stay in the middle and bring another cadet in, and so on.
7. Encourage cadets to be creative and expressive with their singing and dancing when they are in the middle of the circle. They could bring some attitude or even beat boxing into the circle.
8. The activity ends when all cadets are in the middle of the circle.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 74–75). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY — **ENERGIZER**

PIG PERSONALITY PROFILE — **TIME**: 10 min

RESOURCES

- Paper (one sheet per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a piece of paper and a pen/pencil to each cadet.
2. Read the following out loud, "On a blank piece of paper, draw a pig. Don't look at your neighbour's pig. Don't even glance."
3. Allow approximately three minutes for the cadets to draw a pig.
4. When all cadets are finished, allow a few moments for the cadets to look at their neighbours' pigs.
5. Explain that the pig drawings could indicate a person's personality traits. Share the personality traits of the pig exercise with the group. If the pig is drawn:
   (a) toward the top of the paper, you are a positive, cheerful person;
   (b) toward the middle of the paper (top to bottom), you are a practical person;
   (c) toward the bottom of the paper, you are gloomy and have a tendency to behave negatively;
   (d) facing left, you believe in tradition, are friendly and remember dates, including birthdays;
   (e) facing forward (looking toward you), you are direct, enjoy playing devil's advocate and neither fear nor avoid discussions;
   (f) facing right, you are innovative and active but don't have a strong sense of family, nor do you remember dates;
   (g) with many details, you are investigative, cautious and distrustful;
   (h) with few details, you are emotional and naïve, care little for details and are a risk taker;
   (i) with four legs showing, you are secure, stubborn and stick to your ideals;
   (j) with less than four legs showing, you are insecure or are living through a period of major change;
   (k) the size of the pig's ears indicates how good a listener you are – large is good; and
   (l) the length of the pig's tail indicates your energy level – longer indicates more.
6. Allow time for the cadets to discuss their pigs with others.

SAFETY

N/A.

REFERENCE

(ISBN 0-943210-44-5) Pike. B., & Busse, C. (1995). *101 More Games for Trainers*. (pp. 102–103). Minneapolis, MN: Lakewood Publications.

TEAM-BUILDING ACTIVITY **ENERGIZER**

CIRCLE THE CIRCLE **TIME**: 10 min

RESOURCES

- A large, open space free from obstacles, and
- Hula hoop.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets form a circle and hold hands with the cadet on either side of them.
2. Rest a hula hoop on two cadets' grasped hands.
3. Have the cadets try to have the hoop travel around the circle, while everyone is still holding hands.
4. If the activity is completed quickly, have the cadets try again.

SAFETY

N/A.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 60). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
CLUMPS	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets gather in the designated space.
2. Explain that numbers will be shouted out (eg, “four”, “seven”, etc). When numbers are shouted out, the cadets are to form groups consisting of that number of people. Those cadets who do not form a group can simply wait until another number is shouted out, and then form a group.
3. If the cadets catch on quickly, add a new rule that each cadet cannot form a new group with any cadet who was in their previous group.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 32–33). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY **ENERGIZER**

CADET FEUD #1 **TIME**: 10 min

RESOURCES

- Cadet Feud Survey (one per cadet),
- Scissors,
- Pens/pencils (one per cadet),
- Tennis ball,
- Chalkboard/whiteboard, and
- Chalk or whiteboard markers.

ACTIVITY LAYOUT

- Photocopy, cut out and have the cadets complete the survey.
- Conduct the attached survey.
- Tally and rank the top five answers for each question.
- Prepare the chalkboard/whiteboard by writing the numbers one through five.

ACTIVITY INSTRUCTIONS

(Note. This game is played in the same manner as the television show “Family Feud.”)

1. Divide the group into two teams and have them sit facing each other.
2. Place a tennis ball on a table or on the floor. Have the first person from each team come forward and sit an equal distance away from the tennis ball (this will serve as the “buzzer”).
3. Ask the first question (eg, “Name five of the top restaurants.”). The first person to grab the ball will get a chance to answer the question. If the ball is grabbed early, stop reading the question and allow for the cadet to give an answer.
4. If the cadet gives an answer that is on the list, write it beside the corresponding number. If this person has not guessed the number one answer, the other player may have a turn to guess. The person who guesses the highest answer on the list gets to choose whether his/her team will play or pass.
5. After this, each team gets three strikes (wrong answers). The team that is playing gets the chance to guess the remaining answers on the board. Give each person a turn, down the line.
6. Once the playing team gets three strikes, the other team decides as a group what one answer they want to give to try to fill in one of the remaining blanks.
7. If the first team fills in all the blanks, they win the round, but if the opposing team guesses one of the remaining answers, they win the round.
8. Continue with the rest of the questions in the same manner.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 36–37). Richland, WA: Rec Room Publishing.

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. What is your favourite restaurant?	
2. What is your favourite type of music?	
3. What is your hair colour?	
4. What is your favourite shampoo?	
5. What is your favourite winter activity?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. What is your favourite restaurant?	
2. What is your favourite type of music?	
3. What is your hair colour?	
4. What is your favourite shampoo?	
5. What is your favourite winter activity?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. What is your favourite restaurant?	
2. What is your favourite type of music?	
3. What is your hair colour?	
4. What is your favourite shampoo?	
5. What is your favourite winter activity?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. What is your favourite restaurant?	
2. What is your favourite type of music?	
3. What is your hair colour?	
4. What is your favourite shampoo?	
5. What is your favourite winter activity?	

TEAM-BUILDING ACTIVITY **ENERGIZER**

CADET FEUD #2 **TIME**: 10 min

RESOURCES REQUIRED

- Cadet Feud Survey (one per cadet),
- Scissors,
- Pens/pencils (one per cadet),
- Tennis ball,
- Chalkboard/whiteboard, and
- Chalk or whiteboard markers.

ACTIVITY LAYOUT

- Photocopy, cut out and have the cadets complete the survey.
- Conduct the attached survey.
- Tally and rank the top five answers for each question.
- Prepare the chalkboard or whiteboard by writing the numbers one through five.

ACTIVITY INSTRUCTIONS

(Note. This game is played in the same manner as the television show “Family Feud.”)

1. Divide the group into two teams and have them sit facing each other.
2. Place a tennis ball on a table or on the floor. Have the first person from each team come forward and sit an equal distance away from the tennis ball (this will serve as the “buzzer”).
3. Ask the first question (eg, “Name five of the top celebrities.”). The first person to grab the ball will get a chance to answer the question. If the ball is grabbed early, stop reading the question and allow for the cadet to give an answer.
4. If the cadet gives an answer that is on the list, write it beside the corresponding number. If this person has not guessed the number one answer, the other player may have a turn to guess. The person who guesses the highest answer on the list gets to choose whether his/her team will play or pass.
5. After this, each team gets three strikes (wrong answers). The team that is playing gets the chance to guess the remaining answers on the board. Give each person a turn, down the line.
6. Once the playing team gets three strikes, the other team decides as a group what one answer they want to give to try to fill in one of the remaining blanks.
7. If the first team fills in all the blanks, they win the round, but if the opposing team guesses one of the remaining answers, they win the round.
8. Continue with the rest of the questions in the same manner.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 36–37). Richland, WA: Rec Room Publishing.

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. Who is your favourite celebrity?	
2. Where is your favourite place to shop (store name)?	
3. What is your favourite sport?	
4. What is the colour of your toothbrush?	
5. What is your dream job?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. Who is your favourite celebrity?	
2. Where is your favourite place to shop (store name)?	
3. What is your favourite sport?	
4. What is the colour of your toothbrush?	
5. What is your dream job?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. Who is your favourite celebrity?	
2. Where is your favourite place to shop (store name)?	
3. What is your favourite sport?	
4. What is the colour of your toothbrush?	
5. What is your dream job?	

CADET FEUD SURVEY

Answer the following questions. Be sure to write only one answer.

QUESTIONS	ANSWERS
1. Who is your favourite celebrity?	
2. Where is your favourite place to shop (store name)?	
3. What is your favourite sport?	
4. What is the colour of your toothbrush?	
5. What is your dream job?	

TEAM-BUILDING ACTIVITY	**ENERGIZER**
TINY TEACH	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Explain that there will be a series of partner activities announced that the cadets will have to perform.
3. Introduce each performance:
    (a) **Tie a Pair of Shoelaces.** Each pair of cadets will untie the laces of the shoe closest to their partner as they stand side by side. The object is for each pair of cadets, using only one hand, to tie the shoelaces (one from each shoe) together with a standard bow.
    (b) **Whistle in Your Hands.** Cup the hands tightly together to form an air-tight container, but leave a small gap in the top between the thumbs. Try to make a hollow-pitched whistle sound.
    (c) **Tell a Joke.** No matter how long or short, funny or not, pass on an **appropriate** joke to the other cadet.
    (d) **Let Me Show You.** Each cadet will present a skill or talent they choose to their partner (eg, curl of the tongue, a yoga move, etc).
    (e) **Body Gym.** Each pair takes turns showing and teaching the other how to do something completely bizarre with their bodies.
4. Call out a performance and have each pair of cadets perform it. Continue calling out different performances.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 44–45). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
FOUR UP	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the group sit on the ground, with space between each cadet.
2. Explain to the cadets that anyone can stand up when they would like to, but no one can remain standing for longer than five seconds before they sit again.
3. Once some cadets begin to stand, tell them that the goal is to have exactly four people standing up at all times.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 172). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
YURT CIRCLE	**TIME**: 10 min

RESOURCES

A large, open space with a non-slip surface.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets form a circle and grasp the hands or wrists of their neighbours.
2. Have the cadets move back and stretch out the circle without letting go (not to the full extent of the arms).
3. With everyone's feet together and planted on the ground, instruct everyone to lean backwards.
4. Encourage the cadets to adjust the position of their feet if they are uncomfortable.
5. Try to get everyone to fully support each other's weight. This may take a few tries!

SAFETY

Ensure cadets look out for the safety of each other so they do not fall backwards.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 91 and 92). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
HOOP RELAY	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles, and
- Hula hoops (four).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

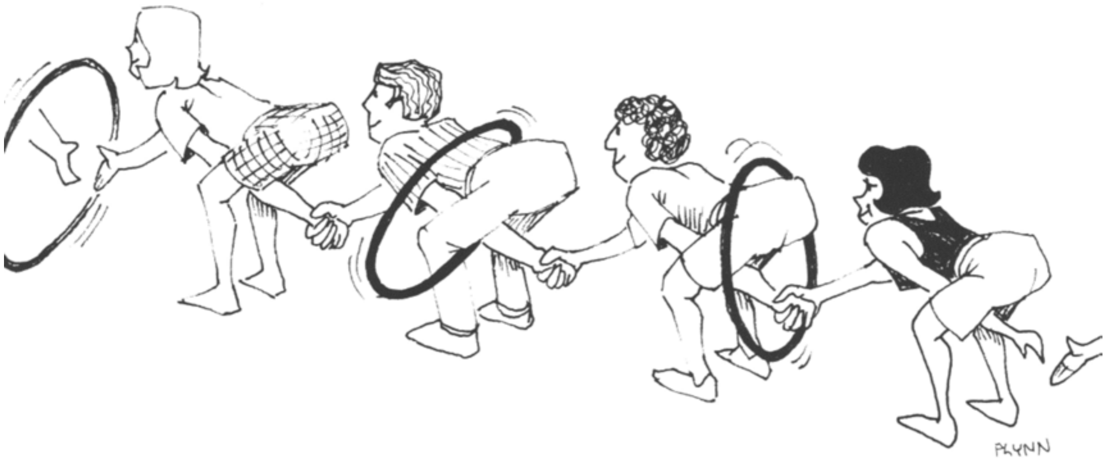
1. Have the cadets form a single file, one behind the other.
2. Have the cadets hold hands front-to-back by reaching backward through their legs to grasp the free hand of the person behind them.
3. Designate one cadet to be the “starter”. Have the “starter” stand in front of the line, holding four hula hoops.
4. Explain that when signalled to begin the game, the “starter” will place one of the hula hoops over the head of the first person in line. The cadets will have to try to have the hula hoop travel from cadet to cadet. When the first hoop reaches the third person in line, the “starter” may add another hoop, and so on. If the “starter” wishes to be part of the game, they can simply start the last hoop and become the first person in line.
5. Signal to begin the game.
6. When the first hoop reaches the last cadet in the line, they will run to the front of the line with the hoop, grab the hand of the now second cadet and start to move the hoop to the end of the line.
7. Continue until the original front cadet returns to their original position.

SAFETY

N/A.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 61). Dubuque, IA: Kendall/Hunt Publishing Company.



K .Rohnke, Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities, Kendall/Hunt Publishing Company (p. 61)

Figure 3O-1 Hoop Relay

TEAM-BUILDING ACTIVITY	**ENERGIZER**
ALL ABOARD	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles,
- Balloons of varying colours (two per cadet), and
- Markers (one per group).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four.
2. Distribute deflated balloons of varying colours around the space.
3. Have each group get into train formation (together in single file) and give the first person in each line, the “engine”, a marker.
4. Explain to the cadets that each group is a passenger “train” that must pick up “passengers”, balloons, two per person. Each person in the train will be a “car”.
5. Balloons become “passengers” when they are inflated and have a face. One cadet must inflate the balloon, tie it and paint a face on it with the marker.
6. Each train must move around together and pick up “passengers”. “Passengers” must be the same colour and everyone must be carrying two. The train must stay still while a cadet is inflating and drawing. The objective is for each train to have all “passengers” that are the same colour.
7. The first “train” to reach the destination point with all “passengers” accounted for (two balloons per cadet) wins the game.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-134984-7) West, E. (1999). *The Big Book of Icebreakers*. (pp. 135–136). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
LINE UP	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain to the cadets that instructions will be given for them to line up in a particular way.
2. Once lined up, the group must sit at the same time, to indicate that they are finished.
3. Possible categories include:
   (a) order of shoe size;
   (b) alphabetically by favourite colour;
   (c) order by the number of siblings each cadet has;
   (d) order by age, youngest to oldest;
   (e) order by hair colour, lightest to darkest;
   (f) alphabetically by first name; and
   (g) alphabetically by last name.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-134984-7) West, E. (1999). *The Big Book of Icebreakers*. (pp. 87–89). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
PICK POCKET	**TIME**: 10 min

RESOURCES

- Pick Pocket Activity Sheet (one per group),
- Scissors,
- Pens/pencils (one per group), and
- Stopwatch.

ACTIVITY LAYOUT

Photocopy and cut the survey.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups.
2. Explain to the cadets that they will have five minutes to try and find as many items on the Pick Pocket Activity Sheet as possible.
3. Distribute a Pick Pocket Activity Sheet to each group.
4. Start the activity.
5. Once five minutes have passed, bring the cadets back to one area and compare which items were found by each group.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-134984-7) West, E. (1999). *The Big Book of Icebreakers*. (pp. 53–55). New York, NY: McGraw-Hill.

PICK POCKET ACTIVITY SHEET

______ A purple pen,
______ A piece of gum,
______ A pair of sunglasses,
______ A comb,
______ A padlock key,
______ A bobby pin,
______ A picture of a friend or relative,
______ Money,
______ A bank card, and
______ A mint.

PICK POCKET ACTIVITY SHEET

______ A purple pen,
______ A piece of gum,
______ A pair of sunglasses,
______ A comb,
______ A padlock key,
______ A bobby pin,
______ A picture of a friend or relative,
______ Money,
______ A bank card, and
______ A mint.

PICK POCKET ACTIVITY SHEET

______ A purple pen,
______ A piece of gum,
______ A pair of sunglasses,
______ A comb,
______ A padlock key,
______ A bobby pin,
______ A picture of a friend or relative,
______ Money,
______ A bank card, and
______ A mint.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
ABOUT NOW	**TIME**: 10 min
RESOURCES • A large, open space free from obstacles, and • Stopwatch.	
ACTIVITY LAYOUT N/A.	
ACTIVITY INSTRUCTIONS 1. Gather the group in an area. 2. Explain to the group that on the command “Now” everyone will try to count 60 seconds in their head and then sit. There is to be no talking and the cadets cannot look at their watches. 3. While looking at the stopwatch, yell “Now” to signal the cadets to begin. 4. Note the cadet who sits down closest to the 60 second time frame. 5. When all cadets are sitting, announce who was the closest. 6. Repeat the activity.	
SAFETY N/A.	
REFERENCE (ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 148). Beverly, MA: Project Adventure, Inc.	

TEAM-BUILDING ACTIVITY	ENERGIZER
MASS STAND UP	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two equal groups.
2. Have each group sit in a circle, with their backs to the middle.
3. Have the cadets in each group link elbows with the cadets sitting on either side of them.
4. Explain that on the command “Go” everyone will try to stand up as one.
5. Give the command “Go.” This activity may require a lot of encouragement and many tries.

SAFETY

N/A.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 100). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**ENERGIZER**
WORD PUZZLE	**TIME**: 10 min

RESOURCES

- A large space,
- Word puzzle sheet (one per cadet),
- Pens/pencils (one per cadet), and
- Stopwatch.

ACTIVITY LAYOUT

Photocopy a word puzzle sheet for every cadet.

ACTIVITY INSTRUCTIONS

1. Distribute a word puzzle sheet and a pen/pencil to each cadet.
2. Explain to the cadets that they have three minutes to try and complete as many word puzzles as possible.
3. After three minutes, have the cadets form groups of three. Among the three cadets, encourage them to come up with as many answers as possible.
4. Share the word puzzle answers with the cadets.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046414-6) Scannel, E., & Newstrom, J. (1994). *Even More Games Trainers Play*. (pp. 137–177). New York, NY: McGraw-Hill Companies.

1 TALE	2 NE1410S	3 CYCLE CYCLE CYCLE	4 BALL
5 Jan. Feb. Mar. DUE	6 1	7 HEAD LO VE HEELS	8 type
9 L Bus Term L	10 BAN ANA	11 T K The R C A	B A C K CK 12 K
13 LAL	14 I'm nhappy	15 ME QUIT	16 DOM
17 S P L I T	18 PETS A	19 CI Life TY	20 YOU / JUST / ME

WORD PUZZLE ANSWERS

1. A tall tale.
2. Anyone for tennis?
3. Tricycle.
4. Curve ball.
5. Three months overdue.
6. Hole in one.
7. Head over heels in love.
8. Type written.
9. Bus terminals.
10. Banana split.
11. The inside track.
12. Full back, half back, quarterback.
13. All mixed up.
14. I’m unhappy without you.
15. Quit following me.
16. Domino.
17. Split down the middle.
18. A step backwards.
19. Life in the big city.
20. Just between you and me.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
CATEGORIES	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the group gather.
2. Explain to the group that they will separate and regroup according to the categories announced.
3. Announce a category. Possible categories include:
   (a) number of siblings,
   (b) last digit in home telephone number,
   (c) position of thumbs when hands are clasped (eg, left over right or right over left),
   (d) month of birth,
   (e) colour of eyes,
   (f) colour of hair,
   (g) type of breakfast ate this morning,
   (h) favourite hot or cold drink, and
   (i) distance travelled to get here.
4. Once groups are formed, announce another category. Continue announcing categories until the time has lapsed.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 31–32). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
HUMAN SCAVENGER HUNT	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

Create a list of scavenger hunt items if other choices than those listed are preferred.

ACTIVITY INSTRUCTIONS

1. Have the group stand or sit together.
2. Read a point from the human scavenger hunt. The team must send a cadet to the front who fits the description. For example, if the leader says "Two cadets who have the same middle name," members must talk and find out if there are two cadets in the group who fit the description and then quickly send those cadets to the leader.
3. The human scavenger hunt could consist of:
   (a) Two cadets who have the same first and last initials.
   (b) The cadet in the group who was born the furthest away.
   (c) Two cadets with the same middle name.
   (d) A group of cadets whose ages add up to 40.
   (e) Two cadets who were born on the same date (eg, June 14th and September 14th)
   (f) Two cadets who were born in the same month.
   (g) A group of cadets whose shoe sizes add up to 30.
   (h) The cadet who lives the closet to here.
   (i) A group of cadets who can spell a word by putting together the first letters of their first names.
   (j) A group of three cadets who all have different coloured eyes.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 18–19). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
THE WALKING BILLBOARD	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles,
- Flip chart paper (one sheet per cadet),
- Markers (one per cadet), and
- Masking tape (one roll).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a piece of flip chart paper and a marker to each cadet. Get all the cadets to place their first and last names at the top.
2. Write and post the following questions on a piece of flip chart paper:
   (a) What is your favourite food?
   (b) What is your biggest pet peeve?
   (c) What is your all-time favourite movie?
   (d) What is your dream job?
3. Allow time for each cadet to write their answers on their piece of flip chart paper.
4. Using masking tape, have the cadets help each other attach the flip chart paper to the writer's shoulders, to look like a "walking billboard".

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046501-0) Scannel, E., & Newstrom, J. (1998). *The Big Book of Presentation Games*. (pp. 125–126). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY **ICEBREAKER**

GETTING ACQUAINTED **TIME**: 10 min

RESOURCES

- A large, open space,
- Large sticky notes (one per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a large sticky note and a pen/pencil to each cadet.
2. Have each cadet write their first and last names on their sticky note.
3. Allow two or three minutes for each cadet to write down two words or brief phrases that tell something about themselves and can be used as conversation starters (eg, hometown, hobby, quirk, etc).
4. Have the cadets start to mingle and form groups of two or three and discuss their words or phrases with other cadets.
5. Once a few minutes have passed, tell the cadets to switch groups while encouraging them to meet and mingle with as many cadets as possible.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046501-0) Scannel, E., & Newstrom, J. (1998). *The Big Book of Presentation Games*. (pp. 23–24). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
BINGO BLAST	**TIME**: 10 min

RESOURCES

- A large, open space,
- Bingo Blast cards (one per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

Photocopy a Bingo Blast card for each cadet.

ACTIVITY INSTRUCTIONS

1. Distribute a bingo card and a pen/pencil to each cadet.
2. Allow five minutes for the cadets to roam around the area trying to find a person to fit each description on the card. Once a person is found, that cadet will sign their name on the bingo card. Encourage the cadets to try to fill out the complete card.
3. Once time is up, have the cadets gather in one area and sit.
4. Read the descriptions out loud and see who fits each description.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046501-0) Scannel, E., & Newstrom, J. (1998). *The Big Book of Presentation Games*. (pp. 28–29). New York, NY: McGraw-Hill.

BINGO BLAST

PLAYS TENNIS __________	HAS TRAVELLED OUTSIDE OF CANADA __________	SPEAKS TWO LANGUAGES __________	HAS BROWN EYES __________	HAS AN OLDER BROTHER __________
HAS BROKEN A BONE __________	HATES BRUSSELS SPROUTS __________	HAS RED HAIR __________	HAS A PET FISH __________	PLAYS AN INSTRUMENT __________
HAS NEVER BEEN TO A CSTC BEFORE __________	HAS CANOED __________	**FREE**	HAS HAD A CAVITY __________	LOVES PICKLES __________
CAN SWIM __________	HAS A PET DOG __________	HAS BLUE EYES __________	HAS THEIR TOENAILS PAINTED __________	PLAYS VOLLEYBALL __________
HAS BLONDE HAIR __________	LIKES MATH __________	HAS A BIRTHDAY DURING THE COURSE __________	KNOWS A SET OF TWINS __________	KNOWS HOW TO DO THE HOKEY POKEY __________

TEAM-BUILDING ACTIVITY	ICEBREAKER
TEAM CHARADES	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two equal groups.
2. Give each group five minutes to:
   (a) choose a name for the team that best represents it; and
   (b) discuss a set of charades or acts that they will use to try to get the others to guess their team name.
3. Allow one minute for each group to act out their group's name, while the rest of the cadets guess.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046501-0) Scannel, E., & Newstrom, J. (1998). *The Big Book of Presentation Games*. (p. 161). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
DOUBLE TAKE	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets spread out in the area.
2. Have the cadets walk around shaking hands and introducing themselves to other cadets.
3. Call out a characteristic and have the cadets form groups with other cadets who share that characteristic. Some characteristics could include:
   (a) hair colour,
   (b) eye colour,
   (c) shoe size,
   (d) favourite colour,
   (e) favourite pizza topping,
   (f) pet ownership,
   (g) favourite sport, and
   (h) favourite music.
4. Encourage the cadets to form groups with different cadets as frequently as possible.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-134984-7) West, E. (1999). *The Big Book of Icebreakers*. (pp. 25–29). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
PECULIARITIES	**TIME**: 10 min

RESOURCES

- A large, open space,
- Peculiarities Activity Sheet (one per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

Photocopy a Peculiarities Activity Sheet for each cadet.

ACTIVITY INSTRUCTIONS

1. Distribute an activity sheet and a pen/pencil to each cadet.
2. Allow five minutes for the cadets to roam around the area trying to find a cadet to fit each description on the card. Once a cadet is found, have the cadet tick their peculiarity off the list and write their name next to the description. Encourage the cadets to try to tick off as many as possible.
3. Once time is up, have the cadets join in one area and sit.
4. Read the descriptions out loud and see who fits each description.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-134984-7) West, E. (1999). *The Big Book of Icebreakers*. (pp. 105–107). New York, NY: McGraw-Hill.

PECULIARITIES ACTIVITY SHEET

1. Who was born on February 29th?
2. Who has or had a dog named Spot, Midnight, Lucky, Shadow or Snoopy?
3. Who competes in sporting activities such as running, basketball, etc?
4. Who likes pizza with anchovies?
5. Who was born in a different province than the one in which they reside?
6. Who was born outside of Canada?
7. Who has been to Nunavut?
8. Who writes songs or poetry?
9. Who has a twin brother or sister?
10. Who has a shoe size greater than 10?
11. Who has milked a cow?
12. Who has been to a concert in the past three months?
13. Who has been on a radio or television show?
14. Who prefers winter to summer?

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
I LIKE ME BECAUSE	**TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs, preferably two cadets that do not know each other well.
2. Have the pairs sit facing each other and decide who will go first and who will go second.
3. Have each pair make eye contact and sit with an open body posture (eg, do not cross arms).
4. Explain that each pair will have two minutes each to answer the question “What do I like about myself?” The partner not answering the question cannot talk but must express a keen interest in the cadet through body language.
5. Have the first cadet speak about themselves. At the end of the two minutes, have the cadets switch roles.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046513-4) Newstrom, J., & Scannel, E. (1998). *The Big Book of Team Building Games*. (pp. 73–74). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
GROUP JUGGLE	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles, and
- Tennis balls (three).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle.
2. Start the activity using one ball. All cadets will begin the game with one arm in the air. The cadet with the ball will call out their own name and the name of the cadet to whom they are going to throw the ball they will then throw the ball to that cadet. The ball must be thrown to a cadet with their arm in the air to ensure each cadet has the opportunity to participate. Once the cadet has caught the ball they are to put their arm down.
3. Have the cadet who catches the ball say their own name, say the name of the cadet to whom they are going to throw the ball and then throw the ball to that cadet.
4. Continue the game until the cadets seem comfortable using one ball.
5. Add more balls. The rules remain the same, only that the cadets have to pay much more attention! Continue until everyone has caught a ball, then all cadets should start again with their arm in the air.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (p. 109). New York, NY: McGraw-Hill Companies, Inc.

TEAM-BUILDING ACTIVITY **ICEBREAKER**

MEET 'N GREET **TIME**: 10 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of three or four.
2. Allow two minutes for each group to find three distinctive things that all of the cadets have in common. The only rule is that the three distinctive things cannot be related to the Cadet Program (eg, won the marksmanship team or received an award at the Annual Ceremonial Review). Some examples could be:
    (a) all are from the same province;
    (b) all have an older brother; and
    (c) all grew up in a single parent home.
3. Once all groups have completed Step 2., have the cadets regroup and share the three commonalities with the remainder of the cadets.
4. If time remains, complete the activity again with different groups.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046414-6) Newstrom, J. (1994). *Even More Games Trainers Play*. (p. 11). New York, NY: McGraw-Hill Companies.

TEAM-BUILDING ACTIVITY	ICEBREAKER
WHO ARE YOU?	**TIME**: 10 min

RESOURCES

- A large, open space,
- Index cards (one per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute an index card and a pen/pencil to each cadet.
2. Have each cadet write down one thing about themselves that they do not think anyone else would know.
3. Collect all the cards and shuffle them. Randomly distribute one card to each cadet.
4. Allow five minutes for the cadets to circulate the room and ask questions to the other cadets to try to find out whose card they have.
5. Have each cadet sit after they have found the person whose card they have and when the cadet with their card locates them.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-046501-0) Scannel, E., & Newstrom, J. (1998). *The Big Book of Presentation Games*. (pp. 23–24). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
BIRTHDAY LINE	**TIME**: 10 min

RESOURCES

- A large, open space free from obstacles, and
- Tape/rope (approximately 10 m [32 feet]).

ACTIVITY LAYOUT

- If using tape, tape two parallel lines 50 cm (20 inches) apart, each approximately 5 m (16 feet) long on the floor.
- If using rope, place two parallel lines 50 cm (20 inches) apart, each approximately 5 m (16 feet) long on the ground.

ACTIVITY INSTRUCTIONS

1. Have all the cadets stand side by side inside the two lines, without their feet touching them.
2. Tell the cadets to organize themselves in order of birthday without stepping outside or on the lines.
3. If completed quickly, have the cadets organize themselves again using different criteria (eg, height, shoe size, hair colour).

SAFETY

N/A.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (p. 57). New York, NY: McGraw-Hill Companies, Inc.

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
A COAT OF ARMS	**TIME**: 10 min

RESOURCES

- A large, open space,
- Coat of arms template (one per cadet),
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

Photocopy a coat of arms template for each cadet.

ACTIVITY INSTRUCTIONS

1. Distribute a coat of arms template and a pen/pencil to each cadet.
2. Have the cadets fill in their coat of arms by reading the following aloud, one at a time:
   (a) In Space 1, draw something that characterizes a recent peak performance.
   (b) In Space 2, sketch something about yourself that very few people know about.
   (c) In Space 3, draw a symbol of how you like to spend your free time.
   (d) In Space 4, represent something that you are very good at.
   (e) In Space 5, write or draw something that could be your personal motto.
3. When complete, use the remaining the time for the cadets to mingle with others to share their coat of arms.

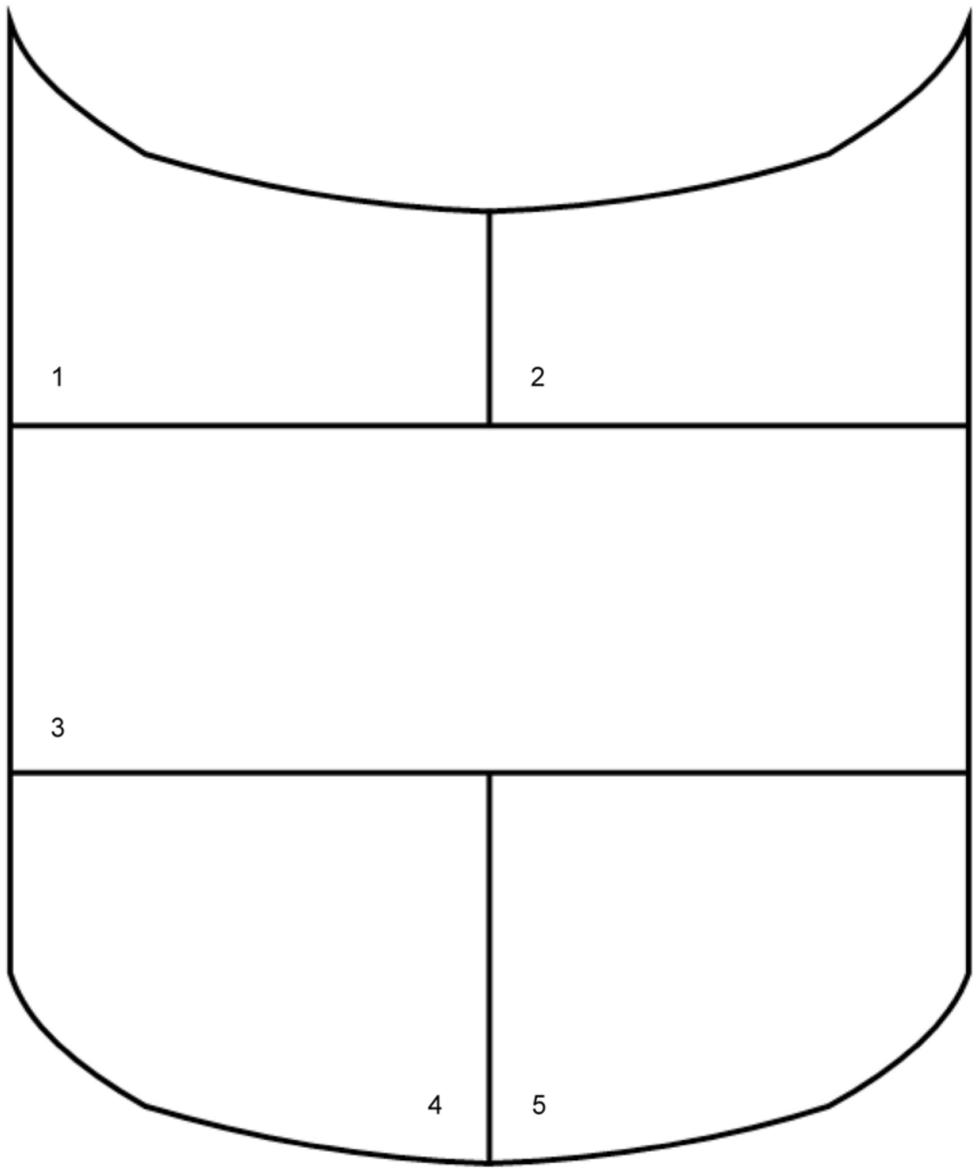
SAFETY

N/A.

REFERENCE

(ISBN 0-07-046513-4) Newstrom, J., & Scannel, E. (1998). *The Big Book of Team Building Games*. (pp. 77–79). New York, NY: McGraw-Hill.

COAT OF ARMS TEMPLATE



J. Newstrom & E. Scannel, The Big Book of Team Building Games, McGraw-Hill (p. 79)

Figure 3O-2 Coat of Arms Template

TEAM-BUILDING ACTIVITY	**ICEBREAKER**
MARTIAN NAMES	**TIME**: 10 min

RESOURCES

- A large, open space,
- Paper (one piece per cadet), and
- Pens/pencils (one per cadet).

ACTIVITY LAYOUT

Prepare your Martian name and meaning on a piece of paper.

ACTIVITY INSTRUCTIONS

1. Tell the following story:
   "Imagine you have just landed on Mars and need to introduce yourself to your Martian tour guide. Language on Mars is the complete reverse of ours. This means you must change your name so it is backward: last name first, first name last and both spelled backward, letter by letter. In addition, every name on Mars means something special and relates to the person who has that name. On your sheet of paper, write your name as it would appear on Mars. Practice pronouncing it. Think about what your Martian name means and be prepared to share it with the group."
2. Show the cadets your Martian name and meaning. For example, Sarah Jones becomes "Senoj Haras," which means "enjoys taking long trips and hiking with my friends" or Joshua Carew becomes "Werac Auhsoj," which means "warrior of the desert."
3. Distribute a piece of paper and a pen/pencil to each cadet and allow two minutes for the cadets to complete their Martian names.
4. Have the cadets share their Martian names with the group.

SAFETY

N/A.

REFERENCE

(ISBN 1-57542-265-4) MacGregor, M. (2008). *Teambuilding With Teens: Activities for Leadership, Decision Making and Group Success*. (pp. 8–9). Minneapolis, MN: Free Spirit Publishing, Inc.

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COMMUNICATION, PROBLEM-SOLVING AND TRUST-BUILDING

List of Activities for Annex P

TEAM-BUILDING ACTIVITY	COMMUNICATION
SNOWFLAKE	**TIME**: 15 min

RESOURCES

8-1/2 x 11 inch sheet of white paper (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a piece of paper to each cadet.
2. Explain that the cadets are to individually follow the directions you are about to give without asking questions or seeking clarification.
3. Give the following directions quickly, with no clarification:
   (a) Fold the paper in half and tear off a top corner.
   (b) Fold it in half again and tear off the top corner.
   (c) Fold it in half again and tear off the left corner.
   (d) Rotate the paper to the right three times and tear off the bottom corner.
   (e) Fold it in half again and tear off the middle piece.
4. Instruct the group to unfold their papers and compare their snowflakes with those around them. They will find that their snowflakes may or may not match others depending on how the instructions were understood.

SAFETY

N/A.

REFERENCE

(ISBN 1-57542-265-4) MacGregor, M. G. (2008). *Team-Building With Teens*. (pp. 67–68). Minneapolis, MN: Free Spirit Publishing Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
BACK-TO-BACK	**TIME**: 10–15 min

RESOURCES

- Paper,
- Pens/pencils (one per group), and
- Drawings (two per group).

ACTIVITY LAYOUT

Photocopy both drawings for each group.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs. Have each pair sit back to back.
2. Distribute a copy of Drawing 1, (Figure 3P-1), to one cadet from each pair. Distribute a piece of paper and pen/pencil to the other cadet.
3. On the signal to start, the cadet with the drawing is to guide their partner to draw the figure without letting them see the original. The cadets are to use symbols and metaphors to describe the drawing, but not geometrical shapes. For example, the cadet cannot say draw a square or circle.
4. Allow the cadets approximately five minutes to draw the figure. When the time is up, have the cadets compare the drawing to the original drawing.
5. Have the cadets reverse roles. Distribute a copy of Drawing 2, (Figure 3P-2), to the cadet who drew first and a piece of paper and a pen/pencil to the other cadet. Repeat Steps 3. and 4.

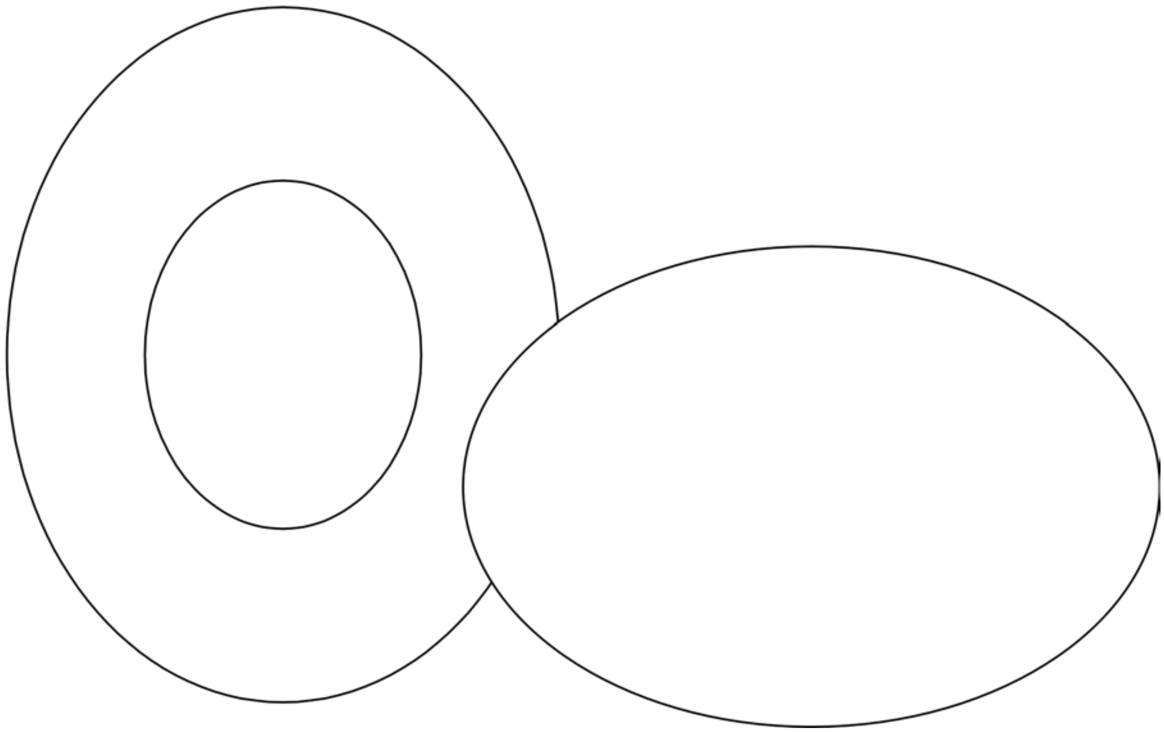
SAFETY

N/A.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 95–97). New York, NY: McGraw-Hill.

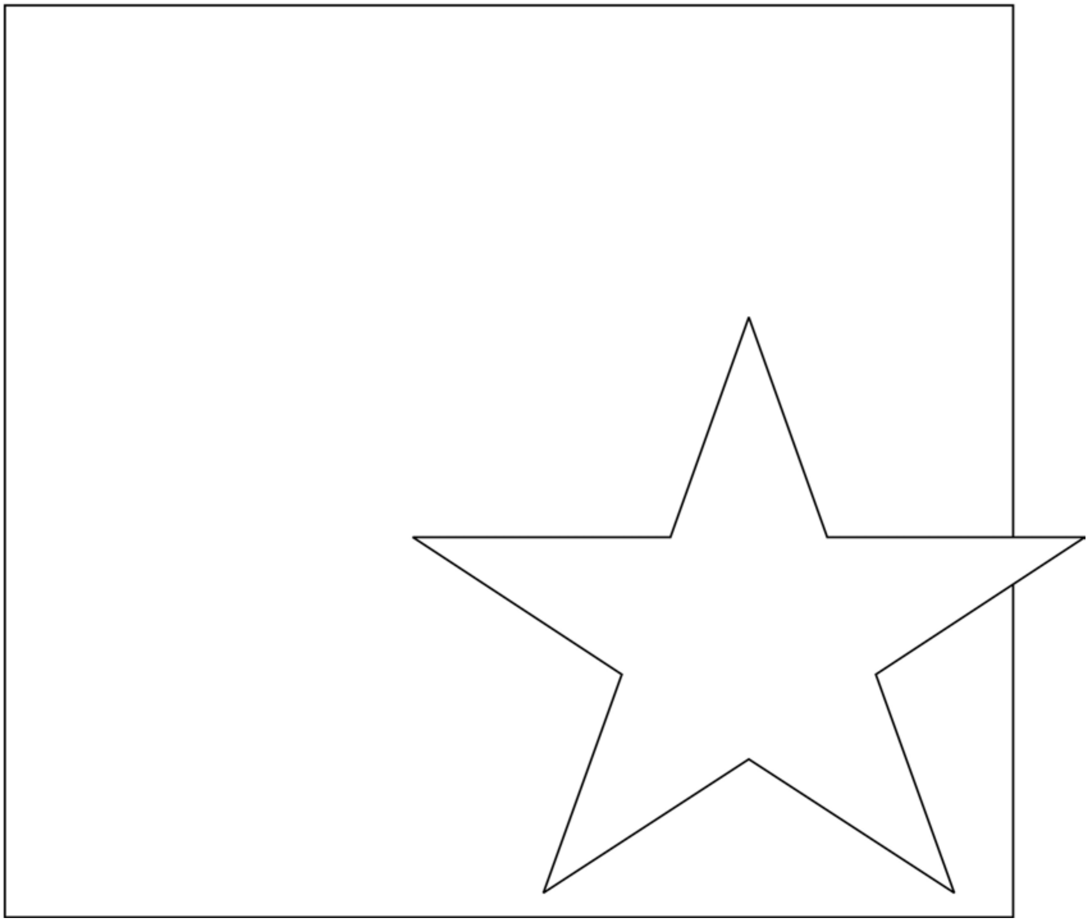
DRAWING 1



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-1 Drawing 1

DRAWING 2



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-2 Drawing 2

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
GROUP CONSTRUCTION	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Toothpicks/popsicle sticks/straws (10 per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets sit in a semicircle with their backs to the centre. Ensure they are spread out enough that they cannot see the toothpicks/popsicle sticks/straws of the cadets near them.
2. Inform the cadets that they are not allowed to speak or look at the other cadets' design throughout the activity.
3. Distribute 10 toothpicks/popsicle sticks/straws to each cadet, including yourself.
4. As the "construction manager" you will build a design on the floor one toothpick/popsicle stick/straw at a time.
5. After placing each toothpick/popsicle stick/straw on the ground, verbally guide the cadets to place their toothpicks/popsicle sticks/straws in the same position.
6. When you have placed all 10 toothpicks/popsicle sticks/straws into a design, the designs of the cadets' should mimic your design.
7. Upon completion of the activity, look at the cadets' designs to see how close they are to the original.

SAFETY

N/A.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (p. 54). Champaign, IL: Human Kinetics.

TEAM-BUILDING ACTIVITY **COMMUNICATION**

WHERE DO I GO? **TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles,
- Two small objects (eg, coins, paper clips, toothpicks, etc), and
- Blindfold.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Ask one cadet to volunteer to go first in the activity.
2. Have the remainder of the cadets sit in a circle approximately 3 m (10 feet) in diameter.
3. Blindfold the volunteer and have them stand in the middle of the circle.
4. Have a member of the group place the two small objects on the ground, inside the circle, close enough together that the volunteer can simultaneously cover one object with each foot.
5. On a start signal, each group member, one at a time, can give one direction to the volunteer (eg, “Move your left foot forward 6 inches.”).
6. Each member can give just one direction with the intent of getting the volunteer to cover one object with each foot.
7. As time permits, have more cadets volunteer to participate as the cadet in the middle of the circle.

SAFETY

Ensure cadets look out for the safety of the cadet in the centre of the circle.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (p. 58). Champaign, IL: Human Kinetics.

TEAM-BUILDING ACTIVITY **COMMUNICATION**

MISSING BUCKET **TIME**: 10–15 min

RESOURCES

- A large, flat and open space free from obstacles,
- Rope/pylons to mark boundaries,
- Blindfolds (one per every two cadets),
- 20 L (five gallon) bucket,
- 4 L (one gallon) jug,
- Plastic drinking cups (enough for half the cadets), and
- 8–10 objects to use as obstacles.

ACTIVITY LAYOUT

- Place the rope/pylons to create an area that is approximately 3.5 m (10–12 feet) wide and 7.5 m (25 feet) long.
- Set up obstacles throughout the course in a random pattern.
- Fill the 20 L (five gallon) bucket with water and place it at the start line.
- Place the empty 4 L (one gallon) container (the receiving container) at the finish line.
- Place the plastic drinking cups at the start line.

ACTIVITY INSTRUCTIONS

1. The goal of the activity is for a group of blindfolded cadets to be verbally led through the obstacle course by the non-blindfolded cadets while transferring water. The blindfolded cadets are to transfer the water in the bucket to the receiving container at the finish line without moving the buckets.
2. Cadets are to avoid the obstacles as they proceed through the course.
3. Non-blindfolded cadets are not allowed to touch the bucket, the receiving container or the drinking cups.
4. If anyone breaks a rule or steps on an obstacle, that cadet must return to the starting line without emptying their water into the receiving container.
5. The activity is complete when the receiving container is filled to the designated mark.

SAFETY

The cadets must ensure the safety of the blindfolded cadets at all times throughout this activity.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (pp. 126–127). Champaign, IL: Human Kinetics.

TEAM-BUILDING ACTIVITY — **COMMUNICATION**

CHARADE LINE — **TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

Create sample situations for the activity if you wish to use different ones than the samples given here.

ACTIVITY INSTRUCTIONS

1. Divide the cadets in two groups.
2. Have the first group come to the front (performance area) and the second group be the audience.
3. Explain the activity to the cadets, to include:
   (a) Line up facing the back of the cadet in front of you.
   (b) Act out a situation for the cadet in front of you without using any verbal communication.
   (c) That person will act out the situation for the next person in line and so forth down the line.
4. Have the group in the performance area line up with their backs to you. Tap the first cadet on the shoulder and have them turn around.
5. Act out a situation. For example, you may mime the following:
   (a) you walk in swinging a bag in your hand;
   (b) you pull up a chair and have a seat;
   (c) you take a fishing rod out of the bag and cast your line;
   (d) you pull in the line when you feel a tug on it;
   (e) you find a rubber boot on your line instead of a fish; and
   (f) you dump the water out of the boot, put it on your foot and leave.
6. That cadet then taps the next cadet, acts out the same situation and so forth down the line. Expect the situation being acted out to change as it passes through the line.
7. The group of cadets acting as the audience may laugh but not offer any advice or guidance.
8. Once the last cadet has observed the situation they should act it out for you and the initial cadet and the entire group should watch while you perform the original situation once more.
9. Have the groups reverse roles so the original audience becomes the actors and vice versa. Have the cadets repeat Steps 4.to 8. with a new situation. For example, you may mime the following:
   (a) you pull a lottery ticket out of your back pocket;
   (b) you pull out a chair and sit;
   (c) you pull a newspaper out of a bag;
   (d) you check the numbers on your lottery ticket with the numbers on the newspaper; and
   (e) you realize all the numbers match and jump up and down in amazement!

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 202–203). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
THE ROCK	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Small rock (must be small enough to be concealed in a fist).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle, facing the centre.
2. Have the cadets close their eyes and stand with both of their hands clenched behind their backs.
3. Explain that if they would like to be the cadet holding the rock, they must open one fist into a cupped position, ready to receive the rock. Cadets not wishing to hold the rock should remain with their hands clenched. Once a cadet receives the rock they are to clench their hand into a fist.
4. Walk around the circle, as quietly as possible and place the small rock into one of the open hands.
5. Continue around the circle to the point from which you started.
6. Have all cadets clench their hands, open their eyes and sit in the circle, keeping their hands clenched at all times.
7. Every person, including the one holding the rock, will have a chance to guess who is holding the rock.
8. After a minute of everyone looking around the circle, allow the group to start making guesses. There is to be no talking among the cadets.
9. Ask for a volunteer to guess first. If a cadet guesses wrong they are not allowed to guess again.
10. Each cadet is given an opportunity to make one guess until the rock holder is discovered.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp.189–190). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY **COMMUNICATION**

KING/QUEEN FROG **TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Poly spots/chairs (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets sit in a circle, facing the centre. Mark each position with spots or chairs.
2. Every cadet must have a unique action that represents an animal. For example:
   (a) a gorilla beating on their chest;
   (b) a monkey scratching their armpits;
   (c) a bird fluttering their wings;
   (d) a dog wagging their tail;
   (e) a cat grooming their face;
   (f) a snake slithering through the grass;
   (g) a penguin waddling;
   (h) an elephant raising their trunk;
   (i) a rabbit hopping;
   (j) a lobster moving their claws; or
   (k) a chicken clucking.
3. Go around the circle and have each cadet demonstrate their action. You may act as the King/Queen Frog or designate one cadet to hold this position. The action for the King/Queen Frog will be a frog leaping.
4. Each round will start with the King/Queen Frog. That cadet will perform their gesture and then the gesture of another cadet. This cadet must quickly do their action, followed by another cadet's action and so forth.
5. If a cadet is too slow, messes up the action or goes in the wrong sequence the game stops. This cadet will leave their spot and sit directly to the left of the King/Queen Frog. This causes everyone sitting to the right of this cadet to move one seat to the left to fill in the gap.
6. When a cadet moves seats, their action does not move with them, it stays with the seat!
7. The object of the game is to get into the royal throne. This occurs when the King/Queen Frog makes a mistake and everyone in the circle moves one seat to the left.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 182–183). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
MUTE LINEUP	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain to the group that from this point on they are all mute – no verbal communication is allowed. The cadets are also not to write anything down on paper, flip charts, etc.
2. Have the group line up in a straight line according to set criteria (eg, height, birth date, number of letters in their first/last name, etc).
3. Once the cadets think they are lined up in the correct order, have them sit to signify they are done.
4. Go through the lineup verbally to see if they were able to get in the correct sequence with non-verbal communication.
5. If time permits, have the group line up using different criteria to see if there were any lessons learned from the first attempt.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 145–146). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY **COMMUNICATION**

MARRIAGE **TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles, and
- Deck of playing cards (Joker included).

ACTIVITY LAYOUT

Based on the number of cadets in the group, pull out a card for each player. Ensure you have a card for each participant, including one Joker. The other cards must be pairs in the same colour and denomination (eg, three of hearts and three of diamonds, ten of spades and ten of clubs).

If there is an even number of cadets participating in the activity, exclude the Joker.

ACTIVITY INSTRUCTIONS

1. Each cadet is given a card and asked not to show it to anyone.
2. Explain that the cadets are to find the person in the room that has their matching card based on colour and denomination (eg, the queen of hearts would be looking for the queen of diamonds).
3. Explain that the cadets are not allowed to show their card at any time and are not allowed to say colours or numbers.
4. Have the cadets try to find their match. They may use words such as "I have a fire engine coloured card and like shiny objects in rings" to determine they have a red card that is a diamond.
5. When pairs think they have found each other they are to link arms and wait for the other participants to finish.
6. The Joker in the room is to do the same thing throughout the activity but will not be able to find their partner as there is only one Joker in the group leaving them as the unmarried card at the end of the activity.

SAFETY

N/A.

REFERENCE

(ISBN 0-7575-4094-5) Cummings, M. (2007). *Playing With a Full Deck: 52 Team Activities Using a Deck of Cards*. (p. 93). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
THAT AIN'T ME!	**TIME**: 10–15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Explain that each cadet will have to mime three things about themselves to their partner enabling their partner to later verbally introduce them to the remainder of the group.
3. The cadets are not allowed to use any form of verbal communication. Cadets should be given approximately three minutes to mime their information to their partner.
4. Cadets can mime things such as:
   (a) part-time jobs,
   (b) favourite school subject,
   (c) favourite hobby/pastime, and
   (d) favourite movie/television show.
5. Once everyone has had time to mime their information, gather the group. Each cadet will then have to verbally introduce their partner based on the information that was mimed.
6. If cadets introduce something that was misinterpreted from the mime, their partner should state, "That ain't me!". This activity is complete when all the cadets have introduced their partners.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 52–53). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
BLIND SHAPES	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Blindfolds (one per cadet), and
- Length of rope long enough for all cadets to hold on to at once.

ACTIVITY LAYOUT

Tie the end of the rope in a knot.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle and blindfold each of them.
2. Place the length of rope on the ground near the feet of the cadets. Explain that the first thing they will have to do is find the rope and pick it up. The cadets are allowed to verbally communicate throughout this activity.
3. Tell the cadets to form a square. After a few minutes, ask the cadets if they think they have formed the square. If they say no, allow them to continue, even if they already are in a square. If they say yes, allow them to remove their blindfolds and look at the shape they have formed.
4. Continue with other shapes (eg, triangles, rectangles, ovals, etc) as time allows.

SAFETY

Ensure the safety of all blindfolded cadets.

REFERENCE

(ISBN 0-7872-0107-3) (1995). *Youth Leadership in Action*. (pp. 63–64). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
WINK	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets sit in a circle facing the centre.
2. Explain that there is a mystery “winker” among the group, but not even that cadet knows who it is yet.
3. Have the cadets close their eyes. Secretly assign the “winker” by tapping them on the shoulder.
4. Explain that the cadets must mingle with all the others and greet each other. The “winker” will be secretly winking at cadets to get them out of the game.
5. Explain that the cadets must wait at least 10 seconds before sitting after they have been winked at by the “winker”. Cadets who have been winked at are to be seated while others continue to mingle.
6. If a cadet who is still in the game suspects someone of being the “winker,” they may raise a hand and announce, “I accuse”. Stop the proceedings and ask if there is a seconder, who is a second cadet who suspects they know who the “winker” may be. If there is no seconder the game will continue.
7. If a seconder speaks up, the facilitator is to count to three and each accuser must point directly to the person they believe is the “winker”. If they each point to a different person, regardless if one of them is correct, they are both out of the game. If they point to the same wrong person, they are both out of the game. If they are correct the activity is over.
8. The activity continues until either everyone is out or two people make a successful accusation.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 179–180). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
MINEFIELD	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Large quantity of small balls (eg, tennis balls, golf balls, ping pong balls, etc),
- Stopwatch, and
- Blindfolds (two).

ACTIVITY LAYOUT

- Place the balls around the floor in a random pattern.
- Mark off a start and a finish line.

ACTIVITY INSTRUCTIONS

1. Ask for two volunteers and blindfold them.
2. Divide the cadets in two groups. Have each group of cadets place themselves evenly throughout the "minefield". One group will be responsible for verbally guiding the first blindfolded cadet through the "minefield". The second group will be responsible for verbally guiding the second blindfolded cadet to try to tag the first blindfolded cadet.
3. Explain that the first blindfolded cadet will be the "sidewinder". This cadet is to aim for the finish line and will be verbally guided through the "minefield" by their group. If the "sidewinder" touches a "mine" (ball) on their way through the "minefield" they must swing both of their arms in a full circle 10 times, counting each revolution aloud.
4. One minute after the "sidewinder" is released into the minefield, launch the second blindfolded cadet, the "missile" into the "minefield". The "missile's" team is to guide them to try to tag the "sidewinder".
5. If the "missile" tags the "sidewinder" prior to them reaching the finish line, the mission is complete.

SAFETY

Ensure the safety of the blindfolded cadets at all times throughout the duration of the activity.

REFERENCE

(ISBN 0-8403-5682-X) Rohnke, K. (1984). *Silver Bullets: A Guide to Initiative Problems, Adventure Games and Trust Activities*. (p. 24). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
CATEGORIES TWIST	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of three.
2. Have each group go to a quiet area away from the other groups. Allow approximately four minutes for the group to come up with as many categories as possible of things they have in common – the odder the better (eg, they have all seen a zebra).
3. Each group will have to share three things with the rest of the group. One item should not be true.
4. Have everyone come back to a common meeting place in the room and sit.
5. Have each group, one at a time, come to the front and state their three commonalities with a straight face.
6. The remaining groups are to decide which commonality is not true. This activity will allow the cadets to start reading people's non-verbal communication skills.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 178). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**COMMUNICATION**
NEGOTIATION	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into three or four small groups (depending on the number of cadets).
2. Explain that each group will go to an area where the other groups can not see them and decide on a physical gesture that they will later have to reveal to the rest of the cadets. Examples of gestures may include:
   (a) waving their hands in the air;
   (b) jumping up and down;
   (c) performing jumping jacks;
   (d) flapping their arms like a bird;
   (e) spinning around in a circle; or
   (f) rubbing their stomachs while patting their heads.
3. After approximately three minutes, have each group come back to the centre of the training area, and stand in a position where every other group can seem them. Explain that the cadets are no longer allowed to use any verbal communication.
4. On the word “go” have every cadet in each group simultaneously demonstrate their group’s gesture for the remainder of the cadets.
5. Explain that the cadets are to now decide on one gesture among all the groups. Remember that the cadets are not allowed to communicate verbally throughout the remainder of this activity.
6. The goal is to see how many times it will take to get every group doing the same gesture without any verbal communication. The gesture may be one from of the groups or a combination of the gestures.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 150–151). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
MAGIC CARPET	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Piece of plastic or material approximately 1.2 m (4 feet) by 1.5 m (5 feet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain that everyone must stand on the magic carpet and that everyone must maintain contact with the magic carpet at all times throughout the activity.
2. Explain that the group is on a magic carpet ride high above the CSTC when suddenly you discover that you are travelling in the wrong direction because the magic carpet is upside down.
3. Have the cadets turn the magic carpet over without stepping off. Every cadet must maintain contact with the magic carpet at all times.

SAFETY

Ensure all cadets maintain contact with the magic carpet. This will prevent cadets from being picked up or carried on shoulders.

REFERENCE

(ISBN 0-7872-4532-1) Cain, J., & Jolliff, B. (1998). *Teamwork & Teamplay*. (pp. 125–126). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
RAFT	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Piece of tarp/plywood approximately 1.2 m (4 feet) by 1.2 m (4 feet) depending on the size of the group (should be just large enough for all of the cadets to fit on).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain to the cadets that their cruise ship has hit a reef and they are required to abandon ship.
2. Explain that there are a number of sharks in the water nearby and the group must all get aboard the life raft in order to be rescued by the Coast Guard. The rescue helicopter can only pick them up if no one is in the water (touching the ground) for at least 20 seconds.
3. The objective is for all the cadets to remain on the life raft for at least 20 seconds in order for the rescue helicopter to come to the rescue.
4. Have the cadets participate in the activity.

SAFETY

Ensure the safety of all cadets while on the raft.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 113–115). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
MOONWALK	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Hula hoops (minimum of eight), and
- Large rubber bands or pieces of soft fabric (one per every two cadets).

ACTIVITY LAYOUT

Place eight or more hula hoops randomly on the ground no more than a foot apart.

ACTIVITY INSTRUCTIONS

1. Have the cadets assemble on one end of the hula hoops. Place the rubber bands around their ankles, connecting them to each other so that the cadets have to move together as a team.
2. Explain that they must move from one hoop to the next without stepping outside.
3. Explain that if someone steps outside a hoop the team must go back to the start and begin again, attempting to communicate and decide how to best move through the hula hoops.
4. The goal is for the cadets to communicate and problem solve the best method of travelling through the hula hoops from the beginning to the end.
5. Have the cadets participate in the activity.

SAFETY

Ensure the rubber bands are large enough not to be too tight on the cadets' ankles.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 123–124). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
BALANCE BEAM	**TIME**: 15 min

RESOURCES

- A large, open space on grass or soft ground,
- 3 m (10 feet) plank of wood approximately 5 cm (2 inches) thick and 20 cm (8 inches) wide,
- Cinder block,
- Surveyor's tape, and
- Eggs (as per Step 2. in Activity Instructions).

ACTIVITY LAYOUT

- Set up the plank of wood so it is balanced in the middle on the cinder block.
- Mark a "V" on the ground in front of the cinder block with the surveyor's tape (as illustrated in Figure 3P-3).

ACTIVITY INSTRUCTIONS

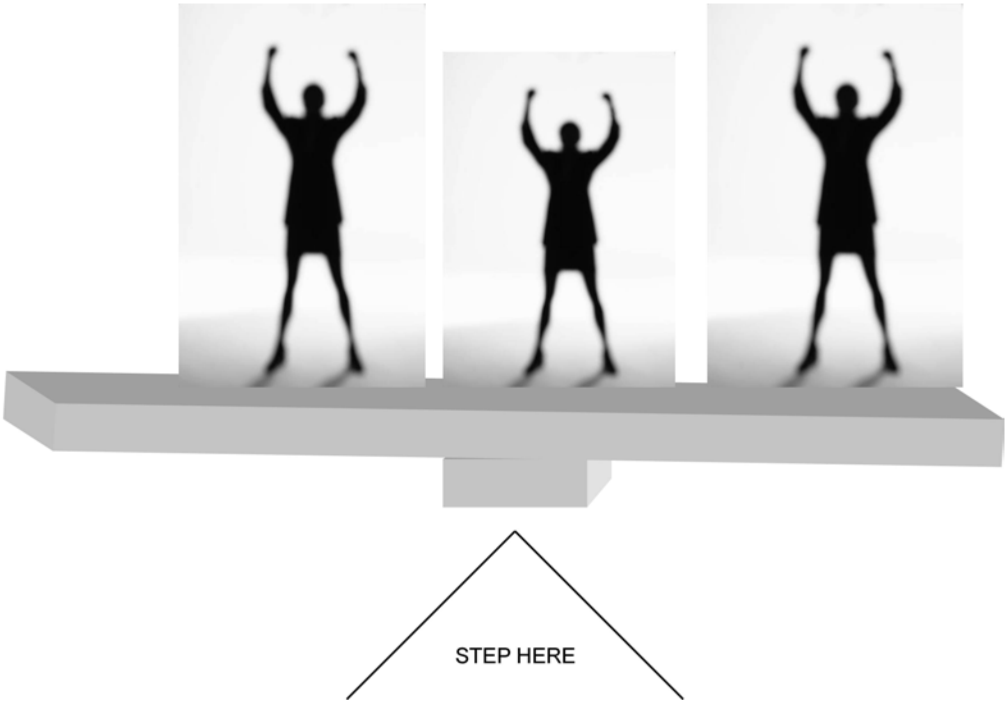
1. Stand on the plank while you brief the team. Demonstrate how a slight shift in weight causes the plank to turn into a see-saw.
2. Explain that all of the cadets are to mount the plank, one at a time, from between the "V" marked on the ground, balance the plank as a group for a minimum of 10 seconds, and dismount, one at a time, between the "V" without causing either end of the plank to touch the ground – an egg can be laid under each end to ensure the plank has not touched the ground on either end.
3. Allow the cadets approximately five minutes to plan a strategy. Explain that once the cadets begin to mount the plank, there will be no more verbal communication.
4. The activity is complete when all of the cadets have successfully stepped off the plank into the "V".

SAFETY

- Ensure the activity is set up on grass or soft ground. In situations where this is not possible, have gym mats set up on either side of the plank.
- Have one or two assistant instructors to spot the cadets on the plank.
- Caution the cadets that if they are about to lose their balance they should step off the plank to avoid causing other cadets to fall or jump.
- Ensure the cadets do not jump off the plank as it could cause it to spin.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 125–128). New York, NY: McGraw-Hill.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-3 Balance Beam Set-Up

TEAM-BUILDING ACTIVITY **PROBLEM-SOLVING**

GROUP SEARCH **TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Masking tape/long piece of cloth (approximately 1.2 m [4 feet] long),
- Blindfolds (one per every two cadets),
- Stopwatch, and
- Three small toys/objects that will fit in a hand (eg, plastic dinosaur, plastic boat, plastic plane, plastic tank, doll, ball, etc).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups.
2. Show the first group the three objects they will have to find.
3. Explain that the group, together as a team, will have to find the three objects while blindfolded.
4. Put masking tape or a long piece of cloth around the first group to attach them together.
5. Blindfold the first group of cadets.
6. Place the objects at various places on the ground within approximately 9 m (30 feet) of their location.
7. Have the cadets' move to find the three objects with the verbal assistance of the second group. It is the cadets' goal to decide how best to move about the area without breaking the tape/cloth or removing their blindfolds.
8. As the cadets find each object they are to identify what it is to the leader.
9. Have the groups reverse roles and repeat Steps 2. to 8.
10. Time both groups to see which group found and identified all three objects faster.

SAFETY

Ensure the safety of the cadets who are blindfolded and attached to their team. The cadets in the other group should be watching out for any safety concerns and alerting the blindfolded cadets.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 133–134). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
TRAFFIC JAM	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Tape or pieces of cardboard/plywood (there should be one more space than the number of cadets).

ACTIVITY LAYOUT

- Mark spaces on the ground (as illustrated in Figure 3P-4) with tape or pieces of cardboard/plywood (there should be one more space than the number of cadets).
- Mark the centre space with an “X” (as illustrated in Figure 3P-4).

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two equal groups.
2. Have each group stand on a space facing the middle space.
3. Explain that the group is to attempt to move past each other so that the group to the right of the ‘X’ ends up on the left and vice versa.
4. Explain the following rules:
   (a) Cadets are not allowed to move around someone facing the same direction as them.
   (b) Cadets are not allowed to move backwards around someone.
   (c) Cadets are allowed to step forward onto an empty space.
   (d) Cadets are allowed to step around someone facing them into an empty space.
5. The activity is complete when all cadets have successfully changed sides.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 149–150). New York, NY: McGraw-Hill.

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-4 Traffic Jam Set-Up

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
CIRCLE WARS	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- 15 rope circles of varying sizes between 0.3–1 m (1–3 feet) in diameter.

ACTIVITY LAYOUT

Place the circles on the ground approximately 0.3–1 m (1–3 feet) apart from each other.

ACTIVITY INSTRUCTIONS

1. Explain to the cadets that they are to put both of their feet entirely in a circle. More than one cadet can put their feet in a circle at a time.
2. On the word “change” have the cadets, when possible, move to another circle and put their feet entirely in that circle.
3. After each time you say “change”, casually pick up one or two of the circles. This will cause the cadets to move faster as circles disappear.
4. Once you get down to the last one or two circles, remind the cadets that they are not allowed to move them. Remind them that it is problem-solving initiative and they are to work with what they have in order to develop possible solutions.
5. This activity is complete when the cadets all have their feet in the last circle.

SAFETY

N/A.

REFERENCE

(ISBN 0-07-059532-1) Snow, H. (1997). *Indoor/Outdoor Team-Building Games for Trainers*. (pp. 163–165). New York, NY: McGraw-Hill.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
UNTYING KNOTS	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- Soft cloth ropes approximately 2.5 m (8 feet) long (one per every cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a circle approximately 3 m (10 feet) in diameter.
2. Have every cadet hold a piece of rope in their right hand.
3. Explain that the cadets must join their free hand with the ropes of other cadets in the circle. Explain that the cadets are not to hold the rope of a cadet standing next to them.
4. This process continues until all cadets are holding a piece of rope in each hand and are joined to the rope in one cadet's right hand and a different cadet's left hand. This will create a knot in the cadets through the ropes (much like a human knot).
5. Have the cadets untie the knot the ropes have created using the following rules:
   (a) cadets are not allowed to let go of their ropes or change hands with the ropes;
   (b) cadets are to communicate and move around to untie the knot to form a connected circle; and
   (c) cadets may end up facing outward from the circle.

SAFETY

N/A.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (pp. 56–57). Champaign, IL: Human Kinetics.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
STEPPING STONES	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles, and
- One base (eg, pieces of cardboard/plywood/tape) per cadet plus one extra.

ACTIVITY LAYOUT

Place each base/tape mark in a straight line approximately 30–38 cm (12–15 inches) apart.

ACTIVITY INSTRUCTIONS

1. Have the cadets stand in a specified order of their choosing, on a base each.
2. Have the cadets determine where the extra base goes.
3. The objective is for the team to end up standing in reverse order from their starting position.
4. The following rules apply:
   (a) Only one person may touch a base at a time.
   (b) When moving bases, a cadet may move in either direction to a neighbouring base.
   (c) Cadets may move to a new base only if it is empty.
   (d) The bases cannot be moved.
   (e) Cadets are not allowed to touch the ground during the activity.
   (f) If any one cadet breaks a rule, the entire group must start the task over.

SAFETY

Secure the bases to the ground or use tape so that the bases do not move.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (pp. 106–107). Champaign, IL: Human Kinetics.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
SWAMP TRAIL	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Twelve 30-cm (12-inch) bases (eg, cardboard/poly spots/tape),
- Tape, and
- Six beanbags.

ACTIVITY LAYOUT

- Designate a start and finish line approximately 4.5 m (15 feet) apart (the swamp is the area in between the two lines).
- Place the bases in two parallel lines between the start and finish lines.
- Place a beanbag at various distances, between 0.5–1.5 m (2–4 feet) away from bases 2, 3, 5, 7, 9 and 10 (as illustrated in Figure 3P-5).

ACTIVITY INSTRUCTIONS

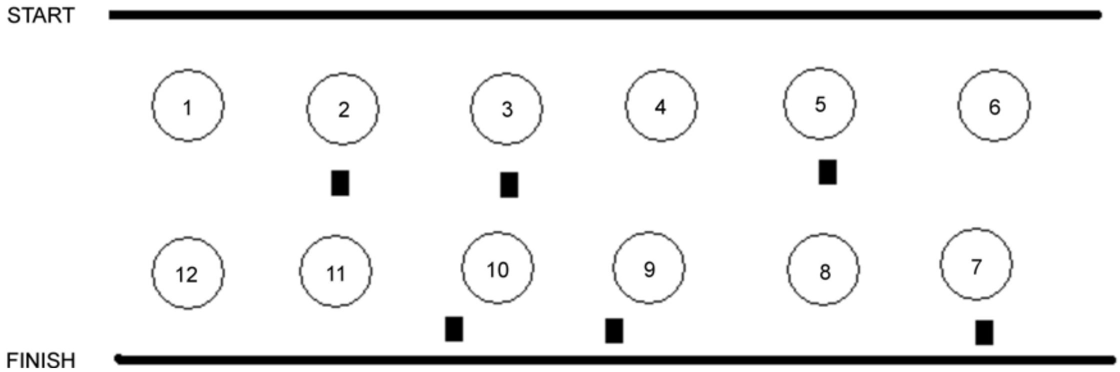
1. Explain to the cadets that they must cross a swamp as a team, holding hands along the way. Each cadet must make it to the other side without stepping into the swamp or letting go of their team members' hands.
2. Explain that along the way, the cadets are to pick up the beanbags.
3. The following rules apply:
   (a) The team must hold hands for the duration of the activity.
   (b) A cadet who is attempting to pick up a beanbag may let go of their team member's hand but must rejoin hands before moving to a new base.
   (c) No one may touch the swamp during the trip through to the other side.
   (d) Each cadet is permitted to pick up and carry only one beanbag.
4. Have the cadets participate in the activity.

SAFETY

- Ensure the bases are secured to the ground or tape is used so that there is no chance of them slipping.
- Each cadet must ensure the safety of their fellow team members as they cross the swamp.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (pp. 166–167). Champaign, IL: Human Kinetics.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-5 Swamp Trail Set-Up

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
HUMAN KNOT	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets form a tight circle facing the centre, raise their arms in the air and grasp the hands of two different cadets. The cadets should not be holding hands with the cadets directly on either side of them.
2. Have the cadets untangle themselves without letting go of the other cadets' hands.
3. The activity is complete when the cadets have untied the knot and formed a circle.

SAFETY

The cadets are to ensure the safety of their team members at all times throughout the duration of this activity.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 165–166). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY **PROBLEM-SOLVING**

SPIDER'S WEB **TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Poles/trees to tie the spider's web on,
- Rope/twine/para cord (approximately 15 m [50 feet] long), and
- Gym mats (approximately four)/soft ground (eg, grass/sand).

ACTIVITY LAYOUT

Create a spider's web between two poles/trees on soft ground or place gym mats around the area to be used (as illustrated in Figure 3P-6). The spider's web should have more openings than there are number of people. The openings must be shapes and sizes that the cadets can pass through with some ease.

ACTIVITY INSTRUCTIONS

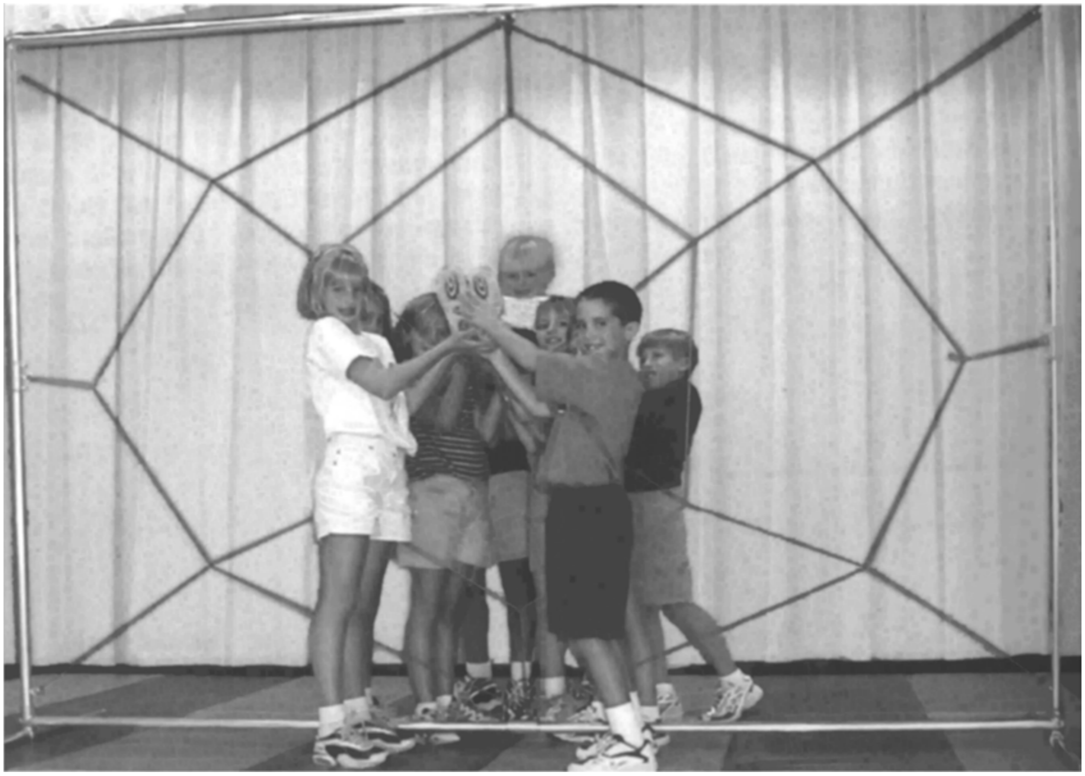
1. Explain that each cadet must pass through a different opening in the spider's web until all cadets have passed from one side to the other.
2. Explain that no cadet may touch the web with any part of the body.
3. The cadets may reach through the web to assist a team member but may not touch the web.
4. Have the cadets participate in the activity.
5. If a cadet touches the web or passes through an opening that another team member has already passed through, that cadet and an already successful team member must go back and attempt the task again.
6. The activity is complete when the entire team has passed successfully through the spider's web to the other side.

SAFETY

- Cadets are not permitted to dive through the openings.
- The cadets must ensure the safety of their team members at all times throughout this activity.

REFERENCE

(ISBN 0-7360-5088-4) Midura, D. W., & Glover, D. R. (2005). *Essentials of Team Building*. (pp. 154–155). Champaign, IL: Human Kinetics.



D. W. Midura, & D. R Glover, Essentials of Team Building, Human Kinetics (p. 154)

Figure 3P-6 Spider Web Set-Up

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
CIRCLE CLAP	**TIME**: 10–15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Explain that the objective of this activity is for everyone to simultaneously clap hands with the person next to them.
2. Have the cadets form a circle. Choose a cadet to begin and have each cadet clap once in succession.
3. Next, have the cadets attempt to make one solitary clap, all clapping in unison.
4. Once they have achieved this, have the cadets attempt to make one solitary clap – the catch being they cannot clap their own hands together. The cadets must clap their hands with the hands of the cadets on either side of them.
5. This activity is complete when the cadets have successfully made one solitary clap by clapping the hands of the cadets on both sides of them.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 155–156). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
QUICK SHUFFLE	**TIME**: 10–15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups. The cadets should not be evenly divided (eg, if there are 10 cadets, divide them into a group of seven and a group of three).
2. Have the larger group stand in one line, side by side, in front of the smaller group. Note the order of the larger group as a reference at the end of the activity.
3. Have the smaller group look at the lineup of cadets for approximately 10 seconds. Then have the cadets close their eyes until directed to open them. While these cadets have their eyes closed, have the larger group quietly shuffle their positions within the lineup.
4. Tell the smaller group to open their eyes and try to put the lineup back into their original configuration.
5. This activity is complete when the cadets have been put into their original configuration.
6. If the cadets complete this activity quickly, rearrange the groups and repeat Steps 1. to 5.

SAFETY

N/A.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (p. 147). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
TALL TOWER	**TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles, and
- Supplies for each group to build a tower (eg, paper, raw spaghetti noodles, marshmallows, toothpicks, straws, paper clips, paper cups, chewing gum, tape, etc).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of two to four cadets.
2. Distribute an equal amount of the supplies to each group.
3. Explain to each group that they are to build the tallest tower they can using only the supplies given to them.
4. Allow the groups approximately seven minutes to build their towers. Have each group display their tower for the other groups.
5. Determine which group has the tallest tower.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 92–93). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
SWAMP CROSSING	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Pieces of cardboard about 30 cm (12 inches) square (two fewer pieces than there are cadets), and
- Three 2-L plastic jugs with lids, and
- Water.

ACTIVITY LAYOUT

- Fill the plastic jugs with water and put the lids on them.
- Designate the start and finish lines for the swamp and place the plastic jugs at the finish.

ACTIVITY INSTRUCTIONS

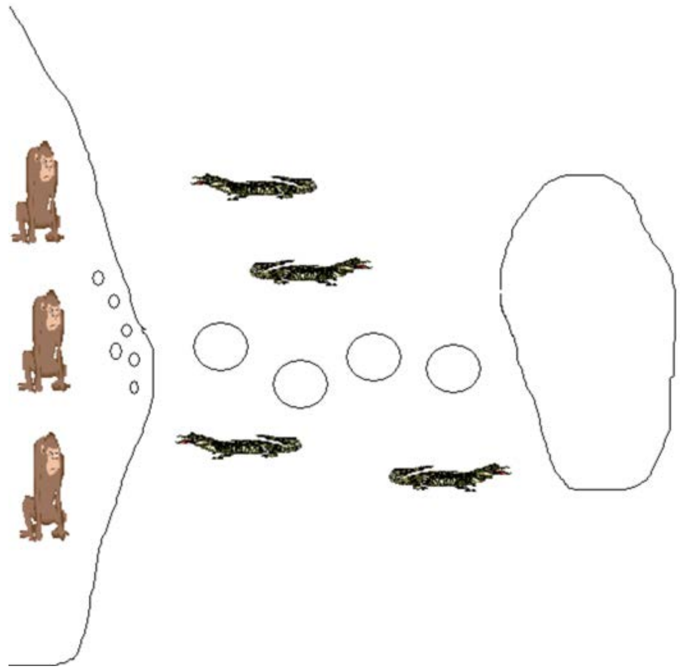
1. Tell the cadets the following story:
   "Your group is stranded on an island and you need fresh water. The only water is in jugs on the other side of the salt-water, alligator-infested swamp. You must go and get it. You must do this as a group because the island gorillas are on the other side and are protective of their water but are afraid of a large group. You may use these special floating stepping stones (give them one or two fewer pieces of cardboard than there are cadets) that you can move across the water. The stones may be moved only by being picked up and set back down. You may not slide them because this will cause them to sink into the swamp."
2. Explain that the cadets may not make a bridge with the stones but must move the last one to the front in order to advance through the swamp.
3. Have the cadets cross the swamp, get the jugs of water and return safely to the start of the swamp with the jugs.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 104–105). Richland, WA: Rec Room Publishing.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-7 Swamp Crossing Set-Up

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
WATER TRANSFER	**TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles,
- Four old bicycle tire inner tubes/three hula hoops,
- Chalk/tape,
- Two large coffee cans, and
- Water.

ACTIVITY LAYOUT

- In a large, open area draw/tape a circle on the ground that is approximately 4.5 m (15 feet) in diameter.
- Place one large coffee can, half-filled with water, in the centre of the circle.

ACTIVITY INSTRUCTIONS

1. Explain to the cadets that they are to get the can of water out of the circle without spilling any of the water.
2. Give the cadets either four old bicycle inner tubes or three hula hoops.
3. Explain that the following rules apply:
   (a) Cadets are not allowed to cross into the circle with any part of their body.
   (b) The extra coffee can may be used for practice before moving the coffee can holding the water.
   (c) Once the cadets have retrieved the can of water they are to pour it into the empty can without the two cans touching.
4. Have the cadets participate in the activity.
5. This activity is complete when the cadets have successfully retrieved the can with water out of the circle and poured it into the second can without spilling any water.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 114–115). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
EGG CONSTRUCTION	**TIME**: 15 min

RESOURCES

- Raw eggs (one per group), and
- Supplies to build an egg protection cover (eg, straws, tape, paper, popsicle sticks, glue, etc).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups.
2. Distribute a raw egg and an equal amount of supplies to each group.
3. Have the cadets build an egg protection cover for their egg which will be dropped from a height of at least 2 m (6 feet).
4. Explain that once each group has their covers built they are to gather as a complete group and drop their eggs to see if they break or are protected.
5. Have the groups drop their eggs, one group at a time, to see if they are adequately protected.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (p. 116). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**PROBLEM-SOLVING**
WATER CARRY	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Ten paper cups,
- Cafeteria-style tray, and
- Water, and
- Paper towels/mop.

ACTIVITY LAYOUT

- Fill the 10 paper cups with water, about three-quarters full.
- Place five paper cups at one end of the space and five at the opposite end (the space should be a minimum of 4.5 m [15 feet] apart).
- Place the cafeteria-style tray in the middle of the area (as illustrated in Figure 3P-8).
- Have an extra jug of water to refill cups and paper towel or a mop to clean up spills.

ACTIVITY INSTRUCTIONS

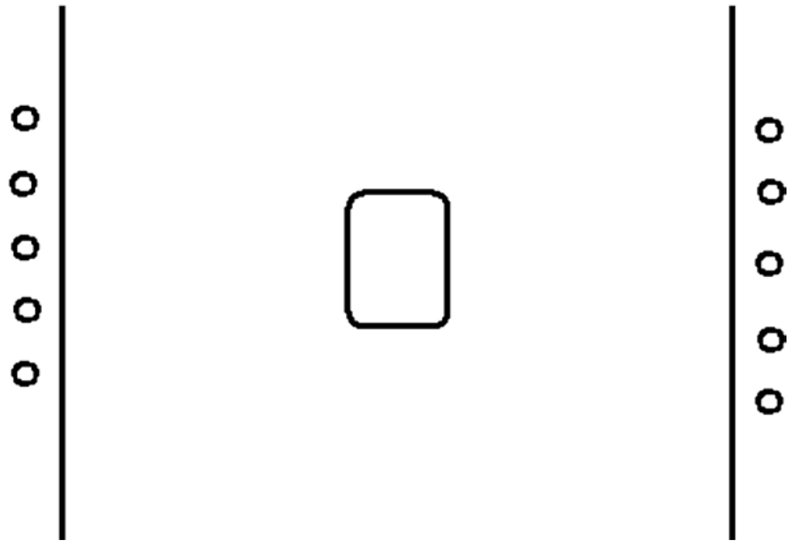
1. Explain that the cadets are to start in the middle of the space where the cafeteria-style tray is placed.
2. Have the cadets retrieve all 10 cups and place them onto the tray without spilling any of the water. The following rules apply:
   (a) Cadets may only get one cup at a time.
   (b) Before getting a second cup from that side of the room, the cadets must travel to the other side of the room with the tray and retrieve a cup from that side.
   (c) When cadets have retrieved all 10 cups of water, they are to place the tray on the floor in the centre of the space.
   (d) Each cadet can only use one foot and one hand for the duration of this activity.
3. Explain that if any water is spilled the whole group must start over.
4. This activity is complete when the 10 cups have been successfully placed on the tray in the centre of the space.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 146–147). Richland, WA: Rec Room Publishing.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 3P-8 Water Carry Set-Up

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
CRAZY MAZE	**TIME**: 15 min

RESOURCES

- A large, open space,
- Chairs (minimum of 10),
- Yarn, string or thin rope (approximately 15 m [50 feet] long) for each group, and
- Blindfolds (two).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two groups.
2. Distribute a minimum of five chairs and yarn, string or thin rope to each group.
3. Have the two groups go to separate parts of the training area.
4. Have each group create a maze with the chairs and yarn, string or rope, with as many twists and turns as possible and perhaps even some dead ends along the way.
5. Once each group has completed their maze, have a blindfolded volunteer from each group walk through the other group's maze. The mazes will be completed one at a time.
6. The blindfolded cadet will be verbally led through the maze by their group. Members of the group that constructed the maze may try to confuse the cadet by giving opposing directions. At no time may the groups touch the blindfolded cadet to help them through the maze.

SAFETY

The cadets must ensure the safety of the blindfolded cadets at all times throughout this activity.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 136–137). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
EVERYBODY UP	**TIME**: 15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs (the first time this activity is done it may be best to try to pair the cadets by size).
2. Have the cadets sit in two straight lines, facing their partners, with the soles of their shoes pressed against their partner's shoes.
3. Have the cadets grab their partner's hands.
4. On your count, have the cadets try to pull each other up to a standing position without letting go of each other's hands.
5. If time allows, the cadets can switch partners and attempt this activity with a new partner of a different size.

SAFETY

The cadets must ensure the safety of their partners at all times throughout this activity by maintaining a solid grasp of one another and staff members must supervise carefully to ensure proper procedures are being followed.

REFERENCE

(ISBN 0-7872-0107-3) (1995). *Youth Leadership in Action*. (pp. 86–87). Dubuque, IA: Kendall/Hunt Publishing Company.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
SLICE & DICE	**TIME**: 10–15 min

RESOURCES

A large, open space free from obstacles.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets line up in two separate lines facing each other approximately 1–1.5 m (3.5–5 feet) apart.
2. Select a volunteer to be the first walker.
3. Explain that upon starting the activity the cadets in the lines should start to swing their arms full stretch in front of them in a chopping motion, bringing the arms up and down in succession (as illustrated in Figure 3P-9). This activity should be started slowly and may pick up speed as the cadets get used to the motion.
4. Have the walker walk through the line of swinging arms at a steady pace.
5. As time allows, have as many walkers go through the line as possible.

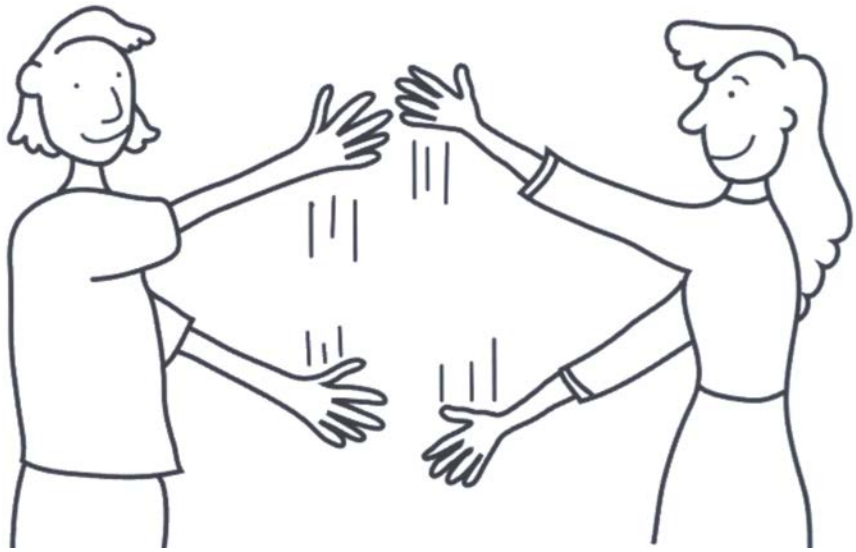
SAFETY

Explain the following safety considerations to the group:

- Members swinging their arms are to ensure they do not touch the walker.
- Walkers are to ensure they keep their eyes open.
- Walkers are to ensure they keep a steady pace while walking through the lines.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 136–137). Beverly, MA: Project Adventure, Inc.



M. Collard, No Props: Great Games With No Equipment, Project Adventure, Inc (p. 136)

Figure 3P-9 Slice and Dice

TEAM-BUILDING ACTIVITY **TRUST-BUILDING**

HOG CALL **TIME**: 10–15 min

RESOURCES

- A large, open space free from obstacles, and
- Blindfolds (one per cadet).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets form two lines facing each other. The cadets facing each other will become partners. If there is an odd number, form one group of three.
2. Assign each group a matching set of words from the following list (or have cadets quickly come up with their own set of appropriate words):
   (a) peanut-butter,
   (b) Coca-Cola,
   (c) salt-pepper,
   (d) bubble-gum,
   (e) french-fry,
   (f) Ken-Barbie,
   (g) Power-Rangers,
   (h) Batman-Robin,
   (i) snap-crackle-pop, and
   (j) Larry-Curly-Moe.
3. Have each line move to opposite ends of the training space. Have each group turn away from the other and blindfold all of the cadets. Each group of cadets will mix themselves up among the other participants.
4. On a signal, have the cadets start the activity by shouting their partner's word. For example, if your word was peanut, you would shout "butter" and your partner would shout "peanut" until you found each other.
5. Once partners find each other have them sit together and remove their blindfolds until all cadets have found their partners.

SAFETY

All cadets are asked to place their hands in front of their torso with palms facing forward and elbows tucked in to avoid running into anything. The cadets are to move around the space cautiously to avoid running into anyone or anything.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 126–127). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
HUG A TREE	**TIME**: 15 min

RESOURCES

- A large, open space (preferably outdoors with lots of obstacles), and
- Blindfolds (one per two cadets).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Blindfold one partner at a time and have the other cadet verbally guide them to an object that is at least 40–50 m (130–160 feet) away from the point from which they started.
3. Once led to the object (eg, a distinctive tree, fallen log, rock, etc) have the blindfolded cadet spend up to one minute getting acquainted with the object. The cadet should be encouraged to feel and smell the object.
4. Have the cadet who is not blindfolded guide the blindfolded cadet back to the starting point – preferably not using a direct line.
5. Upon arriving back at the starting point remove the blindfold.
6. Have the cadet who was blindfolded attempt to find the object that they were introduced to while they were blindfolded. Have their partner accompany them while they attempt to find the object but should not offer them any clues.
7. As time allows, have the cadets reverse roles.

SAFETY

The cadet who is not blindfolded is to ensure the safety of the blindfolded cadet at all times throughout this activity.

REFERENCE

(ISBN 0-934387-05-2) Collard, M. (2005). *No Props: Great Games With No Equipment*. (pp. 122–123). Beverly, MA: Project Adventure, Inc.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
BLINDFOLD BUILD	**TIME**: 15 min

RESOURCES

- A large, open space free from obstacles,
- Blindfolds (one per two cadets), and
- Building blocks (minimum 40).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two even groups. Blindfold the cadets from one group.
2. Use the building blocks to build a structure with half of the blocks while the non-blindfolded cadets watch. Give them one minute to study the structure.
3. Hide the structure and scatter the other half of the pieces around the space.
4. Have the non-blindfolded cadets guide the blindfolded cadets to build the same structure. The non-blindfolded cadets must not touch any building blocks.
5. Once the structure is complete, have the cadets remove their blindfolds. Inform the group how close they were to the original.
6. As time allows, have the cadets reverse roles.

SAFETY

N/A.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 66–67). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
LIGHTHOUSE	**TIME**: 10–15 min

RESOURCES

- A large, open space,
- Various obstacles (eg, desks, chairs, boxes, crates, pylons, etc),
- Blindfold, and
- Pieces of wrapped candy (one piece per lighthouse).

ACTIVITY LAYOUT

Set up obstacles around the training area.

ACTIVITY INSTRUCTIONS

1. Have one cadet volunteer to be the "cargo ship". Blindfold this cadet.
2. Have three or four cadets stand at various points among the obstacles. These cadets will be the "lighthouses".
3. Give the "cargo ship" three or four pieces of the wrapped candy.
4. Explain that the job of each "lighthouse" is to guide the "cargo ship" through the rough waters (obstacle course) so the cargo (wrapped candy) can be delivered to each "lighthouse" safely.
5. Have the "lighthouse" closest to the start point verbally guide the "cargo ship" safely to their "lighthouse". If successful, the "cargo ship" should deliver the cargo (a piece of candy) to that person.
6. Have each "lighthouse" guide the "cargo ship" to them in succession as the "cargo ship" makes their way through the rough water (obstacles).
7. The only "lighthouse" allowed to give directions at a given time is the one the "cargo ship" is headed toward. If the "cargo ship" is in danger of crashing into an obstacle the guiding lighthouse does not receive their shipment of cargo. As well if the "lighthouse" is unable to successfully guide them to the "lighthouse" and the "cargo ship" passes by, they do not receive their shipment of cargo and the next "lighthouse" takes over the directions.
8. As time allows, have the cadets change positions and assume different roles.

SAFETY

The cadets acting as lighthouses are to ensure the safety of the cargo ship throughout the activity.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 88–89). Richland, WA: Rec Room Publishing.

TEAM-BUILDING ACTIVITY	**TRUST-BUILDING**
TRUST TAG	**TIME**: 15 min

RESOURCES

- A large, open space free of obstacles, and
- Blindfolds (one per two cadets).

ACTIVITY LAYOUT

Mark off a playing area.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs. Blindfold one cadet from each pair.
2. Designate one pair to be “it”.
3. Have the blindfolded cadets play a game of tag while their partners verbally guide them through the game. The cadets are to walk for this activity, not run. The non-blindfolded cadet of the team who is “it” must attempt to guide their partner to tag someone. The non-blindfolded cadets of the other partners must attempt to guide their partners away from the cadet who is “it”.
4. Halfway through the time, have the cadets reverse roles.

SAFETY

- The cadets who are not blindfolded are to ensure the safety of the blindfolded cadets at all times throughout this activity.
- Cadets are not permitted to run.

REFERENCE

(ISBN 0-9662341-6-2) Jones, A. (1999). *Team-Building Activities for Every Group*. (pp. 102–103). Richland, WA: Rec Room Publishing.

TEAM-BUILDING PLANNING GUIDE

TEAM-BUILDING ACTIVITY **Type: _______________** **Name of Activity: _____________________** **TIME: ___ minutes**
QUESTIONS TO THE INSTRUCTOR
TIME APPRECIATION **Introduction:** **Conduct of Activity:** **Debriefing:**
ACTIVITY LAYOUT
ACTIVITY INSTRUCTIONS
SAFETY
DEBRIEFING QUESTIONS

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SELF-ASSESSMENT FORM – LEAD A TEAM-BUILDING ACTIVITY

1. How did you feel after leading a team-building activity?

____

____

____

____

2. How did you feel about the teamwork among the members? How did this affect your experience in leading the activity?

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____

____

3. Which aspects did you feel went well while leading the activity? Which aspects did you feel did not go so well? Why?

____

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____

4. What would you do differently given another opportunity lead a team-building activity?

____

____

____

____

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OUTLINE FOR DELIVERING A PRESENTATION ABOUT A LEADER

Use the information and techniques discussed from PO 309 (Deliver a Lesson, Chapter 9) while delivering this presentation.

This presentation is another opportunity to practice presentation skills.

This presentation is to be no less than 7 minutes and no more than 10 minutes long. Notes may be used to deliver this presentation. Presentation aids may be used during the delivery of the presentation (eg, whiteboard/flip chart/OHP/multimedia projector/handouts).

This presentation will not be evaluated for delivery or content, however each cadet should do their best.

Introduction

- Name of the leader,
- Date and place of birth,
- Date of death (if applicable),
- Display a picture of the leader (if available), and
- Information about the childhood of the leader.

Body

- Interesting points of the leader's career, to include:
  - positions of responsibility (if applicable), and
  - incidents where they used their influence,
- How and where the core leadership qualities were displayed by the leader, and
- Other interesting facts about the leader.

Conclusion

- Why you chose this leader,
- Three questions to ensure confirmation of the presentation, and
- A final summary sentence about the leader.

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CHAPTER 4

PO X04 – TRACK PARTICIPATION IN PHYSICAL ACTIVITIES

COMMON TRAINING

ALL TRAINING LEVELS

INSTRUCTIONAL GUIDE
PERSONAL FITNESS
AND HEALTHY LIVING

PO X04 – TRACK PARTICIPATION IN PHYSICAL ACTIVITIES

Total Time:

For the following EOs, refer to the lesson specifications located in A-CR-CCP-801/PG-001, *Royal Canadian Air Cadets Proficiency Level One Qualification Standard and Plan*:

- CX04.01 – Participate in the Cadet Fitness Assessment and Identify Strategies for Improving Personal Physical Fitness,
- CX04.03 – Participate in a Cooking Class,
- CX04.04 – Attend a Personal Fitness and Healthy Living Presentation, and
- CX04.05 – Attend a Local Amateur Sporting Event.

For the following EOs, refer to the instructional guides located in A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Proficiency Level One Instructional Guides*:

- MX04.01 – Participate in 60 Minutes of Moderate- to Vigorous-Intensity Physical Activity (MVPA) and Track Participation in Physical Activities,
- MX04.02 – Identify Strategies to Improve Participation in Physical Activities and Participate in the Cadet Fitness Assessment,
- MX04.03 – Participate in the Cadet Fitness Assessment and Identify Strategies for Improving Personal Physical Fitness, and
- CX04.02 – Participate in Activities that Reinforce the Three Components of Physical Fitness.

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CHAPTER 5

PO X05 – PARTICIPATE IN PHYSICAL ACTIVITIES

COMMON TRAINING

ALL TRAINING LEVELS

INSTRUCTIONAL GUIDE
PHYSICAL ACTIVITIES

PO X05 – PARTICIPATE IN PHYSICAL ACTIVITIES

Total Time:

For the following EOs, refer to the instructional guides located in A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Proficiency Level One Instructional Guides*:

- MX05.01 – Participate in Physical Activities,
- CX05.01 – Participate in Physical Activities, and
- CX05.02 – Participate in a Tournament.

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CHAPTER 6

PO 306 – FIRE THE CADET AIR RIFLE DURING RECREATIONAL MARKSMANSHIP

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M306.01 – PARTICIPATE IN A RECREATIONAL MARKSMANSHIP ACTIVITY

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content, unit range standing orders, and become familiar with the material prior to delivering the lesson.

Photocopy the targets located at Annexes B to J as required.

Construct a range IAW A-CR-CCP-177/PT-001, *Canadian Cadet Movement: Cadet Marksmanship Program Reference Manual*.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow the cadet to experience recreational marksmanship in a safe and controlled environment. This activity contributes to the development of marksmanship skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

The review for this lesson will be from EO M106.02 (Carry Out Safety Precautions on the Cadet Air Rifle, A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Level One – Instructional Guides*, Chapter 6, Section 2).

QUESTIONS

Q1. Why do we follow safety regulations?

Q2. How would you verify the safety catch is ON?

Q3. What are the four "ACTS" of firearm safety?

ANTICIPATED ANSWERS

A1. We follow safety regulations to prevent accidents with the cadet air rifle.

A2. When the safety is ON, no red can be seen.

A3. The mnemonic “ACTS” stands for:

- Assume every firearm is loaded.
- Control the muzzle direction at all times.
- Trigger finger must be kept off the trigger and out of the trigger guard.
- See that the firearm is unloaded (prove it safe).

OBJECTIVES

By the end of this lesson the cadet shall have participated in a recreational marksmanship activity.

IMPORTANCE

It is important for cadets to participate in a recreational marksmanship activity because it allows them to experience marksmanship in a fun, dynamic and safe setting.

Teaching Point 1	**Supervise the Participation of the Cadet in a Recreational Marksmanship Activity**
Time: 80 min	Method: Practical Activity

A range briefing is conducted to pass on vital information and answer any questions the cadets may have prior to participating in a marksmanship activity. The range briefing is required to ensure the safe execution of a marksmanship activity.

CONDUCT A RANGE BRIEFING

1. Explain pertinent sections of the local range standing orders.
2. Review general rules observed on all ranges, to include:
   (a) proving that rifles are safe prior to being picked up, handed to or received from another person;
   (b) never pointing rifles at people;
   (c) inserting safety rods into the barrels of rifles when not in use on the range;
   (d) never horseplaying on a range;
   (e) always pointing rifles down range; and
   (f) following the Range Safety Officer’s (RSO) directions and orders at all times.

Review range commands with an explanation and demonstration for each command.

All loading/firing is to be simulated.

3. Review commands used on an air rifle range (as illustrated in Figure 6-1-1).

COMMAND	ACTION TO BE TAKEN
Cover Off Your Firing Point	Stand up, move behind the firing point and await further commands.
Place Your Equipment Down and Stand Back	Lay the equipment down on the mat and stand back when finished.
Adopt the Prone position	Adopt the prone position, pick up the rifle, ready the equipment and put on hearing and eye protection.
Type of Firing (GRIT)	GRIT is the acronym for: 1. Group (relay), 2. Range (distance), 3. Indication (number of rounds), and 4. Type (grouping, scored).
Relay, Load	1. Pick up and hold the rifle with the dominant hand. 2. Ensure the safety catch is in the “ON” position. 3. Pump the rifle, observing a three second pause. 4. Load a pellet (flat end forward). 5. Close the bolt.
Relay, Fire	1. Place the safety catch in the “OFF” position. 2. Aim the rifle at the target. 3. Squeeze the trigger. 4. Open the bolt. 5. Repeat the following sequence for each shot: (a) Pump the rifle, observing a three second pause. (b) Load a pellet (flat end forward). (c) Close the bolt. (d) Aim the rifle at the target. (e) Squeeze the trigger. (f) Open the bolt. 6. Place the safety in the “ON” position. 7. Partially open the pump lever. 8. Lay down the rifle.

Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 6-1-1 Air Rifle Range Commands

4. Describe the layout of the air rifle range.

5. Review hand-washing procedures on completion of firing. This is important because each time a person handles pellets, a small trace of lead is left on their hands. To decrease the risk of lead poisoning, it is important that all persons wash their hands thoroughly after handling pellets.

ACTIVITY

OBJECTIVE

The objective of this activity is to provide the cadet the opportunity to participate in a recreational marksmanship activity.

RESOURCES

- Cadet air rifle (one per firing lane),
- Cadet air rifle sling (one per cadet),
- Air rifle pellets,
- Target frame,
- Suitable target,
- Shooting mat,
- Safety glasses/goggles, and
- Pen/pencil.

Additional resources required for specific marksmanship activities may be found in the Annexes.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Brief cadets on safety rules or any other guidelines pertaining to the activity.
2. Divide the cadets into relays according to the number of firing lanes.
3. Conduct a recreational marksmanship activity, choosing from the following categories:
    (a) classification (see Annex A),
    (b) fun activities (see Annexes B to E),
    (c) timed activities (see Annexes F to H), or
    (d) competitive team/individual activities (see Annexes I to J).

If EO C306.03 (Adopt the Standing Position With the Cadet Air Rifle, Section 4) has been taught prior to this marksmanship activity, this EO may be conducted in the standing position.

SAFETY

Range activities will be conducted IAW A-CR-CCP-177/PT-001.

END OF LESSON CONFIRMATION

The cadets' participation in the activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Marksmanship is a fun and exciting activity that requires personal discipline and teamwork skills. This activity has also developed into highly competitive levels at the provincial, regional, and national levels.

INSTRUCTOR NOTES/REMARKS

Hand-washing stations must be available for cleanup after the activity is completed.

Cadets may fire in the standing position if they have previously received the training during C306.03 (Adopt the Standing Position With the Cadet Air Rifle, Section 4).

REFERENCES

A0-027 A-CR-CCP-177/PT-001 Director Cadets 3. (2005). *Canadian Cadet Movement: Cadet Marksmanship Program Reference Manual*. Ottawa, ON: Department of National Defence.

A0-041 Director Cadets 4. (2007). CATO 14-41, *Marksmanship, Rifles and Ammunition*. Ottawa ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO C306.01 – IDENTIFY CIVILIAN MARKSMANSHIP ORGANIZATIONS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CPP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Consult the Internet or local telephone directory to identify the national, provincial and local civilian marksmanship organizations applicable to the squadron.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadet to opportunities available to enhance their marksmanship training with civilian organizations.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified opportunities to enhance their marksmanship training with civilian organizations.

IMPORTANCE

It is important for the cadets to identify local civilian marksmanship organizations and understand that the activities available through these organizations are personal and not supported by the Cadet Program. Civilian marksmanship organizations assist people who are interested in marksmanship.

Teaching Point 1 — **Discuss Local Civilian Marksmanship Organizations**

Time: 5 min — Method: Interactive Lecture

Inform the cadets of a local civilian marksmanship organization and identify available activities and requirements for membership.

Civilian marksmanship organizations and rifle associations are popular throughout the world and are found in many countries. Traditionally formed to augment the military, marksmanship organizations now have become governing bodies for civilians interested in marksmanship.

Local civilian marksmanship organizations exist in most major cities in Canada. These organizations can include the city or regional rifle associations or local rod and gun clubs. These organizations usually have a small calibre rifle range available for their members' use. To find local civilian marksmanship organizations, refer to the Internet or the local telephone listings.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why were civilian marksmanship organizations traditionally formed?

Q2. What are some examples of these organizations?

Q3. How would you find some organizations in your area?

ANTICIPATED ANSWERS

A1. They were traditionally formed to augment the military.

A2. City or regional rifle associations or local rod and gun clubs.

A3. Refer to the internet or local telephone listings.

Teaching Point 2 — **Discuss the Applicable Provincial Rifle Organizations**

Time: 10 min — Method: Interactive Lecture

PROVINCIAL RIFLE ORGANIZATIONS

Select the rifle association for the province in which the cadet squadron is located.

Civilian marksmanship organizations assist people interested in marksmanship to advance their skills in marksmanship. These activities are not supported by the Cadet Program.

Provincial rifle associations are the provinces' governing bodies on fullbore and smallbore target shooting. These associations exist to promote marksmanship within the province by organizing events and competitions. Provincial rifle associations also provide competitions for cadet units within their province. Provincial associations include:

Alberta Provincial Rifle Association. The Alberta Provincial Rifle Association (APRA) was created in 1902, as the Territorial Rifle Association, before the Province of Alberta was created. The objectives of the APRA are:

- to promote in every lawful way the interests of small arms marksmanship in the Province of Alberta;
- to promote annual prize meetings for individuals and teams and to offer prizes for skill in shooting;
- to encourage the establishment and maintenance of suitable ranges through legislation and private means;
- to assist in the formation of shooting clubs; and
- to create public interest for the encouragement of small arms shooting both as a sport and as a necessary means of national defence;

The APRA can be found on the Internet at www.albertarifle.com

British Columbia Rifle Association. The British Columbia Rifle Association (BCRA) was created in 1874, incorporated in 1910, and is one of the oldest members of the British Columbia Societies Act. The objectives of the BCRA are:

- to create a public sentiment for the encouragement of small arms shooting as a sport; and
- the control and safe handling of firearms and as a necessary part of national defence.

Through the Department of National Defence, members are permitted to participate in shooting events held on military rifle ranges in British Columbia.

The BCRA can be found on the Internet at www.bcrifle.org

Manitoba Provincial Rifle Association. The Manitoba Provincial Rifle Association Inc. (MPRA) was created in 1872, for the purpose of encouraging rifle shooting among the militia and citizens of Manitoba. The objectives of the MPRA are:

- to enhance the perception of shooting as a sport by encouraging and supporting all athletes involved in shooting to achieve their maximum performance levels; and
- to promote safe firearms handling.

> The Honourable D.A. Smith (Lord Strathcona) was a patron of the MPRA for 40 years. He took an interest in shooting and donated many prizes, especially to cadets.

The MPRA can be found on the Internet at www.manitobarifle.ca

Newfoundland Provincial Rifle Association. The Newfoundland Provincial Rifle Association can be contacted through the Dominion of Canada Rifle Association (DCRA).

Nova Scotia Rifle Association. The Nova Scotia Rifle Association (NSRA) was created in 1861, and is the oldest provincial rifle association. The objectives of the NSRA are:

- to foster the safe and responsible use of firearms, and
- to develop marksmanship skills.

The NSRA can be found on the Internet at www.nsrifle.org

Ontario Provincial Rifle Association. The Ontario Provincial Rifle Association (ORA) was created in 1868. The objectives of the ORA are:

- to provide opportunities for shooting with different types of rifles; and
- offer programs for marksman from beginner to world class.

The ORA can be found on the Internet at www.ontariorifleassociation.org

Prince Edward Island Rifle Association. The Prince Edward Island Rifle Association can be contacted through the DCRA.

Province of Quebec Rifle Association. The Province of Quebec Rifle Association (PQRA) was created in 1869 and supports various shooting clubs and associations. The objective of the PQRA is to teach and promote marksmanship in competitive and recreational environments, where safety is first and foremost.

The PQRA can be found on the Internet at www.pqra.org

Royal New Brunswick Rifle Association. The Royal New Brunswick Rifle Association (RNBRA) was created in 1866 to serve all shooting and related disciplines in New Brunswick. The objectives of the RNBRA are to promote:

- good sportsmanship,
- safe, efficient and practical arms handling, and
- good marksmanship by civilians, civic police and the military.

The RNBRA can be found on the Internet at www.rnbra.ca

Saskatchewan Provincial Rifle Association. The Saskatchewan Provincial Rifle Association (SPRA) is the governing body for fullbore target rifle shooting in Saskatchewan. The objectives of the SPRA are to promote:

- the pursuit of excellence in marksmanship; and
- the safe and responsible handling of firearms.

The SPRA can be found on the Internet at www.saskrifle.ca

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the objective of provincial rifle associations?

Q2. How do these rifle associations meet this objective?

Q3. How do these associations support the cadet movement?

ANTICIPATED ANSWERS

A1. To promote marksmanship within the province.

A2. By organizing marksmanship events and competitions.

A3. By providing competitions for cadet units within their province.

Teaching Point 3	**Discuss National Marksmanship Organizations**
Time: 5 min	Method: Interactive Lecture

NATIONAL MARKSMANSHIP ORGANIZATIONS

The DCRA

The DCRA, headquartered at Connaught Ranges Primary Training Centre, Ottawa, Ont., is Canada's national governing body for fullbore and smallbore target shooting. The DCRA was founded in 1868 and incorporated by parliament in 1890, to encourage marksmanship training in response to the departure of the British military and the Fenian Raids in 1866.

> The Fenian Raids were attacks on British targets in Canada between 1866 and 1871, to pressure Britain to withdraw from Ireland. Most of the raids were successfully repelled by British forces and local militias.

The DCRA continues to promote excellence in civilian and military marksmanship.

The DCRA works with the CCM by organizing events and competitions including postal championships held for cadet units across the country and summer matches for the National Rifle Team (NRT) and Canadian and British army cadets on CSTC courses at Connaught NACSTC.

The DCRA can be found on the internet at www.dcra.ca

> Section One of the DCRA postal championships are matches that are restricted to sea, army and air cadets. Section Two is open to any junior team and cadets are encouraged to enter.

The Shooting Federation of Canada (SFC)

The SFC, headquartered at Connaught Ranges Primary Training Centre, Ottawa, Ont., is Canada's national sport governing body for recreational and competitive target shooting in Canada. The SFC is the authority for the marksmanship technical training portion of the National Coaching Certification Program (NCCP).

The SFC can be found on the internet at www.sfc-ftc.ca

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are the two National Marksmanship Organizations in Canada?

Q2. How does the DCRA work with the NRT?

Q3. How does the DCRA work with cadet units across Canada?

ANTICIPATED ANSWERS

A1. The Dominion of Canada Rifle Association and the Shooting Federation of Canada.

A2. The DCRA works with the NRT by organizing events and competitions during the summer.

A3. The DCRA conducts postal matches held for cadet units across the country.

Teaching Point 4	Identify the Applicable National/Provincial Biathlon Organizations
Time: 5 min	Method: Interactive Lecture

BIATHLON CANADA

Biathlon Canada is the governing body for the sport of biathlon within Canada. Biathlon Canada organizes many events, competitions and programs, including the Biathlon Bears Program, which is a community program, offered across Canada. The Biathlon Bears program is open to novices and the training is tailored to the athlete's skill level. This program offers training to develop both skiing and marksmanship skills. As skills are learned and mastered, the biathlete progresses to the next Biathlon Bear level.

PROVINCIAL AND TERRITORIAL BIATHLON ORGANIZATIONS

Divisions of Biathlon Canada are located within many of the provinces and territories. These division offices run training and offer support to the local resorts/clubs. These divisions include:

- Biathlon Alberta,
- Biathlon British Columbia,
- Biathlon Manitoba,
- Biathlon New Brunswick,
- Biathlon Nova Scotia,
- Biathlon Newfoundland and Labrador,
- Biathlon Ontario,
- Biathlon Quebec,
- Biathlon Saskatchewan,
- Biathlon Yukon, and
- Northwest Territories Biathlon.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What organization is the governing body for the sport of biathlon within Canada?

Q2. What community biathlon program is offered across Canada?

Q3. What are the objectives of the provincial and territorial organizations?

ANTICIPATED ANSWERS

A1. Biathlon Canada is the governing body within Canada.

A2. Biathlon Bears is offered across Canada.

A3. To run training and offer support to the local resorts/clubs.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the Canadian national marksmanship organizations?

Q2. What marksmanship organizations are in your province/territory?

Q3. Which of these organizations is your cadet squadron active with?

ANTICIPATED ANSWERS

A1. The DCRA, SFC and Biathlon Canada.

A2. Answers will vary by province/territory.

A3. Answers will depend on cadet squadron.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Identifying opportunities with civilian marksmanship organizations, one will know where they can acquire additional marksmanship training that is not supported by the Cadet Program. The opportunities provided by these organizations could enhance one's sense of accomplishment through improved marksmanship skills and allow them to choose activities in which they would like to participate.

INSTRUCTOR NOTES/REMARKS

Have the cadets identify only the applicable national, provincial and local marksmanship organizations.

REFERENCES

A0-119 Shooting Federation of Canada. (2007). *Shooting Federation of Canada*. Retrieved November 2, 2007, from www.sfc-ftc.ca/document.cfm?sectionID=39.

C0-149 Biathlon Canada. (2005). *Biathlon Bears: Community Coaching*. Ottawa, ON: Biathlon

C2-086 Dominion of Canada Rifle Association. (2007). *History*. Retrieved October 4, 2007, from www.dcra.ca/history.htm.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C306.02 – CORRECT MARKSMANSHIP ERROR

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy Annexes K and L for each cadet.

Photocopy the answer key located at Annex M for the instructor and assistant instructors.

Set up a mock firing point.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 to 3 to give an overview of the theories and the practice of adjusting sights.

A practical activity was chosen for TP 4 as it is an interactive way to introduce and allow cadets to experience adjusting sights on the cadet air rifle in a controlled environment. This activity contributes to the development of sight adjustment skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet is expected to correct marksmanship error by adjusting elevation and windage on the cadet air rifle.

IMPORTANCE

It is important for the cadets to learn how to correct marksmanship error in order to zero the cadet air rifle when participating in a marksmanship activity. A zeroed rifle will give the marksman the assurance that the centre of the target is properly aligned with the cadet and their rifle. Having a zeroed rifle and knowing how to zero a rifle is important to every marksman in order to achieve a higher score in application activities.

Teaching Point 1	**Explain Centring the Group**
Time: 10 min	Method: Interactive Lecture

THE THEORY OF A GROUP

When a series of three or more shots are fired from the same point of aim, they will seldom pass through the same point on the target. The pattern that is produced from the shot holes in the target is called a group.

Factors Affecting the Group

There are three factors that affect the shape and size of the group:

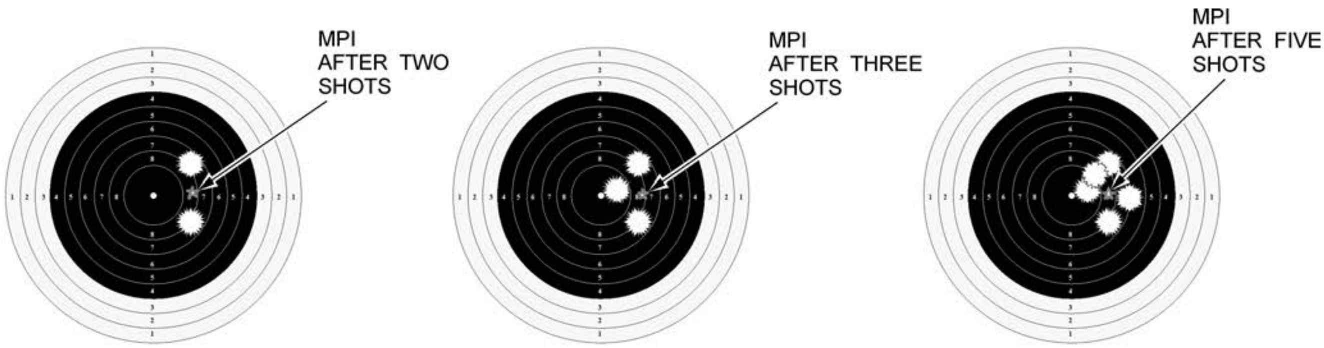
- **The Ammunition.** Even though every pellet is manufactured to be exactly the same, slight variations in each pellet will result in slight variations in results when firing. The number of pellets used will also affect the group size.
- **The Rifle.** Each rifle will fire a pellet with its own slight variation due to small differences in the barrel and firing mechanisms.
- **The Marksman.** Factors associated with the marksman's aiming, holding, breathing and follow-through techniques will affect each shot.

MEAN POINT OF IMPACT (MPI)

Ensure the handout located at Annex K is passed out to the cadets during this portion of the lesson to allow the cadets to see how the MPI moves as more pellets are shot into the target.

The MPI is the point on the target which is the average centre between all shots on the target. As each shot is fired, the MPI changes as the group develops. To centre the group correctly, corrections should be based on the MPI.

To determine the MPI, each shot must be evaluated. It takes at least two shots for an MPI to be determined. For two shots, the MPI will be the point centred between the two shots. After firing three shots, the MPI will change so that the MPI is centred between all three shots (as illustrated in Figure 6-3-1).



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 6-3-1 MPI Examples

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Define the term group.

Q2. What are the three factors that affect the size and shape of the group?

Q3. What is the definition of MPI?

ANTICIPATED ANSWERS

A1. The pattern that is produced from the shot holes in a target.

A2. The three factors that affect the shape and size of the group:

- the ammunition,
- the rifle, and
- the marksman.

A3. The MPI is the point on the target which is the average centre between all shots on the target.

Teaching Point 2	**Explain Sight Adjustment**
Time: 10 min	Method: Interactive Lecture

THE PURPOSE OF SIGHT ADJUSTMENT

Sight adjustment is used to ensure that the rifle is zeroed to the marksman. Sight adjustment will not make up for poor marksmanship skills, but may aid the proficient marksman in aligning their grouping to a target. There are two different ways a sight can be adjusted in order to zero the rifle: the windage and the elevation.

ELEVATION

Elevation affects the pellet by moving its vertical position, which moves the point of impact up or down the target. It compensates for the trajectory drop of the pellet.

WINDAGE

Windage affects the pellet by moving its horizontal position, which moves the point of impact left or right. It compensates for the direction and force of the wind on the pellet.

A ZEROED CADET AIR RIFLE

A zeroed cadet air rifle is accurate for a particular marksman at a particular position and distance from the target. A zeroed cadet air rifle has a particular sight setting that will be perfectly aimed, by putting pellets directly into the centre of the target.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the purpose of adjusting the sights on a rifle?

Q2. What does the elevation adjustment refer to?

Q3. What does the windage adjustment refer to?

ANTICIPATED ANSWERS

A1. Sight adjustment is used to ensure the rifle is zeroed to the marksman.

A2. Elevation adjustment refers to the adjustment required to compensate for the trajectory drop of the pellet.

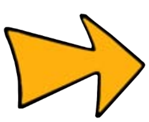
A3. Windage adjustment refers to the adjustment required to compensate for the direction and force of the wind on the pellet.

Teaching Point 3	**Explain the Increments of Sight Adjustment**
Time: 5 min	Method: Interactive Lecture

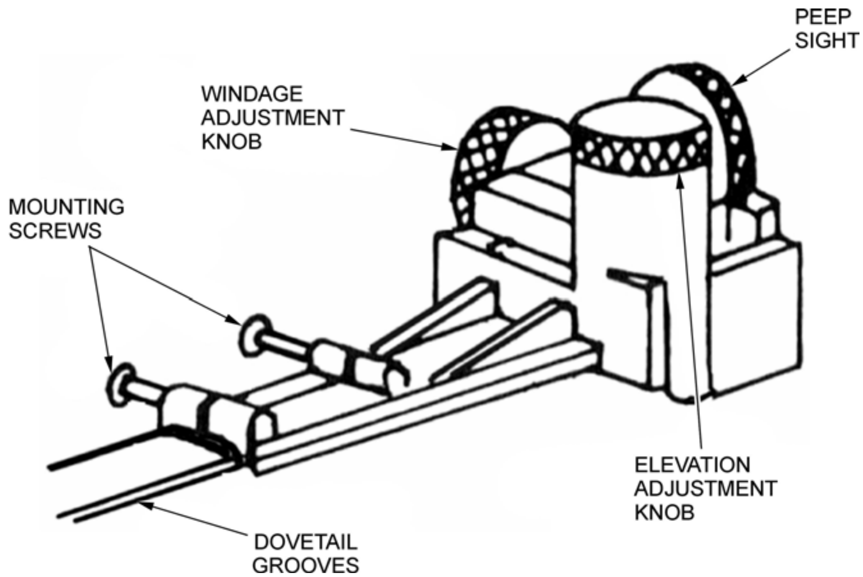
Ensure the cadets have a cadet air rifle in front of them during this portion of the lesson in order to see the actual sight of the cadet air rifle and the means in which it functions.

SIGHT ADJUSTMENT OF THE CADET AIR RIFLE

Sight adjustment of the cadet air rifle is achieved by turning the knobs of the rear sight. The elevation adjustment knob is found on the top of the rear sight and the windage elevation knob is found on the right-hand side of the rear sight. They are used to move the MPI of the shot either left or right and up or down. The adjustment of these knobs is measured in clicks that can be felt as the knob is turned. It takes three clicks to move the point of impact approximately one pellet width in any direction.



At a distance of 10 m, each click equals approximately a 1.219 mm shift of the MPI.



Daisy Outdoor Products, AVANTI Competition Pellet Rifle: Operation Manual: AVANTI Legend Model 853, Daisy Outdoor Products (p. 6)

Figure 6-3-2 Rear Sight of the Cadet Air Rifle

LOWERING AND RAISING THE ELEVATION

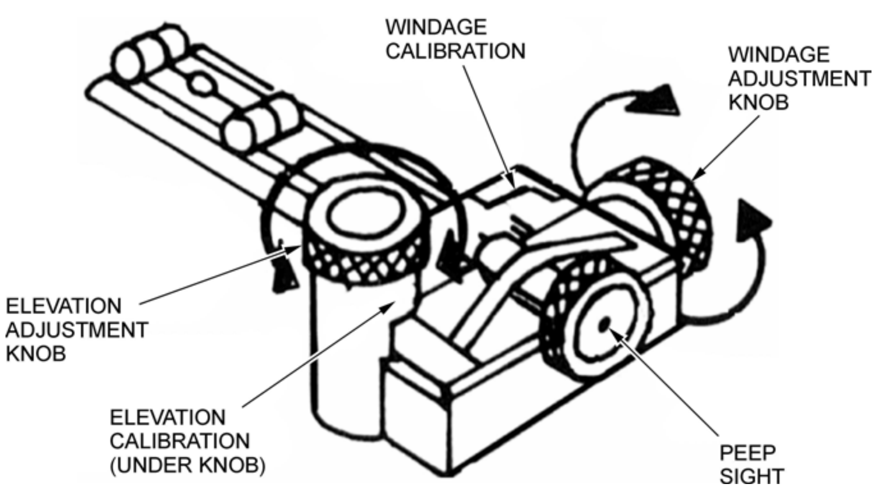
To lower the elevation of the MPI, turn the elevation knob counter-clockwise (to the left). To raise the elevation of the MPI, turn the elevation knob clockwise (to the right), as per the arrow and the word “UP” located on the knob.

MOVING THE WINDAGE LEFT AND RIGHT

To move the MPI left, turn the windage knob counter-clockwise (to the left). To move the MPI to the right, turn the windage knob clockwise (to the right), as per the arrow and the letter “R” located on the knob.

In order to move the MPI up and to the right turn the elevation and windage knobs clockwise.

In order to move the MPI down and left turn the elevation and windage knobs counter-clockwise.



Daisy Outdoor Products, AVANTI Competition Pellet Rifle: Operation Manual: AVANTI Legend Model 853, Daisy Outdoor Products (p. 6)

Figure 6-3-3 Sight Adjustment of the Cadet Air Rifle

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. How many clicks on the adjustment knob will move the MPI on the target one pellet width in any direction?

Q2. What direction does the marksman turn the elevation adjustment knob in order to raise the MPI?

Q3. What direction does the marksman turn the windage adjustment knob in order to move the MPI to the left?

ANTICIPATED ANSWERS

A1. In order to move the MPI on the target one pellet width, three clicks are required.

A2. The marksman turns the elevation adjustment knob clockwise (to the right) in order to raise the MPI.

A3. The marksman turns the windage adjustment knob counter-clockwise (to the left) in order to move the MPI to the left.

Teaching Point 4	**Conduct a Sight Adjustment Exercise**
Time: 30 min	Method: Practical Activity

Each pair of cadets will complete the exercise located at Annex L and then practice adjusting their sights.

An assistant instructor may be used to aid the cadets in the completion of this activity.

ACTIVITY

OBJECTIVE

The objective of this activity is to confirm that each cadet can determine the MPI and adjust sights accordingly on the cadet air rifle.

RESOURCES

- Cadet air rifle (one per firing lane),
- Sight adjustment activity targets located at Annex L, and
- Pen/pencil.

ACTIVITY LAYOUT

A mock firing point.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute the exercise located at Annex L to each cadet.
3. Have the cadets, in pairs, determine the MPI of all five shots for each scoring diagram.
4. Have the cadets put an asterisk to indicate the MPI.

5. Have the cadets determine the vertical and horizontal distance, in clicks, that the MPI must move to be aimed at the centre of the target.
6. Have the cadets write the number of clicks required for the windage and elevation, marking whether to turn the knob clockwise (cw) or counter-clockwise (ccw).
7. Have the cadets practice adjusting the sights on the cadet air rifle for each scoring diagram.
8. Correct using the answer key located at Annex M.

SAFETY

Ensure the following:

- the cadet air rifles are safe by performing individual safety precautions IAW A-CR-CCP-177/PT-001;
- all cadet air rifles are pointed in a safe direction throughout the lesson;
- no pellets or cleaning pellets are present in the training area; and
- all other applicable safety regulations are followed IAW local range standing orders.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the sight adjustment exercise will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Correcting marksmanship error is necessary to achieve success in marksmanship activities. It ensures that the marksman, the rifle and the target are aligned and that the centre of aim is in the centre of the target. It is important for each marksman to understand how to adjust their sights in order to achieve a completely aligned rifle.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-027 A-CR-CCP-177/PT-001 Director Cadets 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Program Reference Manual*. Ottawa, ON: Department of National Defence.

C2-097 Ontario Rifle Association. (2003). *Ontario Rifle Association Handbook for New Member*. Haliburton County, ON: MilCun Marksmanship Complex.

C2-098 (ISBN 1-931220-05-0) Constantine, R. (1998). *Modern Highpower Competition: From Beginner to Master*. Manchester, CT: Precision Shooting Inc.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C306.03 – ADOPT THE STANDING POSITION WITH THE CADET AIR RIFLE

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to give an overview of the objectives of the standing position.

Demonstration was chosen for TPs 2 to 4 as it allows the instructor to explain and demonstrate aspects of the standing position.

A practical activity was chosen for TP 5 as it is an interactive way to allow the cadet to experience the standing position in a safe and controlled environment. This activity contributes to the development of marksmanship skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to adopt the standing position with the cadet air rifle.

IMPORTANCE

It is important for cadets to adopt the standing position with the cadet air rifle as this position is used in both biathlon and civilian air rifle competitions. As the standing position is the only position for the international air rifle competitions, it is seen as a progression for cadet recreational marksmanship.

Teaching Point 1 — **Explain the Objectives of the Standing Position**

Time: 5 min — Method: Interactive Lecture

Explain to the cadets that the standing position is more technical, physically demanding and harder to master then the prone position. The information presented in this TP is required to understand the demonstrations prior to practicing the standing position.

The first principle of marksmanship is to find a comfortable firing position. The standing position is the easiest and quickest position to assume and does not require any artificial support, like the use of the sling in the prone position. It is the most difficult position in which to remain steady as it has the smallest area of support and it has a high centre of gravity. Cadets must accept that when firing in the standing position, they may never achieve complete immobility.

OBTAINING A GOOD POSITION

Obtaining a good position is the most important principle of marksmanship; this is especially true when firing in the standing position. A good position helps to maintain balance, comfort and stability during firing. Cadets should wear comfortable flat sole shoes or boots to add stability to the position and stand on the firmest surface possible. Although an excellent position will not guarantee an excellent performance, a poor position can almost assure a substantially negative effect on one's score.

The objective of a good position is to obtain a stable, balanced, uniform platform in the most efficient way possible, allowing holding and aiming to be achieved with as little movement and muscular tension as possible.

The standing position should be:

- natural,
- without strain,
- comfortable,
- stable,
- balanced in such a way that body weight is equally distributed between both feet, and
- consistent throughout the relay.

USING A RIFLE REST

An excellent way for a cadet to learn the standing position is to practice with the use of a rifle rest. Since the movements of the cadet air rifle are amplified from the lack of support points with the standing position, a rifle rest is very helpful. A rest allows the cadet air rifle to remain steady while allowing the cadet to understand and perfect the marksmanship skills being practiced. Once these skills are learned, the rifle rest should be removed. Some examples of rifle rests for the standing position are a tripod stand, a stool on top of a table or simply a flat surface on the end of a broom stick.

MAINTAINING A CENTRE OF GRAVITY

> The instructions given are based on a right-handed marksman. For a left-handed marksman, substitute the left for right and right for left throughout the points.

The centre of gravity is the point where the weight of the rifle and the cadet's body weight are evenly distributed between the feet. In order to compensate for the weight of the rifle, the cadet's back is bent rearward and rotated to the left in order to gain bone support and stability.

If the cadet stands straight, the weight of the cadet air rifle will pull their body to the front. Muscle strain will be felt in the back as the cadet attempts to keep their body from falling forward. By bending backward and rotating the back to the left, a shift in body weight will occur slightly towards the right foot. At a certain point, the weight of the body on the right foot will equal the weight on the left foot. The body-rifle combination then reaches a state of balance, with the centre of gravity located between the cadet's two feet.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the first principle of marksmanship?

Q2. What is an excellent way for a cadet to learn the standing position?

Q3. What is the centre of gravity in relation to the standing position?

ANTICIPATED ANSWERS

A1. Obtaining a good position.

A2. With the use of a rifle rest.

A3. The centre of gravity is the point where the weight of the rifle and the cadet's body weight are evenly distributed between the feet.

Teaching Point 2	**Explain and Demonstrate Adopting the Standing Position**
Time: 5 min	Method: Demonstration

> For this TP, it is recommended that instruction take the following format:
>
> 1. Explain and demonstrate the complete skill while cadets observe.
> 2. Explain and demonstrate each step required to complete the skill.
>
> **Note:** Assistant instructors may be employed to demonstrate the skill as it is explained.

> No two bodies are exactly the same, not even twins; therefore, no two bodies will look alike in any shooting position. Building the best position for your performance, means your standing position will differ from the person standing beside you.

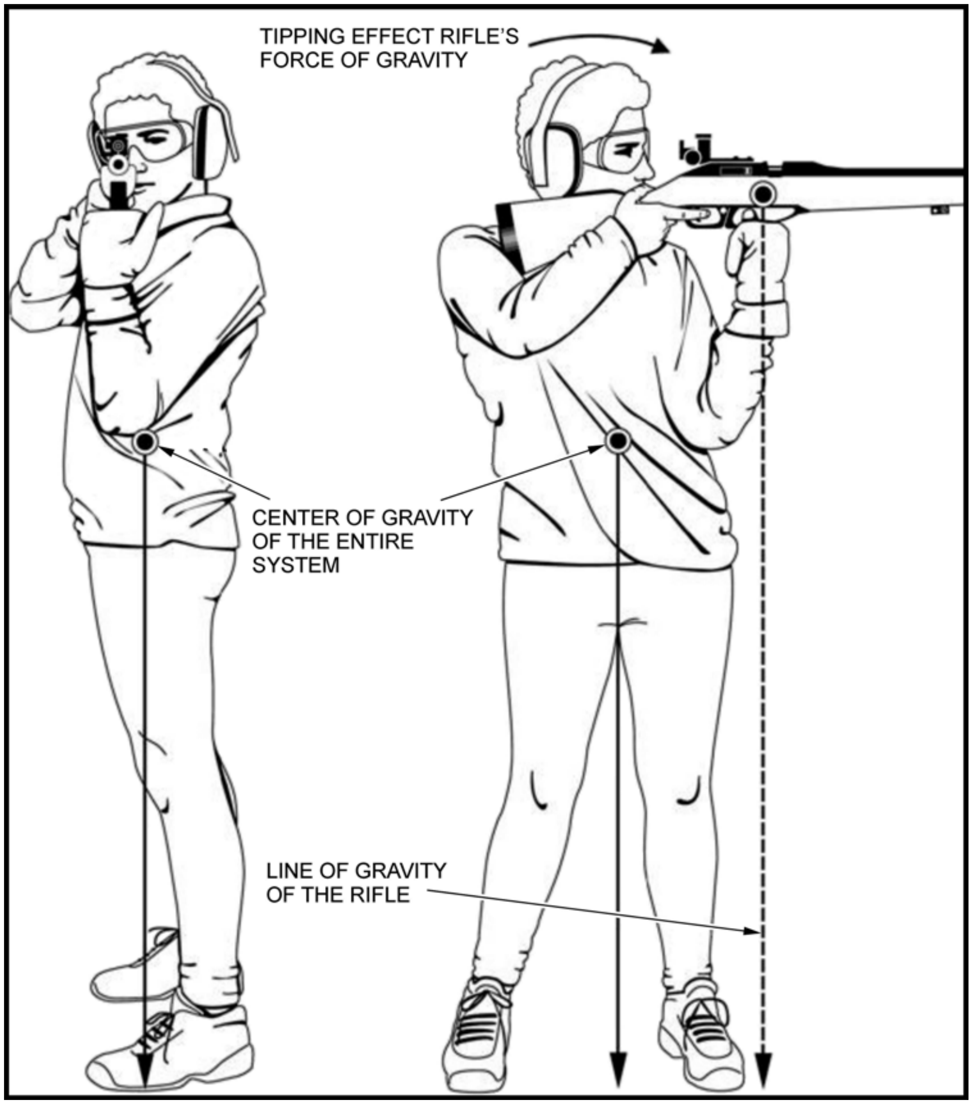
ADOPTING THE STANDING POSITION

The following guidelines should be adhered to when adopting the standing position:

1. the body should face to the right, approximately 90 degrees to the target;
2. the feet should be:
   (a) positioned shoulder width apart,
   (b) pointed straight ahead in relation to the body, or
   (c) turned slightly outward for comfort;

> The weight of the body and the rifle should be equally distributed between both feet.

3. the legs should be straight with knees unlocked, as locked knees affect circulation, causing increased discomfort and unsteadiness;
4. the hips should be 90 degrees to the target and should not thrust forward;



A-CR-CCP-177/PT-001 (p. 2-9)

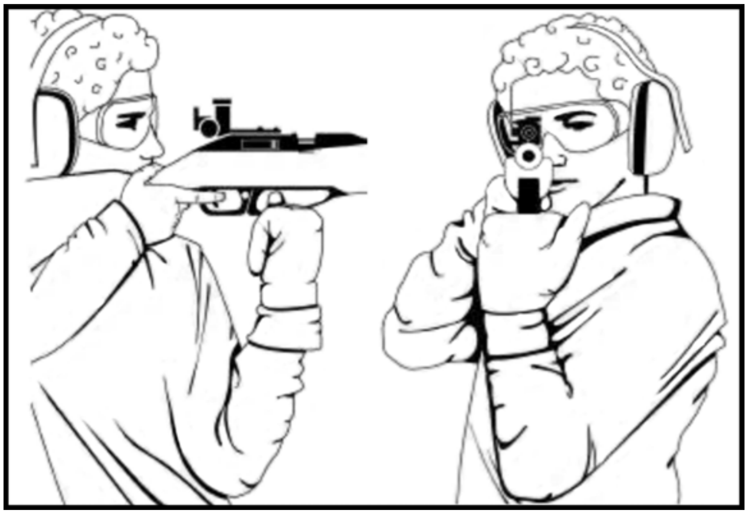
Figure 6-4-1 Standing Position

5. the back should be bent rearward to gain bone support and stability;

6. the left arm, without muscles used for support, should rest against the ribcage with the elbow almost directly under the rifle, resting against the ribcage or hipbone;

7. the left hand is used to support the rifle and should be positioned on the pump handle, using one of the following methods:

   (a) forming a clenched fist;



A-CR-CCP-177/PT-001 (p. 1-6-3)

Figure 6-4-2 Clenched Fist

(b) forming a V shape with the thumb and fingers; or

A-CR-CCP-177/PT-001 (p. 1-6-3)

Figure 6-4-3 V Shape With the Thumb and Fingers

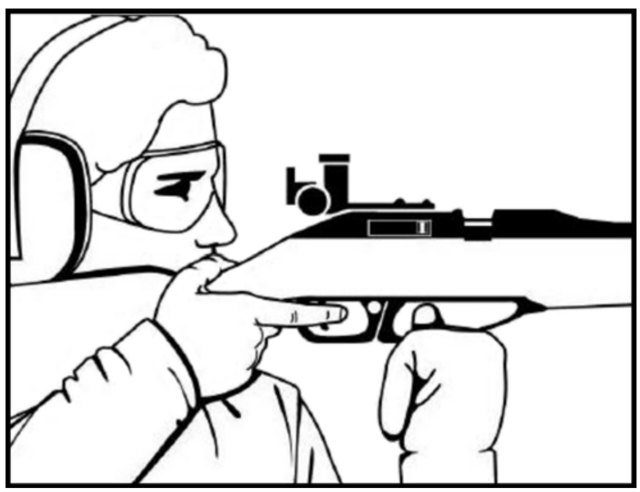
(c) using the heel of the hand with relaxed fingers;

A-CR-CCP-177/PT-001 (p. 1-6-4)

Figure 6-4-4 Heel of the Hand

8. the right arm should drop naturally to the side with the right hand placed comfortably, but firmly on the small of the butt;

9. the head should remain in an upright and natural position to allow the eyes to look forward through the sights; and

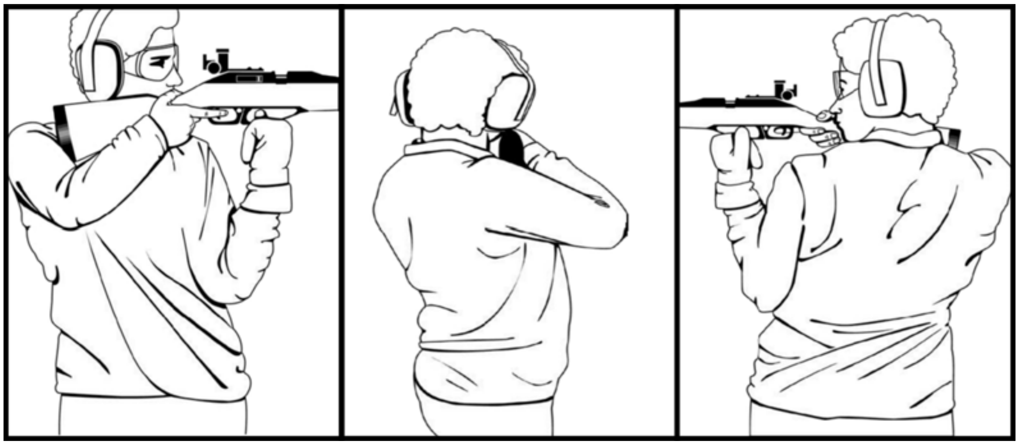


A-CR-CCP-177/PT-001 (p. 1-6-4)

Figure 6-4-5 Head and Eyes

10. the butt should rest slightly high on the shoulder, allowing the cadet air rifle to rest naturally across the chest with the cheek resting on the stock and the sights at eye level.

The standing position allows for a more natural and relaxed position that is more comfortable than prone, as it places less pressure and weight on the spine.



A-CR-CCP-177/PT-001 (p. 2-9)

Figure 6-4-6 Back and Hip Position

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why is the back bent rearward?

Q2. Why should the head remain in an upright and natural position?

Q3. Where should the butt of the cadet air rifle rest?

ANTICIPATED ANSWERS

A1. The back is bent rearward to gain bone support and stability.

A2. The head should remain in an upright and natural position to allow the eyes to look forward through the sights.

A3. The butt resting slightly high on the shoulder, allowing the cadet air rifle to rest naturally across the chest with the cheek resting on the stock and the sights at eye level.

Teaching Point 3	**Explain and Demonstrate Adjusting the Aim**
Time: 5 min	Method: Demonstration

When firing in the standing position, the larger of the two front apertures should be selected to provide the best sight picture. The aperture size should appear 1-1/2 times bigger than the aiming mark to allow the cadet to see the aiming mark that will be shifting around more than in the prone position.

When aiming the cadet air rifle in the standing position, the aiming process is the same as it is for the prone position. It is achieved by adopting a comfortable position, ensuring body alignment with the target, sight alignment and obtaining a sight picture. The only thing that varies from the prone position is that the front aperture should be larger and eye relief may be longer, but still between 5–15 cm (2–6 inches).

For this TP, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill.

Note: Assistant instructors may be employed to demonstrate the skill as it is explained.

HIGHER

To adjust the aim higher in the standing position, move the left hand rearward, closer to the trigger guard.

LOWER

To adjust the aim lower in the standing position, move the left hand forward, away from the trigger guard.

When smaller adjustments higher or lower are required, they can be achieved by adjusting when to hold a breath during the breathing cycle.

LEFT AND RIGHT

To adjust the aim to the left or right, adjustments are made by moving both feet in such a way as to keep them in the same position in relation to each other. The result should be as if the position was rotated in a disc, turned to the left or right as required.

When smaller adjustments left or right are required, they can be achieved by adjusting the position of the left hand and forearm. Adjusting the aim by this method may result in having to acquire a new firing position.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. How does aiming in the standing position vary from the prone position?

Q2. How is aiming adjusted higher or lower in the standing position?

Q3. How is aiming adjusted to the left or right in the standing position?

ANTICIPATED ANSWERS

A1. The front aperture should be larger and eye relief may be longer, but still between 5–15 cm (2–6 inches).

A2. By moving the left hand rearward or forward of the trigger guard.

A3. By moving both feet in such a way as to keep them in the same position in relation to each other, as if on a rotating disc.

Teaching Point 4	**Explain and Demonstrate Natural Alignment**
Time: 5 min	Method: Demonstration

Natural alignment is the same procedure for the standing position as it is for the prone position.

Natural alignment describes the direction that the cadet air rifle is aimed when the marksman is in a comfortable standing position with the cadet air rifle at the ready. In a comfortable position, the cadet air rifle should not be forced to point at the target. Even with a comfortable standing position and sight alignment, forcing the cadet air rifle can cause muscle tension and will affect the accuracy of each shot.

For this TP, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill.

Note: Assistant instructors may be employed to demonstrate the skill as it is explained.

Natural alignment is obtained by:

1. adopting the standing position;
2. acquiring a sight picture;
3. closing both eyes;
4. taking 3–4 normal breaths to relax the muscles;
5. after 10 seconds, opening the eyes to inspect the sight picture; and
6. adjusting body position to acquire a sight picture.

The purpose of closing the eyes and relaxing is to allow the muscles to return to a natural position. This allows the position to be adjusted and avoids having to force the cadet air rifle to aim at the target.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. Natural alignment has a marksman in what type of position?

Q2. How long are the eyes closed, and how many breaths are taken to obtain natural alignment?

Q3. What negative effect can forcing the cadet air rifle have?

ANTICIPATED ANSWERS

A1. In a comfortable standing position with the cadet air rifle at the ready.

A2. The eyes are closed for 10 seconds and 3–4 natural breaths are taken.

A3. It can cause muscle tension and will affect the accuracy of each shot.

Teaching Point 5	**Have the Cadets Adopt the Standing Position**
Time: 30 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets adopt the standing position, position the cadet air rifle into the shoulder, obtain natural alignment and adjust their position as required.

RESOURCES

- Cadet air rifle (one per firing lane),
- Rifle rest (one per firing lane),
- Target frame (one per firing lane),
- Suitable target (one per firing lane),
- Raised target platform (one per firing lane),
- Safety glasses/goggles.

ACTIVITY LAYOUT

Construct an air rifle range IAW A-CR-CCP-177/PT-001, Part 1, Section 8.

ACTIVITY INSTRUCTIONS

1. Divide cadets into equal relays according to the number of firing lanes.
2. Have the relays take turns assuming the standing position using the cadet air rifle.
3. With assistance, allow the cadets to practice the standing position as taught.
4. Have cadets adjust their standing position, to include:
   (a) the body should face 90 degrees to the target;
   (b) the feet should be:
      (1) positioned shoulder width apart,
      (2) pointed straight ahead in relation to the body, or
      (3) turned slightly outward for comfort,
   (c) the legs should be straight with knees unlocked;
   (d) the hips should be 90 degrees to the target and not thrust forward;
   (e) the back should be bent rearward;

(f) the left arm should rest against the ribcage with the elbow under the rifle, resting against the ribcage or hipbone;

(g) the left hand supporting the rifle, should be positioned on the pump handle;

(h) the right arm should drop naturally to the side with the right hand placed on the small of the butt;

(i) the head should remain upright and in a natural position to allow the eyes to look through the sights; and

(j) the butt should rest slightly high on the shoulder, allowing the cadet air rifle to rest naturally across the chest with the cheek resting on the stock and the sights at eye level.

5. Inspect each cadet for a comfortable position.

6. Repeat steps as required, within the allotted time.

SAFETY

Ensure that the cadet air rifles are pointed in a safe direction at all times. Cadets will treat air rifles as though they are loaded.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in the standing position activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the activity in TP 5 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The standing position is the least stable position due to its high centre of gravity and small support area. It requires a great amount of concentration and practice. The standing position is seen as a progression for cadet recreational marksmanship and is the only position for the international air rifle competitions.

INSTRUCTOR NOTES/REMARKS

Cadets who have completed this lesson will participate in EO M306.01 (Participate in a Recreational Marksmanship Activity, Section 1) from the standing position.

REFERENCES

A0-027 A-CR-CCP-177/PT-001 Director Cadets 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Program Reference Manual*. Ottawa, ON: Department of National Defence.

C2-146 (ISBN 0-9655780-0-3) Pullum, B. & Hanenkrat, F. (1997). *The New Position Rifle Shooting: A Comprehensive Guide to Better Target Shooting*. Oak Harbor, OH: Target Sports Education Center.

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CLASSIFICATION ACTIVITY

CLASSIFICATION ACTIVITY

Objective: To provide cadets the opportunity to obtain marksmanship classifications.

Scoring: The standard for the classification levels that are:

1. Marksman: Two five-round groupings within a circle of 3 cm in diameter.
2. First Class Marksman: Two five-round groupings within a circle of 2.5 cm in diameter.
3. Expert Marksman: Two five-round groupings within a circle of 2 cm in diameter.
4. Distinguished Marksman: Two five-round groupings within a circle of 1.5 cm in diameter.

Equipment Required:

Mandatory:

- CCT200GRTD Canadian Cadet Movement (CCM) Air Rifle Grouping Target (one per cadet),
- Air Rifle Grouping Template from A-CR-CCP-177/PT-001 (p. B1-1), and
- A stopwatch.

Optional aids to firing are limited to the following:

- Cadet air rifle sling,
- Marksmanship jacket,
- Shooting glove, and
- Hat.

Activity Instructions:

1. Distribute an Air Rifle Grouping Target to each cadet.
2. Have the cadets write their name and date on the target and attach it to the target frame.
3. Give the cadets five pellets to fire into the centre of the target.
4. Have the cadets fire in relays following the commands given by the RSO.
5. Give the cadets 15 minutes to complete firing.
6. Have the cadets retrieve their targets.
7. Score the targets using the Air Rifle Grouping Template.
8. Record the scores and allow the cadets to keep their targets.

The following is prohibited:

- Alterations made to the rifles.
- A pellet-loading clip.
- Supports used as a rest for the rifle or the forearm.
- A spotting scope.
- Use of sights not provided with the cadet air rifle.
- Coaching.

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FUN ACTIVITIES – PYRAMID

PYRAMID

Objective: To fire pellets into each point on the pyramid.

Scoring: One point is awarded for each point on the pyramid that is hit by a pellet.

Equipment Required:

Mandatory: Pyramid Target (one per cadet).

Optional aids to firing are limited to the following:

- Cadet air rifle sling,
- Marksmanship jacket,
- Shooting glove, and
- Hat.

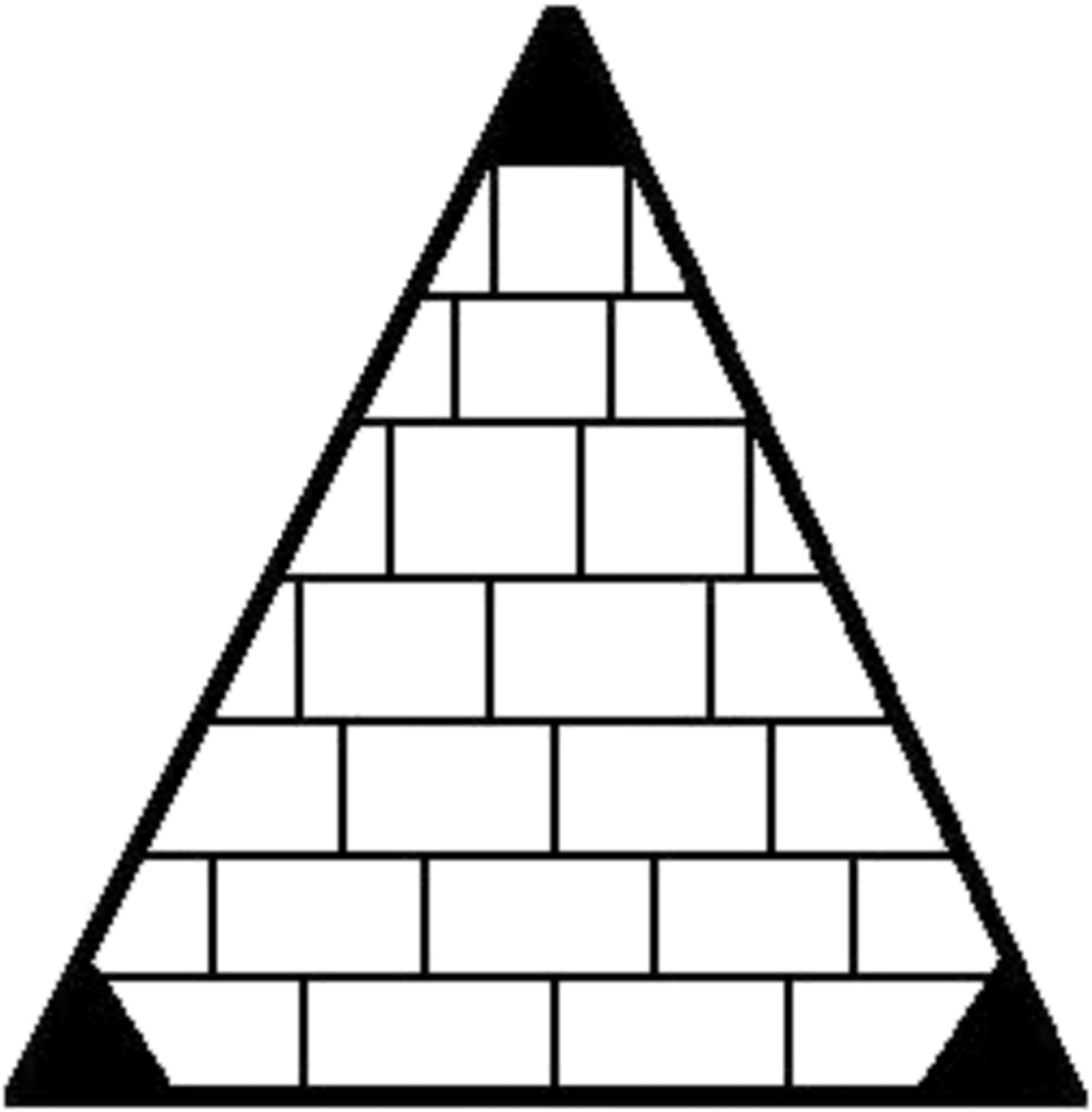
Activity Instructions:

1. Distribute one Pyramid Target to each cadet.
2. Have the cadets write their name and date on the target and attach it to the target frame.
3. Give the cadets three pellets to fire, one pellet into each corner of the pyramid.
4. Have the cadets fire in relays following the commands given by the RSO.
5. Give the cadets three minutes to complete firing.
6. Score the targets awarding one point for each corner hit on the pyramid.
7. Allow the cadets to review and keep their targets.

The following actions are prohibited:

- Alterations made to the rifles.
- A pellet-loading clip.
- Supports used as a rest for the rifle or the forearm.
- A spotting scope.
- Use of sights not provided with the cadet air rifle.

PYRAMID TARGET



Name: ____ Date: __________

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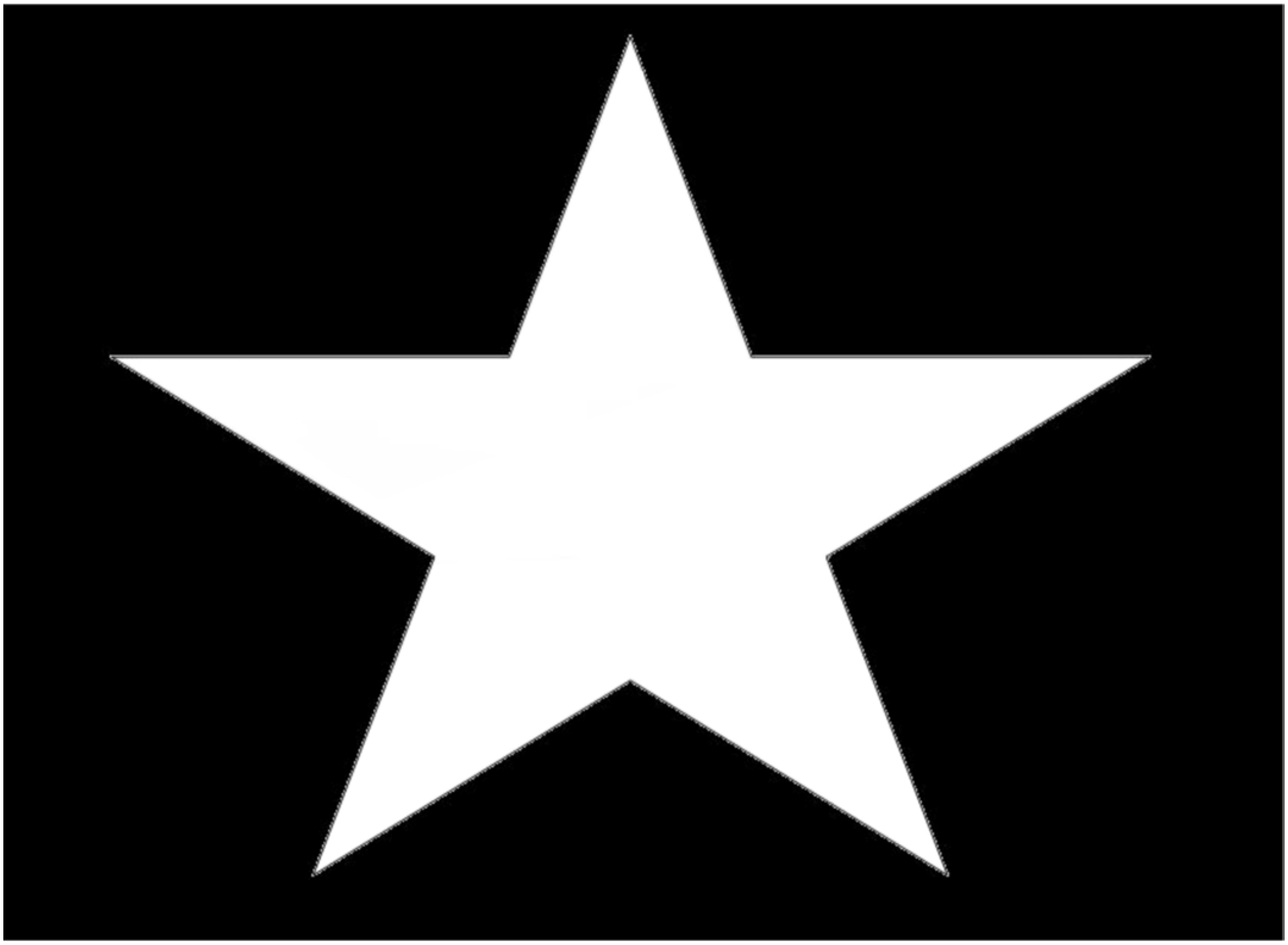
Figure 6B-1 Pyramid Target

FUN ACTIVITIES – SHOOTING STAR

SHOOTING STAR
Objective: To fire a pellet into each point on the star.
Scoring: One point is awarded for each point on the star that is hit by a pellet.
Equipment Required: Mandatory: Star Target (one per cadet). Optional aids to firing are limited to the following: • Cadet air rifle sling, • Marksmanship jacket, • Shooting glove, and • Hat.
Activity Instructions: 1. Distribute one Star Target to each cadet. 2. Have the cadets write their name and date on the target and attach it to the target frame. 3. Give the cadets five pellets to fire, one pellet into each point on the star. 4. Have the cadets fire in relays following the commands given by the RSO. 5. Give the cadets five minutes to complete firing. 6. Score the targets awarding one point for a pellet hit within each point on the star. 7. Allow the cadets to review and keep their targets. The following is prohibited: • Alterations made to the rifles. • A pellet-loading clip. • Supports used as a rest for the rifle or the forearm. • A spotting scope. • Use of sights not provided with the cadet air rifle.

STAR TARGET



Name: ______________________________ Date: ____________

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Figure 6C-1 Star Target

FUN ACTIVITIES – BEACH BALL

<table>
<tr><td>BEACH BALL</td></tr>
<tr><td>Objective: To fire 10 pellets into the black circle on the beach ball.</td></tr>
<tr><td>Scoring: One point is awarded for each successful hit in the black circle.</td></tr>
<tr><td>Equipment Required:
Mandatory: Beach Ball Target (one per cadet).
Optional aids to firing are limited to the following:
• Cadet air rifle sling,
• Marksmanship jacket,
• Shooting glove, and
• Hat.</td></tr>
<tr><td>Activity Instructions
1. Distribute one Beach Ball Target to each cadet.
2. Have the cadets write their name and date on the target and attach it to the target frame.
3. Give the cadets 10 pellets to fire into the black circle of the beach ball.
4. Have the cadets fire in relays following the commands given by the RSO.
5. Give the cadets 10 minutes to complete firing.
6. Score the targets awarding one point for each pellet hit within the black circle.
7. Allow the cadets to review and keep their targets.
The following is prohibited:
• Alterations made to the rifles.
• A pellet-loading clip.
• Supports used as a rest for the rifle or the forearm.
• A spotting scope.
• Use of sights not provided with the cadet air rifle.</td></tr>
</table>

BEACH BALL TARGET

Name: ____ Date: ____________

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Figure 6D-1 Beach Ball Target

FUN ACTIVITIES – BALLOONS

BALLOONS

Objective: To fire pellets into balloons on the target.

Scoring: One point is awarded for each balloon hit by a pellet.

Equipment Required:

Mandatory: Balloon Target (one per cadet).

Optional aids to firing are limited to the following:

- Cadet air rifle sling,
- Marksmanship jacket,
- Shooting glove, and
- Hat.

Activity Instructions:

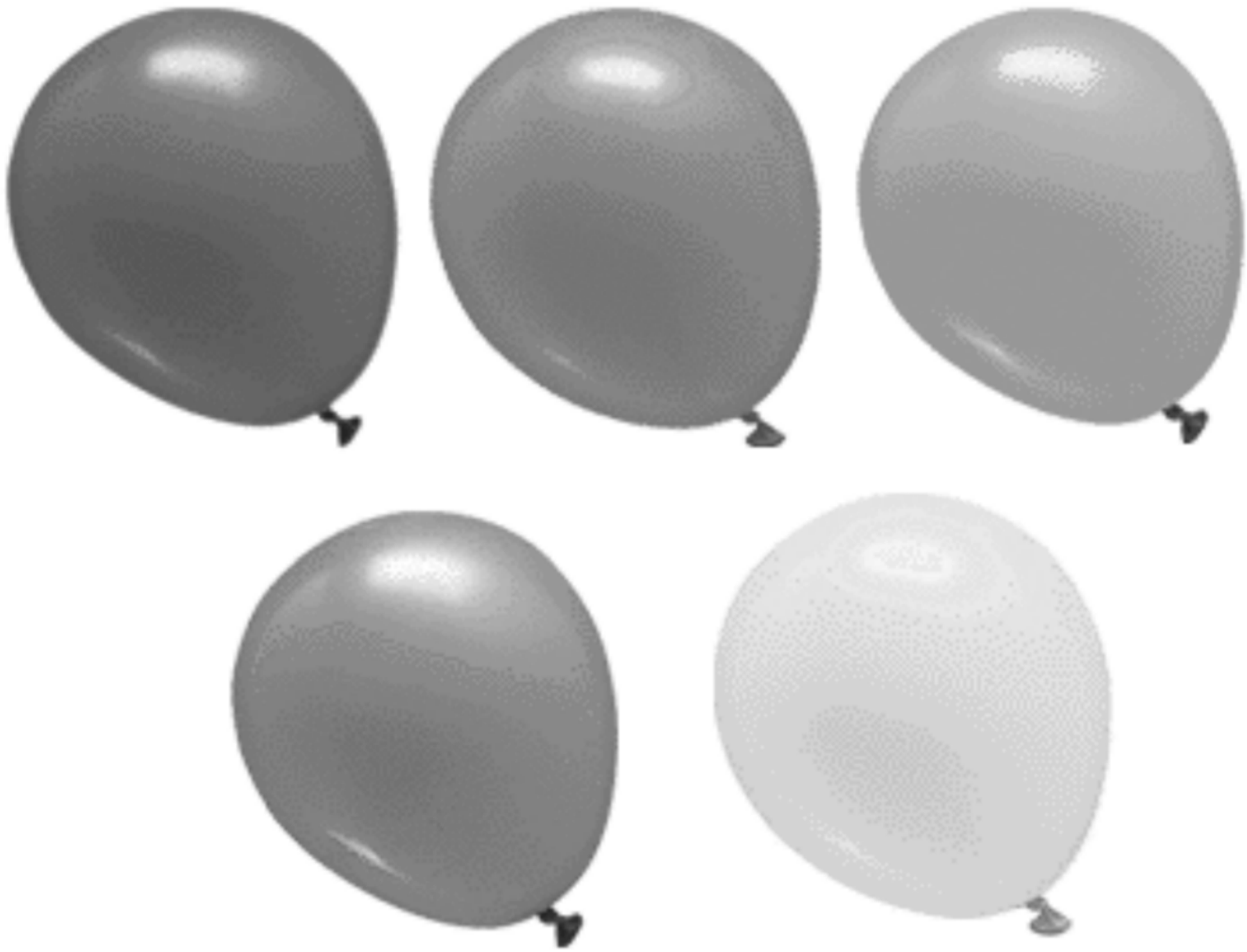
1. Distribute one Balloon Target to each cadet.
2. Have the cadets write their name and date on the target and attach it to the target frame.
3. Give the cadets five pellets to fire, one pellet into each balloon.
4. Have the cadets fire in relays following the commands given by the RSO.
5. Give the cadets five minutes to complete firing.
6. Score the targets awarding one point for each balloon hit.
7. Allow the cadets to review and keep their targets.

The following is prohibited:

- Alterations made to the rifles.
- A pellet-loading clip.
- Supports used as a rest for the rifle or the forearm.
- A spotting scope.
- Use of sights not provided with the cadet air rifle.

Note: Actual balloons may be used in place of the paper targets.

BALLOON TARGET



Name: ____ Date: ____________

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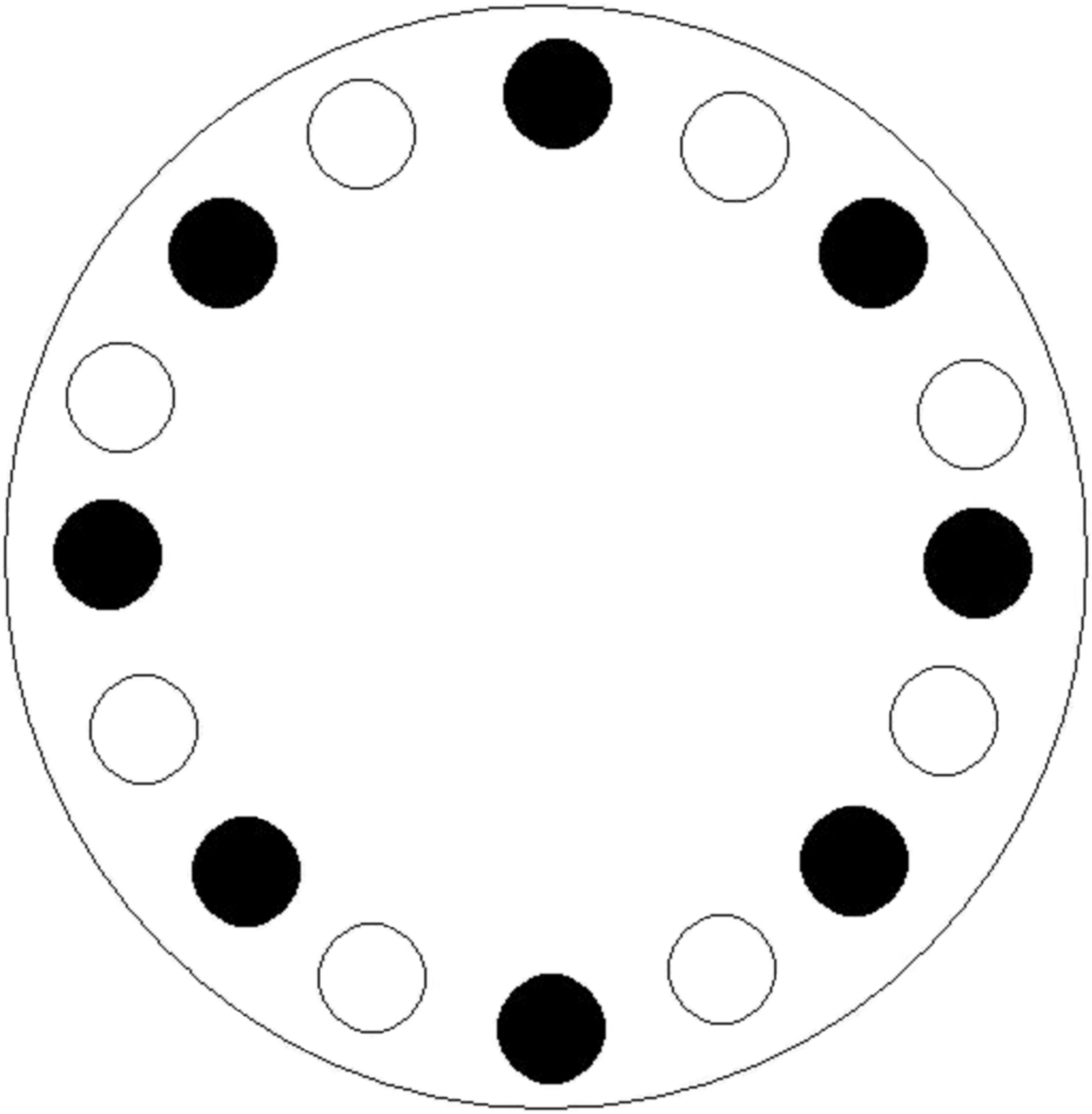
Figure 6E-1 Balloon Target

TIMED ACTIVITIES – CHASE THE DOTS

CHASE THE DOTS
Objective: To fire pellets into the dots on the target in a clockwise direction, within a time limit.
Scoring: One point is awarded for each black dot that is hit by a pellet within the time allotted.
Equipment Required: Mandatory: • Chase the Dots Target (one per cadet), and • A stopwatch. Optional aids to firing are limited to the following: • Cadet air rifle sling, • Marksmanship jacket, • Shooting glove, and • Hat.
Activity Instructions: 1. Distribute one Chase the Dots Target to each cadet. 2. Have the cadets write their name and date on the target and attach it to the target frame. 3. Give the cadets eight pellets to fire, one pellet into each black dot, in a clockwise direction. 4. Have the cadets fire in relays following the commands given by the RSO. 5. Give the cadets eight minutes to complete firing. 6. Score the targets awarding one point for each black dot hit. 7. Allow the cadets to review and keep their targets. The following is prohibited: • Alterations made to the rifles. • A pellet-loading clip. • Supports used as a rest for the rifle or the forearm. • A spotting scope. • Use of sights not provided with the cadet air rifle. • Coaching.
Note: To make this activity more difficult, shorten the time allowance.

CHASE THE DOTS TARGET



Name: ______________________________ Date: __________

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Figure 6F-1 Chase the Dots Target

TIMED ACTIVITIES – SPEED GRID

SPEED GRID
Objective: To fire pellets into the circles on the target, within a time limit.
Scoring: One point is awarded for each circle that is hit by a pellet within the time allotted.
Equipment Required: Mandatory: • Cadet air rifle five-pellet clip (three per firing lane), • Speed Grid Target (one per cadet), and • A stopwatch. Optional aids to firing are limited to the following: • Cadet air rifle sling, • Marksmanship jacket, • Shooting glove, and • Hat.
Activity Instructions: 1. Distribute one Speed Grid Target to each cadet. 2. Have the cadets write their name and date on the target and attach it to the target frame. 3. Give the cadets 15 pellets, pre-loaded into three five pellet clips. 4. Have the cadets fire one pellet into each circle on the target. 5. Have the cadets fire in relays following the commands given by the RSO. 6. Give the cadets 15 minutes to complete firing. 7. Score the targets awarding one point for each circle hit. 8. Allow the cadets to review and keep their targets. The following is prohibited: • Alterations made to the rifles. • Supports used as a rest for the rifle or the forearm. • A spotting scope. • Use of sights not provided with the cadet air rifle. • Coaching.
Note: To make this activity more difficult, shorten the time allowance.

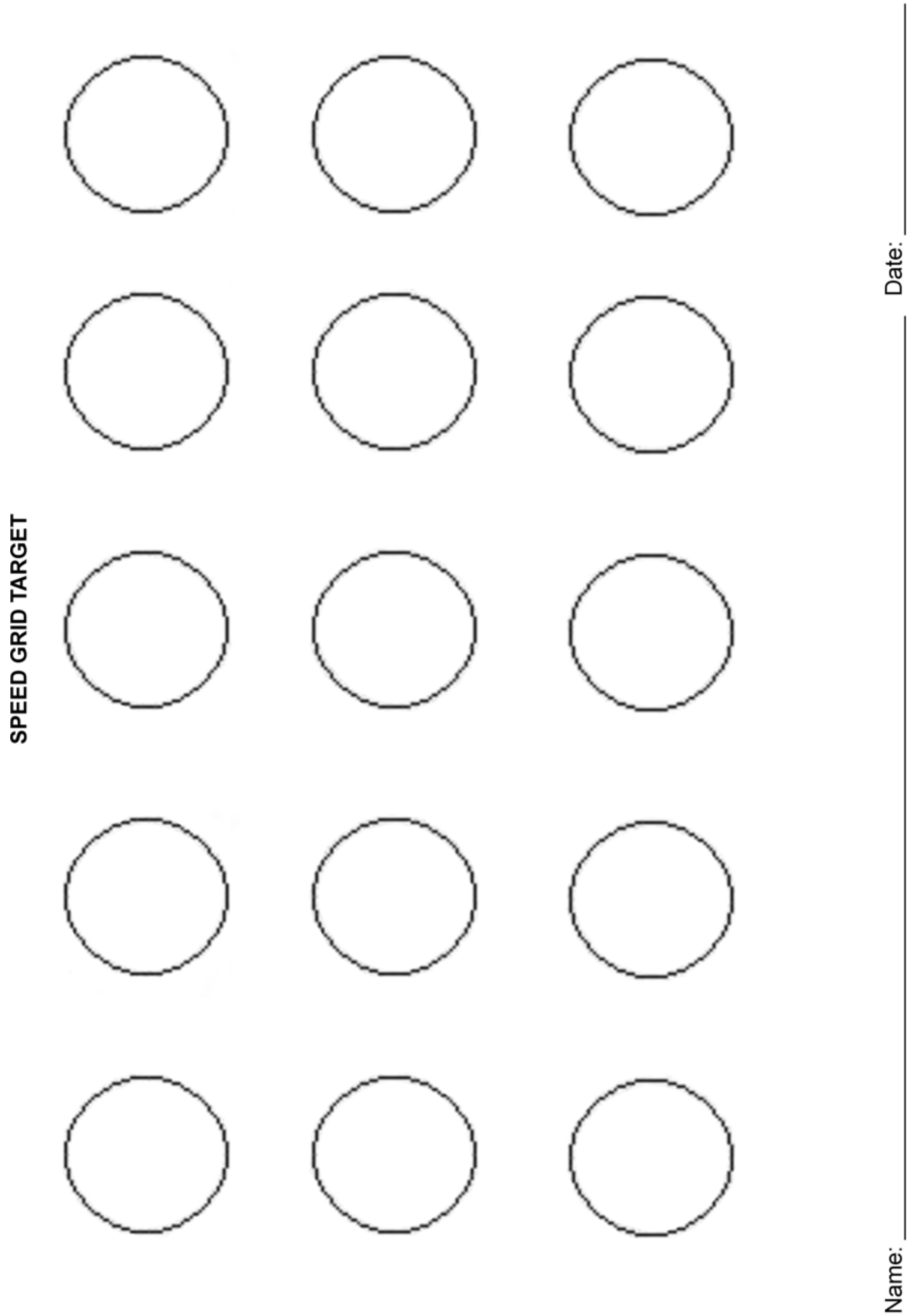

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Figure 6G-1 Speed Grid Target

TIMED ACTIVITIES – BEAT THE CLOCK

BEAT THE CLOCK

Objective: To fire pellets into the designated hours (numbers) within a time limit.

Scoring: One point is awarded for each correct hour (number) hit by a pellet within the time allotted.

Equipment Required:

Mandatory:

- Beat the Clock Target (one per cadet), and
- A stopwatch.

Optional aids to firing are limited to the following:

- Cadet air rifle sling,
- Marksmanship jacket,
- Shooting glove, and
- Hat.

Activity Instructions:

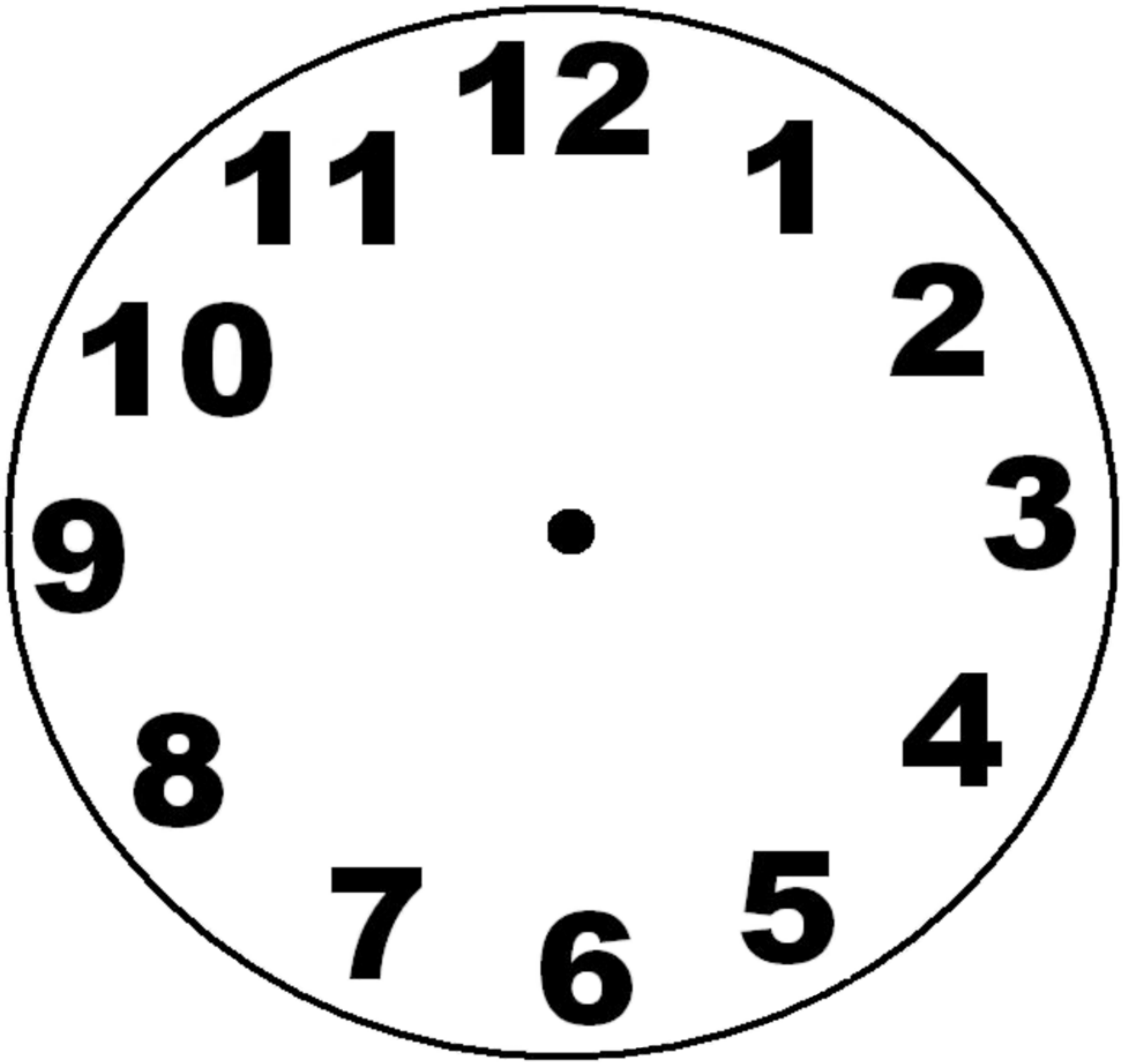
1. Distribute one Beat the Clock Target to each cadet.
2. Have the cadets write their name and date on the target and attach it to the target frame.
3. Have the cadets fire in relays following the commands given by the RSO.
4. Have the RSO using the 12-hour clock, call out one number every 20 second for a total of six numbers.
5. Give the cadets six pellets to fire, one pellet at each hour (number) as it is called.
6. Score the targets awarding one point for each correct number hit on the target.
7. Allow the cadets to review and keep their targets.

The following is prohibited:

- Alterations made to the rifles.
- Supports used as a rest for the rifle or the forearm.
- A spotting scope.
- Use of sights not provided with the cadet air rifle.
- Coaching.

Note: To make this activity more difficult, shorten the time allowance.

BEAT THE CLOCK TARGET



Name: ____ Date: __________

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Figure 6H-1 Clock Target

COMPETITIVE ACTIVITIES – CORPS/SQUADRON MARKSMANSHIP

CORPS/SQUADRON MARKSMANSHIP COMPETITION

Objective: To provide cadets the opportunity to compete within the squadron.

Scoring: Targets will be scored IAW A-CR-CCP-177/PT-001, to include:

- Each target has a highest possible score of 100 points (10 diagrams worth 10 points each).
- All shot holes are scored using the highest value of the scoring ring that it is broken.
- Shots outside the scoring rings are given a value of zero.
- If more than the one pellet is fired on a target, the shots with the highest value will be discarded until one shot remain on the target. Also, a two-point penalty will be deducted for each excess shot.
- If more than one shot is fired at a scoring diagram, only the prescribed number of shots may be fired at the remaining diagrams [eg, if two shots were fired at the first diagram, one diagram on the target would remain blank (free of shots)]. If this occurs more than twice, a two-point penalty will be deducted for each excess shot.
- This activity may be conducted as individuals or teams of four.

Equipment Required:

Mandatory: CCT2001AR853 CCM Competition Targets (two per cadet).

Optional aids to firing are limited to the following:

- Cadet air rifle sling,
- Marksmanship jacket,
- Shooting glove, and
- Hat.

Activity Instructions:

1. Distribute two CCT2001AR853 CCM Competition Targets to each cadet.
2. Have the cadets write their name and date on each target and attach them to the target frame.
3. Give the cadets 20 scoring pellets to fire, one pellet at each scoring diagram (additional zeroing pellets are permitted).
4. Have the cadets fire in relays, following the commands given by the RSO.
5. Give the cadets 30 minutes to complete firing.
6. Have the RSO collect the targets, score as described above and record the results.
7. Allow the cadets to review and keep their targets.

The following is prohibited:

- Crossfiring.
- Alterations made to the rifles.
- Supports used as a rest for the rifle or the forearm.
- A spotting scope.
- Use of sights not provided with the cadet air rifle.

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COMPETITIVE ACTIVITIES – LUNAR LAUNCH

LUNAR LAUNCH

Objective: To provide cadets the opportunity to compete within the squadron.

Scoring: The average distance from the earth to the moon is 384 400 km. All targets from marksmanship activities conducted during marksmanship training will be added together to calculate a distance from earth and achieve a position on the space shuttle crew. The four scoring levels/positions must meet the following standards:

1. Mission Commander: A score of 100 plus: 384 400 km from earth, lunar landing!
2. Mission Specialist: A score of 75 to 99: 288 300 km from earth.
3. Chief Engineer: A score of 50 to 74: 192 200 km from earth.
4. Science Officer: A score of 25 to 49: 96 100 km from earth, lunar launch!

Equipment Required:

Mandatory: Scores for all targets used in marksmanship activities during the training year.

Activity Instructions:

1. Add the scores from the targets used by each cadet during the training year.
2. Use the scoring method described above to assign the cadets levels/positions on the space shuttle crew.

Notes:

1. A record must be kept of each cadet’s scores from all marksmanship activities.
2. This activity may be conducted over multiple training years.
3. The certificate found at Annex J may be awarded to cadets who achieve levels/positions in this activity.

This is to certify that

____

has achieved the position of

____

in the

Lunar Launch Marksmanship Activity

________________ Date

____________________ Range Safety Officer

MPI EXAMPLES

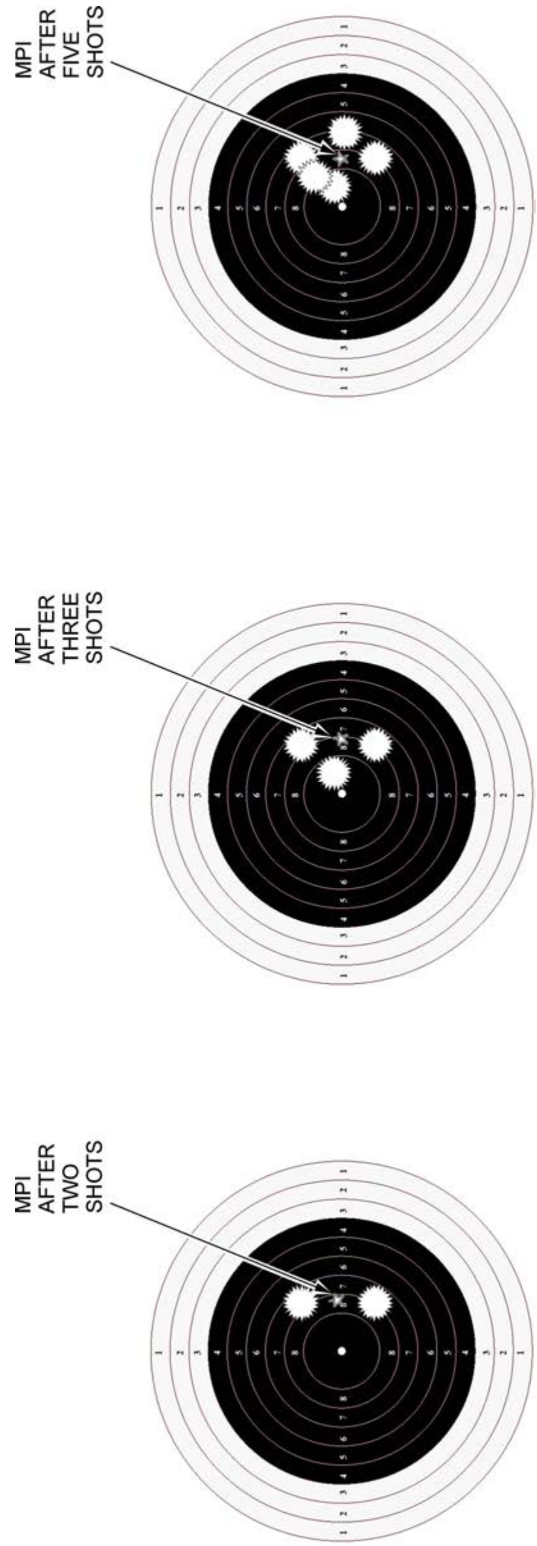

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Figure 6K-1 MPI Examples

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SIGHT ADJUSTMENT ACTIVITY

Name: ____ Date: ________________

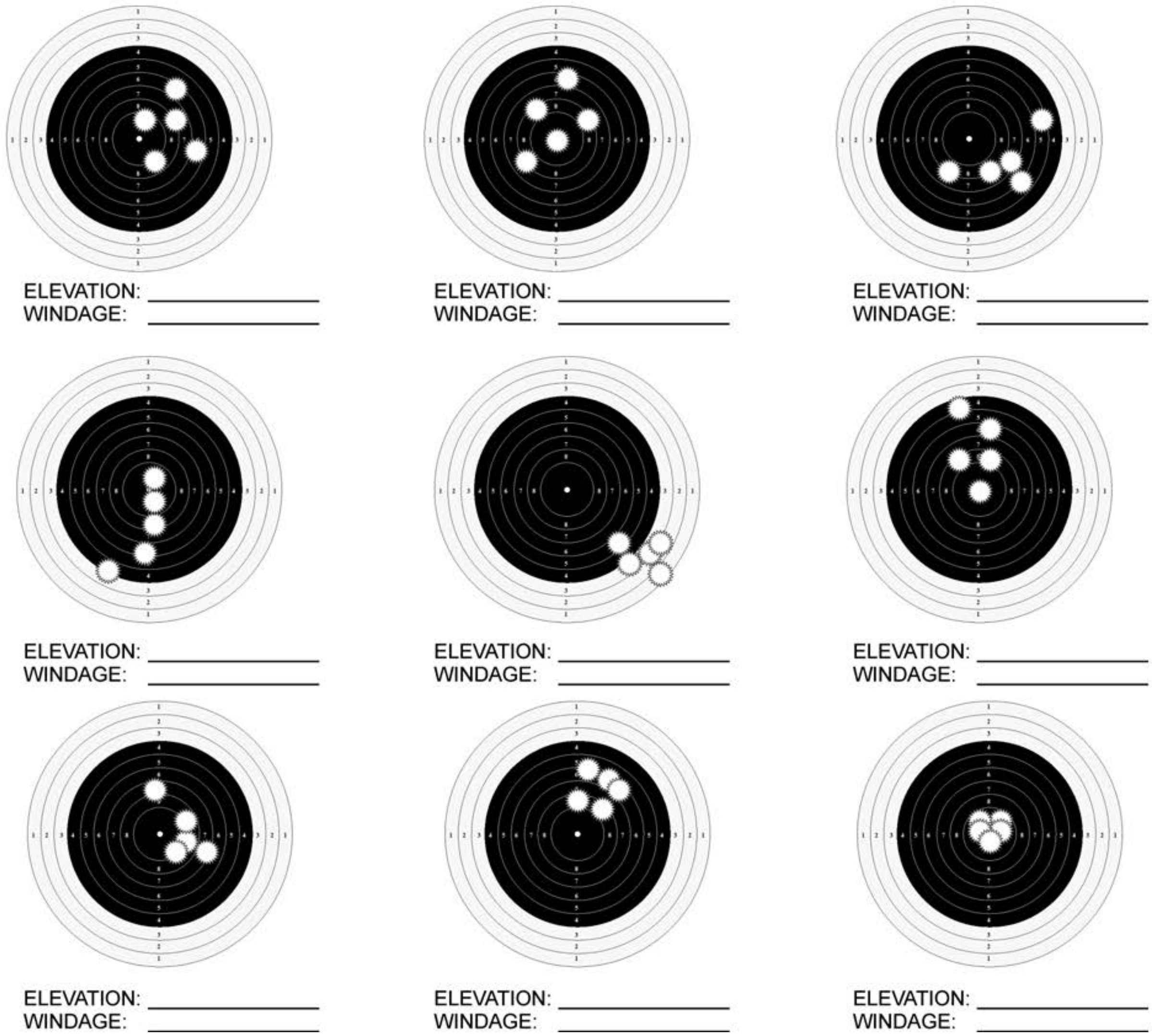

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Figure 6L-1 Sight Adjustment Activity Targets

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SIGHT ADJUSTMENT ACTIVITY TARGETS

ANSWER KEY

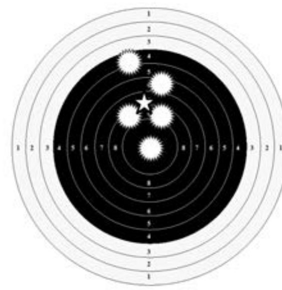
ELEVATION: 1 CCW
WINDAGE: 4 CCW

ELEVATION: 2 CCW
WINDAGE: 1 CW

ELEVATION: 5 CW
WINDAGE: 6 CCW

ELEVATION: 6 CW
WINDAGE: NONE

ELEVATION: 9 CW
WINDAGE: 12 CCW



ELEVATION: 6 CCW
WINDAGE: 1 CW

ELEVATION: 1 CCW
WINDAGE: 6 CCW

ELEVATION: 8 CCW
WINDAGE: 4 CCW

ELEVATION: 0 CLICKS
WINDAGE: 0 CLICKS

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Figure 6M-1 Answer Key Targets

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CHAPTER 7

PO 307 – SERVE IN AN AIR CADET SQUADRON

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M307.01 – IDENTIFY PROFICIENCY LEVEL THREE TRAINING OPPORTUNITIES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Prepare a handout or slide of the year's training schedule.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TPs 1 and 3 as it is an interactive way to provoke thought and stimulate interest among the cadets.

An interactive lecture was chosen for TP 2 to orient the cadets to and generate interest in Proficiency Level Three complementary training opportunities.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified Proficiency Level Three training opportunities.

IMPORTANCE

It is important for cadets to know what training will be conducted during Proficiency Level Three to give them an overview of what the training year will entail. This lesson will prepare the cadets for the training year and help generate interest in the topics.

Teaching Point 1 — **Identify Proficiency Level Three Mandatory Training Opportunities**

Time: 15 min — Method: In-Class Activity

OVERVIEW

The training program is broken into Performance Objectives (POs), which are the overall subjects, and Enabling Objectives (EOs), which are the topics within each PO. Training is conducted as mandatory and complementary components.

MANDATORY TRAINING

Mandatory training encompasses the EOs that all squadrons must complete throughout the training year.

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadets to participate in a gallery walk of information for each PO in order to identify Proficiency Level Three mandatory training opportunities.

RESOURCES

Resources will be IAW with each PO as listed below.

ACTIVITY LAYOUT

The classroom will be set up with a station for each PO with a basic description of the PO, information, pictures, videos, and other training aids that will illustrate what the cadet will learn in each PO.

PO 301 – CITIZENSHIP (CHAPTER 1)

Citizenship provides the cadets an opportunity to recognize the purpose of community service groups within the community. The cadets will discuss community service groups and their role within the community.

Examples of information/training aids that could be set up at this station include:

- posters or brochures from local community service groups,
- emblems and symbols representing local community service groups,
- videos illustrating the work of local community service groups,
- testimonials from members of local community service groups,
- testimonials from people who benefit from local community service groups, and
- pictures from various citizenship activities in which the squadron has participated.

PO 302 – COMMUNITY SERVICE (CHAPTER 2)

Community service provides the cadets an opportunity to perform community service. The community service should provide a direct benefit to the community and promote good citizenship.

Examples of information/training aids that could be set up at this station include:

- pictures from various community service activities in which the squadron has participated, and
- video or pictures from Remembrance Day ceremonies or other ceremonial parades.

PO 303 – LEADERSHIP (CHAPTER 3)

Leadership provides the cadets an opportunity to identify the role and responsibilities of a team leader within a leadership team, participate in a mentoring relationship, practice self assessment, communicate as a team leader, supervise cadets, solve problems, and lead cadets through a leadership assignment.

Examples of information/training aids that could be set up at this station include:

- leadership quotes, and
- pictures of cadets from the squadron participating in leadership activities.

PO 304 – PERSONAL FITNESS AND HEALTHY LIVING (CHAPTER 4)

Personal fitness and healthy living provides the cadets an opportunity to update their personal physical activity plans (from Proficiency Level Two) for the training year. Cadets will participate in the Cadet Fitness Assessment, to include the Progressive Aerobic Cardiovascular Endurance Run (PACER) and the muscular component of the test. They will set new short-term and long-term goals for the training year. This PO gives the cadets some of the tools required to make more informed choices in order to follow a healthy lifestyle. This is important as physical fitness is one of the aims of the Cadet Program.

Examples of information/training aids that could be set up at this station include:

- target heart rate charts,
- a CD/tape player with the audio recording of the PACER beeps playing,
- a video demonstrating the PACER and muscular portion of the Cadet Fitness Test, and
- copies of the Individual Score Sheet.

PO 305 – RECREATIONAL SPORTS (CHAPTER 5)

Recreational sports provides the cadets the opportunity to participate in organized recreational team sports. This is important as physical fitness is one of the aims of the Cadet Program.

Examples of information/training aids that could be set up at this station include:

- soccer ball,
- volleyball,
- floor hockey ball,
- hockey sticks,
- frisbees, and
- pictures of cadets at the squadron participating in recreational sports.

PO 306 – AIR RIFLE MARKSMANSHIP (CHAPTER 6)

Air rifle marksmanship provides the cadets an opportunity to participate in recreational air rifle marksmanship activities.

A miniature range could be set up at this station, to include:

- a mat,
- a cadet air rifle,
- sample targets,
- a scope,
- a sling, and
- safety goggles/glasses.

PO 307 – GENERAL CADET KNOWLEDGE (CHAPTER 7)

General cadet knowledge provides the cadets with the information required to serve as a member of an air cadet squadron. Cadets will identify the training opportunities available in Proficiency Level Three, recognize the relationship between the Air Cadet League of Canada (ACLC) and the Department of National Defence (DND), and identify year three summer training opportunities.

Examples of information/training aids that could be set up at this station include:

- an internet computer set to the Air Cadet League Of Canada website, and
- information sheets/posters on year three summer training opportunities.

PO 308 – DRILL (CHAPTER 8)

Drill provides the cadets an opportunity to direct a squad prior to a parade. The cadets will prepare a squad for parade and practice calling drill commands.

Examples of information/training aids that could be set up at this station include:

- a copy of the A-PD-201-000/PT-000, *Canadian Forces Manual of Drill And Ceremonial*,
- pictures of the cadets in the squadron participating in drill, and
- a video of cadets participating in drill competitions.

PO 309 – INSTRUCTIONAL TECHNIQUES (CHAPTER 9)

Instructional Techniques provides the cadets with an opportunity to instruct a lesson. The cadet will identify methods of instruction, identify instructional aids, plan a lesson, and instruct a 15-minute lesson.

Examples of information/training aids that could be set up at this station include:

- pictures of instructors conducting a lesson; and
- samples from the QSP and IG, and sample lesson plans.

PO 320 – CANADIAN FORCES (CF) FAMILIARIZATION (CHAPTER 11)

CF Familiarization provides the cadets with an opportunity to participate in CF Familiarization activities. The cadet will describe the role of Canada's air force.

Examples of information/training aids that could be set up at this station include:

- a map showing past and current operations,
- a small synopsis of each operation,
- a list of roles for each Wing and specific squadrons, and
- news articles related to air force activities.

PO 331 – PRINCIPLES OF FLIGHT (CHAPTER 12)

Principles of Flight provides the cadets an opportunity to explain the principles of flight by identifying aircraft stability.

Examples of information/training aids that could be set up at this station include:

- a model of an aircraft in flight,
- pictures of aircraft illustrating factors affecting stability, and
- video of aircraft performing at an air show.

PO 336 – METEOROLOGY (CHAPTER 13)

Meteorology provides the cadets an opportunity to identify meteorological conditions. The cadet will describe the properties of the atmosphere, explain the formation of clouds, and explain the effects of air pressure, humidity, and temperature on weather.

Examples of information/training aids that could be set up at this station include:

- a cloud chart,
- pictures of various kinds of weather, and
- a video of weather.

PO 337 – NAVIGATION (CHAPTER 14)

Navigation provides the cadets an opportunity to practice air navigation skills. The cadet will measure distances along a route and determine a position on a map.

Examples of information/training aids that could be set up at this station include:

- examples of air navigation maps, and
- navigation equipment.

PO 340 – AEROSPACE (CHAPTER 15)

Aerospace provides the cadets an opportunity to participate in aerospace activities by identifying Canadian astronauts and discussing the history of manned space exploration.

Examples of information/training aids that could be set up at this station include:

- mini biographies of select Canadian astronauts,
- a model of manned space vehicle (eg, the *Orbiter* space shuttle), and
- mission profiles of manned missions.

PO 370 – AIRCRAFT MANUFACTURING AND MAINTENANCE (CHAPTER 17)

Aircraft manufacturing and maintenance provides the cadets an opportunity to recognize aircraft manufacturing and maintenance. The cadet will identify the components of the pitot static system, identify aircraft manufacturers, and describe routine inspection procedures.

Examples of information/training aids that could be set up at this station include:

- components of a pitot static system,
- profiles of aircraft manufacturers, and
- a diagram of routine inspections.

PO 390 – AIRCREW SURVIVAL (CHAPTER 18)

Aircrew survival provides the cadets an opportunity to navigate a route using a map and compass. The cadet will identify parts of a compass, identify marginal information and conventional signs, determine grid references, determine distances on a map and on the ground, determine bearings on a map and on the ground, and navigate a route using a map and compass.

Examples of information/training aids that could be set up at this station include:

- pictures of cadets on a field exercise,
- examples of proper footwear,
- a topographical map, and
- a compass.

ACTIVITY INSTRUCTIONS

1. Have the cadets walk around the classroom for approximately 10 minutes, visiting each station.
2. After the gallery walk, answer any questions that the cadets may have, based on the stations that they have seen.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 2 — **Identify Proficiency Level Three Complementary Training Opportunities**

Time: 5 min — Method: Interactive Lecture

Complementary training provides cadets and squadron staff with a variety of topics and activities they can choose based on interest and resources. These lessons are used to complement the mandatory training that must be conducted.

PO 301 – Citizenship (Chapter 1)

Complementary training for Citizenship provides the cadets an opportunity to discuss the three branches of the Canadian government, discuss current events, tour a local community service group's facility, and participate in a presentation from a local community service group.

PO 302 – Community Service (Chapter 2)

Complementary training for Community Service provides the cadets an opportunity to participate in a ceremonial parade and an additional opportunity to perform community service.

PO 303 – Leadership (Chapter 3)

Complementary training for Leadership provides the cadets an opportunity to lead a team-building activity, and deliver a presentation on a leader.

PO 304 – Personal Fitness and Healthy Living (Chapter 4)

Complementary training for Personal Fitness and Healthy Living provides the cadets an opportunity to perform the PACER at the mid-point of the training year, to evaluate their personal activity plan, describe stress, and to create team goals.

PO 305 – Recreational Sports (Chapter 5)

Complementary training for Recreational Sports provides the cadets an opportunity to participate in an organized sports tabloid, participate in an organized intramural sports event, and participate in an orienteering event.

PO 306 – Air Rifle Marksmanship (Chapter 6)

Complementary training for Air Rifle Marksmanship provides the cadets an opportunity to identify civilian marksmanship organizations, correct marksmanship errors, fire the cadet air rifle from the standing position, practice holding, aiming and firing techniques, and participate in a recreational marksmanship activity.

PO 307 – General Cadet Knowledge (Chapter 7)

Complementary training for General Cadet Knowledge provides the cadets an opportunity to participate in presentations given by guest speakers from the Regional Cadet Support Unit, the squadron's Cadet Liaison Officer, and a member of the Air Cadet League of Canada, and identify the application procedures for the glider and power pilot scholarships.

PO 308 – Drill (Chapter 8)

Complementary training for Drill provides the cadets an opportunity to practice ceremonial drill as a review, practice calling drill commands, and execute flag drill, and drill with arms.

PO 309 – Instructional Techniques (Chapter 9)

Complementary training for Instructional Techniques provides the cadets an opportunity to deliver a one-minute presentation, plan a lesson, instruct a 15-minute lesson, identify drill formations, describe drill instructional techniques, and instruct a 15-minute drill lesson.

PO 311 – Summer Biathlon (Chapter 10)

Summer Biathlon provides the cadets an opportunity to participate in summer biathlon activities including aiming and firing the cadet air rifle following physical activity, and participating in a recreational summer biathlon activity.

PO 320 – CF Familiarization (Chapter 11)

Complementary training for CF Familiarization provides the cadets an opportunity to discuss CF careers in aviation, tour a CF facility, and participate in a presentation given by a guest speaker from a local air force unit.

PO 331 – Principles of Flight (Chapter 12)

Complementary training for Principles of Flight provides the cadets an opportunity to review principles of flight, read pitot static instruments, identify aspects of helicopter aerodynamics, demonstrate attitudes and movements in a flight simulator, and participate in a presentation given by a member of the local aviation community.

PO 336 – Meteorology (Chapter 13)

Complementary training for Meteorology provides the cadets an opportunity to read an aviation routine weather report, tour a meteorological facility, and participate in a presentation given by a flight services specialist.

PO 337 – Navigation (Chapter 14)

Complementary training for Navigation provides the cadets an opportunity to operate a radio for aviation transmissions, operate a global positioning system (GPS) receiver for air navigation, and practice air navigation skills.

PO 340 – Aerospace (Chapter 15)

Complementary training for Aerospace provides the cadets an opportunity to identify online stargazing programs, identify Canadian astronauts, discuss the Canadian space program, discuss unmanned space exploration, describe elements of the night sky, simulate life in space, launch a water rocket, identify GPS components, describe aspects of the International Space Station (ISS), and participate in a presentation given by a member of the astronomy community or aerospace industry.

PO 360 – Aerodrome Operations (Chapter 16)

Complementary training for Aerodrome Operations provides the cadets an opportunity to identify types of aerodromes, explain aspects of aerodrome lighting, construct a model of the airspace at an aerodrome, identify how equipment is used at an aerodrome, identify aspects of emergency response and aerodrome security, and explain aspects of air traffic services.

PO 370 – Aircraft Manufacturing and Maintenance (Chapter 17)

Complementary training for Aircraft Manufacturing and Maintenance provides the cadets an opportunity to identify tasks required to maintain aircraft, describe materials used in aircraft construction, identify basic power tools used in aircraft manufacturing and maintenance, construct an aluminum model biplane, tour an aircraft restoration project, participate in a presentation from the aircraft manufacturing or maintenance industry, and tour a local aircraft manufacturing or maintenance facility.

PO 390 – Aircrew Survival (Chapter 18)

Complementary training for Aircrew Survival provides the cadets an opportunity to identify types of maps, interpret contour lines, determine direction using the sun or determine direction at night, use blazing techniques, act as a member of a ground search and rescue (SAR) party, orient a map by inspection, orient a map using a compass, calculate magnetic declination, identify methods of preparing and cooking a small animal or fish, construct camp crafts, identify elements of the night sky, perform minor first aid in a field setting, participate in a presentation from the SAR community, and construct a solar still.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. As part of Citizenship, what are the EOs (topics) that may be taught?

Q2. What EOs are encompassed under complementary training for Personal Fitness and Healthy Living?

Q3. In Meteorology, what EOs may be taught?

ANTICIPATED ANSWERS

A1. Discuss the three branches of the government, discuss current events, tour a local community service group's facility, and participate in a presentation from a local community service group.

A2. Perform the PACER at the mid-point of the training year, evaluate their personal activity plan, describe stress, and create team goals.

A3. Read an aviation routine weather report, tour a meteorological facility, and participate in a presentation given by a flight services specialist.

Teaching Point 3 **Conduct an Activity on Proficiency Level Three Training Opportunities**

Time: 5 min Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to familiarize the cadets with Proficiency Level Three training opportunities.

RESOURCES

- Handouts of POs located at Annex B,
- Handouts of PO statements located at Annex C, and
- Tape.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Place the labels face up on desks throughout the classroom.
2. Have a cadet stand up and read out their label.
3. Have the cadet who thinks they have the corresponding PO or PO statement stand up.
4. Have the remainder of the cadets confirm if it is correct.
5. Tape corresponding POs and PO statements to a flipchart/whiteboard/wall.
6. Continue until all POs are complete.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets’ participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in the activity in TP 3 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being aware of the topics to be covered during Proficiency Level Three training will help generate interest in the training year. Being aware of the opportunities available throughout the training year may help motivate you in your specific areas of interest.

INSTRUCTOR NOTES/REMARKS

For Proficiency Level Three complementary training opportunities in TP 2, refer to the squadron's annual training plan.

This EO should be scheduled as early as possible in the training year. See the sample schedule located at Chapter 2, Annex C.

REFERENCES

A0-010 Director Cadets 2. (2007). CATO 11-04, *Cadet Program Outline*. Ottawa, ON: Department of National Defence.

A3-064 Director Cadets 3. (2008). CATO 51-01, *Air Cadet Program Outline*. Ottawa, ON: Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M307.02 – IDENTIFY YEAR THREE CSTC TRAINING OPPORTUNITIES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Read CATO 54–20, *Summer Training Directive – Royal Canadian Air Cadets* and its Annexes.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A group discussion was chosen for TP 1 as it allows the cadets to interact with their peers and share their experiences, opinions, and feelings about year three CSTC training opportunities.

An interactive lecture was chosen for TP 2 to orient the cadets to year three CSTC training opportunities and to generate interest.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified year three CSTC training opportunities.

IMPORTANCE

It is important for cadets to identify the year three CSTC training opportunities available to them because it may help them decide if and for which course they would like to apply.

Teaching Point 1	**Discuss the Areas of Interest of CSTC Training Opportunities**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

Write the specialty areas on a whiteboard/flip chart. Explain the activities that are conducted within each area.

FITNESS AND SPORTS

Cadets will improve individual fitness and sport knowledge and skills. Activities will focus on:

- officiating,
- fitness instruction,
- sports leadership,
- coaching,
- rules and regulations of sports, and
- personal fitness.

MUSIC

Military Musician

Cadets will develop music knowledge and skills. Activities will focus on:

- music theory;
- playing an instrument as part of an ensemble;
- playing an instrument as part of a military band; and
- developing individual music skills.

Pipe and Drum Musician

Cadets will develop music knowledge and skills. Activities will focus on:

- music theory;
- playing an instrument as part of an ensemble;
- playing an instrument as part of a pipe and drum band; and

- developing individual music skills.

MARKSMANSHIP

Cadets will develop the knowledge and skills required to improve marksmanship and coaching abilities. Activities will focus on:

- recreational and competitive air rifle marksmanship,
- various marksmanship techniques,
- firing positions,
- duties of a range assistant, and
- basic duties of a marksmanship coach.

LEADERSHIP

Cadets will develop the knowledge and skills required to improve leadership abilities in a peer and small group setting. Activities will focus on:

- leadership,
- supervision,
- team-building,
- instructional techniques,
- effective communication,
- problem solving, and
- ceremonial drill.

AVIATION

Cadets will develop the knowledge and skills required to improve their understanding of the fundamentals of aviation. Depending on the course chosen, activities will focus on:

- meteorology,
- aero engines,
- air navigation,
- airmanship,
- principles of flight,
- navigation,
- pilot decision making,
- air law,
- flight safety, and
- aviation medicine.

AVIATION TECHNOLOGY

Cadets will develop knowledge and skills required to improve their understanding of the fundamentals of aviation technology. Activities will focus on:

- aerodrome operations,
- aircraft fabrication,
- aircraft construction, and
- aircraft maintenance.

AEROSPACE

Cadets will develop knowledge and skills required to improve their understanding of the fundamentals of aerospace science. Activities will focus on:

- theoretical and practical principles of space science,
- simulations of life in space,
- familiarization with recognized space missions, and
- history of space exploration.

AIRCREW SURVIVAL

Cadets will develop the knowledge and skills required to improve aircrew survival skills. Activities will focus on:

- instructional techniques in the field,
- map and compass for ground navigation,
- leadership in a field setting,
- fire construction,
- shelter construction,
- signal construction, and
- food and water collection.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet.
- This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS:

Q1. Which areas of interest in summer training appeal to you?

Q2. Who is interested in applying for summer training this year? Why?

Q3. What specialty areas are you interested in pursuing? Why?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the group discussion will serve as the confirmation of this TP.

Teaching Point 2	**Explain Selection of Year Three Summer Courses**
Time: 15 min	Method: Interactive Lecture

ALL SIX WEEK COURSES OFFERED IN AREAS OF COMMON INTEREST

Fitness and Sports Instructor

The aim of the Fitness and Sports Instructor course is to enhance skills developed on the Basic Fitness and Sports course, to develop leadership and instructional skills in fitness and sports settings, and to stimulate further interest in personal fitness and healthy living.

Air Rifle Marksmanship Instructor

The aim of the Air Rifle Marksmanship Instructor course is to enhance skills developed during proficiency level training, the General Training course, and some year two CSTC courses. As well, cadets will develop leadership, coaching, and instructional skills in a marksmanship setting.

Intermediate Military Band Musician

The aim of the Intermediate Military Band Musician course is to enhance knowledge and skills developed during the Military Band – Basic Musician course, and to develop leadership skills in a military band setting.

Intermediate Pipe Band

The aim of the Intermediate Pipe Band course is to enhance knowledge and skills developed during the Pipe Band – Basic Musician course, and to develop leadership skills in a pipe band setting.

ALL SIX WEEK COURSES OFFERED IN ELEMENTALLY SPECIFIC AREA

Survival Instructor

The aim of the Survival Instructor course is to enhance survival skills developed on the Basic Survival course and proficiency level training; to develop new survival skills, and to develop leadership and instructional skills in a survival/field setting.

Advanced Aerospace

The aim of the Advanced Aerospace course is to enhance aerospace knowledge developed on the Basic Aviation Technology and Aerospace course, and proficiency level training; develop new knowledge and skills, and further stimulate an interest in the aerospace/astronomy communities.

Advanced Aviation Technology – Airport Operations

The aim of the Advanced Aviation Technology - Airport Operations course is to enhance knowledge developed on the Basic Aviation Technology and Aerospace course, and proficiency level training; develop new knowledge and skills, and further stimulate an interest in airport operations.

Advanced Aviation Technology – Aircraft Maintenance

The aim of the Advanced Aviation Technology - Aircraft Manufacturing course is to enhance knowledge developed on the Basic Aviation Technology and Aerospace course, and proficiency level training; develop new knowledge and skills, and further stimulate an interest in aircraft maintenance.

Glider Pilot Scholarship (GPS)

The aim of the GPS is to train the successful applicant to the standard as defined in the A-CR-CCP-242/PT-005 *Air Cadet Gliding Manual*. Upon graduation from the course, cadets will be awarded their Air Cadet Glider wings and a Transport Canada Pilots Licence - Glider.

THREE WEEK ADVANCED AVIATION COURSE

The Advanced Aviation course is the only three-week course offered with the completion of Proficiency Level Three. The aim of this course is to enhance the cadet's knowledge of aviation subjects and to further stimulate an interest in becoming a pilot.

PREREQUISITES FOR EACH THREE- AND SIX-WEEK COURSE

For all courses other than the GPS, the cadet must:

- be undergoing Proficiency Level Three training by the application deadline;
- successfully complete Proficiency Level Three by June 30 of the year the cadet wishes to attend the CSTC;
- be physically fit;
- complete a CF 51;
- have parental consent; and
- be recommended by the squadron Commanding Officer.

> Cadets do not have to complete a year two CSTC course to apply for their year three CSTC courses.
>
> For more information on the GPS course, see EO C307.04 (Identify the Application Procedure for the Glider and Power Pilot Scholarships, Section 4).

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are the four 6-week courses offered in areas of common interest?

Q2. What is the only three-week course offered during year three summer training?

Q3. What are the prerequisites for three- and six-week courses other than the GPS?

ANTICIPATED ANSWERS

A1. Fitness and Sports Instructor, Air Rifle Marksmanship Instructor, Intermediate Military Band Musician, and Intermediate Pipe Band Musician.

A2. The Advanced Aviation course.

A3. For all courses other than the GPS, the cadet must:

- be undergoing Proficiency Level Three training by the application deadline;
- successfully complete Proficiency Level Three by June 30 of the year the cadet wishes to attend the CSTC;
- be physically fit;
- complete a CF 51;
- have parental consent; and
- be recommended by the squadron Commanding Officer.

END OF LESSON CONFIRMATION

The cadets' participation in the group discussion will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Summer training is a fun and exciting aspect of the Cadet Program. CSTCs are also a place to meet cadets and make new friends from different squadrons across Canada. It is important to be familiar with the CSTC training opportunities offered so cadets may apply for the course that interests them most.

INSTRUCTOR NOTES/REMARKS

This EO should be conducted before the summer training application deadline.

It is recommended that the summer training application forms be completed during a training session after this EO has been conducted.

REFERENCES

A0-010 Director Cadets 2. (2007). CATO 11-04, *Cadet Program Outline*. Ottawa, ON: Department of National Defence.

A0-033 Director Cadets 3. (2004). CATO 14-21, *Music Training and Education With the Canadian Cadet Organizations*. Ottawa, ON: Department of National Defence.

A3-003 Director Cadets 3. (2000). CATO 54-20, *Summer Training Directive – Royal Canadian Air Cadets*. Ottawa, ON: Department of National Defence.

A3-029 Director Cadets 3. (2006). CATO 51-01, *Air Cadet Program Outline*. Ottawa, ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M307.03 – RECOGNIZE THE PARTNERSHIP BETWEEN THE AIR CADET LEAGUE OF CANADA (ACLC) AND DND

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handouts of Annexes D, E and F.

Create a slide of Annex F.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadet to the partnership between the ACLC and DND.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have recognized the partnership between the ACLC and DND.

IMPORTANCE

It is important for cadets to recognize the partnership between the ACLC and DND as it will give the cadets knowledge of the dichotomy of the Air Cadet Program. This may allow them to better understand the organization and structure of the Air Cadet Program.

Teaching Point 1 **Describe the Three Levels of the ACLC**

Time: 5 min Method: Interactive Lecture

THE THREE LEVELS OF THE ACLC

There are three levels in organization of the ACLC:

- national,
- provincial, and
- local.

Each of the levels has its own area of responsibility and cooperates with DND at a comparable level.

National

The national level of the ACLC is a board of governors composed of 15 Canadians representing all provinces and territories. The board meets annually, choosing a president, vice-presidents, the executive committee, and other committees of importance. There is also an advisory board made up of past-presidents of the ACLC.

The Board of Governors maintains a full-time administrative headquarters in Ottawa, Ont. This office works closely with National Defence Headquarters (NDHQ) in providing year-round supervision and administration of the ACLC and the approximate 450 air cadet squadrons in Canada.

Provincial

There are 12 provincial committees, including:

- British Columbia,
- Alberta,
- Saskatchewan,
- Manitoba,
- Northwest Ontario,
- Ontario,
- Quebec,
- New Brunswick,
- Nova Scotia,
- Prince Edward Island,
- Newfoundland and Labrador, and
- the Northern Territories.

The committees are comprised of all local Sponsoring Committee Chairpersons, plus others that may be elected, such as prominent local citizens. Provincial committees supervise the activities of all air cadet squadrons in their respective areas and are financed by public fundraising and the support of their member squadrons.

The provincial committees also assist squadrons through sponsored activities such as intra-provincial sports and drill competitions. The provincial committees own all gliders, tow aircraft, winches, and vehicles used in support of air cadet glider pilot training and glider familiarization flying activities.

The provincial committees work with the respective Region Cadet Support Unit (RCSU) to provide supervision and assistance to squadrons within their area.

Local

Air cadet squadrons are supported through various organizations which provide volunteers, financial contributions, extra activities, and material assistance. Three distinct groups may provide this support:

- sponsor,
- sponsoring committee, and
- supporter.

Distribute the handout located at Annex D detailing the squadron's sponsor, sponsoring committee, and any known supporters. Supporters may be anonymous, so not all supporters may be known to the squadron.

The sponsor may be a club (Royal Canadian Legion or Rotary Club of Canada), an association (Air Force Association of Canada), or a group of interested people (parents committee). The sponsor is responsible for the creation of a sponsoring committee, which is the basic unit of the ACLC.

The sponsoring committee has many responsibilities to fulfill at the squadron, which include but are not limited to:

- providing training aids and equipment not provided by DND;
- arranging recreational activities for the cadets;
- providing transportation when not provided by DND; and
- providing input to cadets' applications for summer training.

The squadron may also receive support from other organizations and individuals not associated with the sponsoring committee. These are recognized as supporters of the squadron, and usually provide assistance through periodic financial donations.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Identify the three levels of the ACLC.

Q2. Provide an example of an association which would sponsor an air cadet squadron.

Q3. What is a supporter?

ANTICIPATED ANSWERS

A1. National, provincial, and local.

A2. Air Force Association of Canada.

A3. Organizations or individuals not associated with the sponsoring committee who provide support to the squadron.

Teaching Point 2 | **Discuss the Role of the ACLC**

Time: 10 min | Method: Interactive Lecture

ROLE OF THE ACLC

The members of the ACLC perform many roles in support of air cadet squadrons. Two roles that are performed which directly affect the cadets, include:

- selecting scholarship recipients; and
- selecting cadets for national summer training courses.

Selecting Scholarship Recipients

The ACLC offers several scholarships and bursaries at the national level for air cadets, to include:

- **Robert and Mary Dale Scholarship.** Robert Dale served as National President of the ACLC from 1972–1973. Mr. Dale and his wife, Mary, set up an annual scholarship to be offered by the ACLC. This scholarship is awarded on the basis of secondary school achievements combined with outstanding performance as an air cadet. This award may be received only once by an individual.
  Applicants must be graduates of a secondary school (or equivalent) system from any province or territory in the year of application, with the intent of immediately starting full-time, post-secondary education. Applicants must also prove that they have been accepted at a post-secondary education institution which will lead to a degree, diploma, or a professional or technical qualification. The application deadline is May 1st of the entrance year.
- **Leonard and Kathleen Birchall Scholarship.** Air Commodore Leonard Birchall and Mrs. Kathleen Birchall have been long-time supporters of the Air Cadet Program. This support has been shown in many ways, most recently through an annual scholarship to be offered through the ACLC. This scholarship is awarded on the basis of secondary school achievements combined with outstanding performance as an air cadet and a community member. This award may be received only once by an individual.
  Applicants must be graduates of a secondary school (or equivalent) system from any province or territory in the year of application, with the intent of immediately starting full-time, post-secondary education. Applicants must also prove that they have been accepted at a post-secondary education institution which will lead to a degree, diploma, or professional or technical qualification. The application deadline is May 1st of the entrance year.
- **Pilot Training Achievement Awards.** Awarded annually to cadets who have graduated from the Power Pilot Scholarship national summer training course. An amount of money, dependant on the bursary, is either given to the recipient or credited to a flight training centre in order to cover the initial expenses for continuing to fly at the local flying club or flight training centre. These awards include:
  - Air Force Association of Canada Awards: Twenty-five $300 awards,
  - Virginia Mitchell Awards: $300 awards,
  - 426 Thunderbird Squadron Association: $300 award,
  - Sabre Pilots Association of the Air Division: Three $300 awards,
  - Air Transport Association of Canada: Two $500 awards,
  - John Kerr Memorial Award: $300 award,
  - Commissionaire Frank Kobe Award: $300 award,
  - 99’s Canadian Aviation Award: $300 awards,
  - Terry Angus Memorial Award: $300 awards, and

  - LCol D.V. (Bud) Crandell Award: $300 award.

- **Canadian Business Aviation Association (CBAA) Power Scholarship.** Awarded annually to the top overall applicant for the Power Pilot Scholarship from the province in which the CBAA is holding its annual general meeting. The recipient is sponsored by the CBAA allowing DND to send one more cadet each year.
- **CAE Power Scholarship.** Awarded annually to the top overall applicant for the Power Pilot Scholarship. The scholarship rotates among the provinces in which CAE has its training centres on an annual basis. The recipient is sponsored by CAE allowing DND to send one more cadet each year.
- **Air Line Pilots Association (ALPA) Power Scholarship.** Awarded annually to the top overall national applicant for the Power Pilot Scholarship. The recipients are sponsored on their scholarship by ALPA, allowing DND to send one more cadet each year.
- **Irvin Erb/Virginia Mitchell Awards for the Top Power Pilots in Canada.** Awarded annually to the male and female cadet who achieve the highest overall score on the Power Pilot Scholarship. Each recipient receives $1 000 towards further flight training.
- **Annual Music Awards for Excellence.** Awarded annually to the top musician in each of the pipes and drums and military band categories.

Distribute the handout located at Annex E detailing the national summer training courses to each cadet.

Selecting Cadets for National Summer Training Courses

The ACLC is involved in selecting cadets for the national summer training courses offered through the Air Cadet Program. This takes the form of a review board, where members will review applications and interview applicants. Not all courses will have the same selection process. The national summer training courses that the ACLC may select candidates for include:

- International Air Cadet Exchange (IACE),
- Power Pilot Scholarship (PPS),
- Glider Pilot Scholarship (GPS),
- Senior Leaders Course (SLC),
- Fitness and Sports Instructor Course (FSIC),
- Survival Instructor Course (SIC),
- Advanced Aerospace Course (AASC),
- Advanced Aviation Technology–Aircraft Manufacturing and Maintenance (AATC–AM),
- Advanced Aviation Technology–Airport Operations (AATC–AO), and
- Oshkosh Trip (OT).

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the Leonard and Kathleen Birchall scholarship awarded in recognition of?

Q2. What is the purpose of the Pilot Training Achievement Awards?

Q3. In what way are members of the ACLC involved in the selection of cadets for national summer training courses?

ANTICIPATED ANSWERS

A1. This scholarship is awarded on the basis of secondary school achievements combined with outstanding performance as an air cadet and community member.

A2. To help graduates of the Power Pilot Scholarship national summer course cover initial expenses for continuing to fly at their local flying club or flight training centre.

A3. A review board, where members will review applications and interview applicants.

Teaching Point 3	**Identify the Responsibilities of the ACLC**
Time: 5 min	Method: Interactive Lecture

RESPONSIBILITIES OF THE ACLC

The ACLC has a partnership with DND. The responsibilities of delivering the Air Cadet Program are divided between these two partners.

Where possible, provide examples where the cadets may have seen the results of the list below.

Distribute the handout located at Annex F detailing the responsibilities of the ACLC and DND to each cadet.

The ACLC and its members at all three levels have the following responsibilities:

- making recommendations for the formation or disbandment of squadrons;
- providing financial support to squadrons as required;
- supervising squadron sponsoring committees;
- overseeing, in cooperation with DND, the effective operation of air cadet squadrons and their sponsoring committees;
- administering trust accounts set up for awards to outstanding cadets;
- identifying and providing other appropriate awards to recognize commendable cadets’ and volunteers’ performances; and
- participating in the cadet selection process for national courses and exchange programs.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Identify three responsibilities of the ACLC.

ANTICIPATED ANSWERS

A1. The answer may be any three of the following:

- making recommendations for the formation or disbandment of squadrons;
- providing financial support to squadrons as required;
- supervising squadron sponsoring committees;
- overseeing, in cooperation with DND, the effective operation of air cadet squadrons and their sponsoring committees;
- administering trust accounts set up for awards to outstanding cadets;
- identifying and providing other appropriate awards to recognize commendable cadets' and volunteers' performances; and
- participating in the cadet selection process for national courses and exchange programs.

Teaching Point 4	**Identify the Responsibilities of DND**
Time: 5 min	Method: Interactive Lecture

RESPONSIBILITIES OF DND

DND has a partnership with the ACLC. The responsibilities of delivering the Air Cadet Program are divided between these two partners.

Where possible, provide examples of where the cadets may have seen the results of the list below.

DND and its representatives are responsible for providing the following:

- supervision and administration of cadet squadrons;
- materiel to squadron IAW the scale of issue;
- training, pay and allowances for Cadet Instructor Cadre (CIC) officers;
- funds for payment of annual funding allocations (operation and maintenance) and training bonuses;
- transportation for directed training;
- facilities and staff for cadet summer training centres (CSTCs);
- syllabi and training aids;
- medical care as authorized by regulations;
- liaison with cadet squadrons;
- officers or appropriate civilians for annual ceremonial reviews; and
- policy regarding CIC officers, civilian instructors, and cadets.

ACTIVITY

OBJECTIVE

The objective of this activity is to match the responsibilities with either the ACLC or DND as applicable.

RESOURCES

- Whiteboard,
- Tape, and
- Cue cards.

ACTIVITY LAYOUT

Desks that all face the whiteboard.

ACTIVITY INSTRUCTIONS

1. Divide the whiteboard into two halves.
2. Label one half as “Responsibilities of the ACLC” and the other half as “Responsibilities of DND”.
3. Distribute one cue card, in random order, to each cadet until the cards are all gone.
4. One at a time, have each cadet stand up, read their card, and then place it on the board under the appropriate heading.
5. Correct as required.

CONFIRMATION OF TEACHING POINT 4

The cadets’ participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in the matching activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The ACLC and DND have large roles to play in the support of a squadron. Most cadets do not see the efforts put forth by members of these two organizations beyond the staff and volunteers who regularly work with them. Recognizing the partnership of the ACLC and DND will provide the cadets with a new perspective on the operation of a squadron.

INSTRUCTOR NOTES/REMARKS

It is recommended that this EO be scheduled early in the training year and prior to the national course and scholarship selection boards.

REFERENCES

C3-247 Air Cadet League of Canada. (2008). *Policy and Procedures Manual*. Retrieved February 13, 2008, from www.aircadetleague.com/main.asp?language =english&*flash=enabled&page=news_e.html.*

C3-248 Air Cadet League of Canada. (2008). *Post-Secondary Scholarships*. Retrieved February 13, 2008, from www.aircadetleague.com/main.asp?language=english&*flash=enabled&page=news_e.html*.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C307.04 – IDENTIFY THE APPLICATION PROCEDURE FOR THE GLIDER AND POWER PILOT SCHOLARSHIPS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Complete Annex H prior to photocopying.

Photocopy Annexes G, H, I and J for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to the application procedure for the flying scholarship courses.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified the application procedures for the glider and power pilot scholarships.

IMPORTANCE

It is important for cadets to identify the application procedures for the glider and power pilot scholarships to ensure that prospective applicants are fully aware and prepared for the process.

Teaching Point 1	**Describe the Learning Resources Available**
Time: 10 min	Method: Interactive Lecture

There are many learning resources available for prospective applicants. These are divided into two categories:

- instructor-led resources, and
- self-study resources.

Distribute the handout located at Annex G.

INSTRUCTOR-LED RESOURCES

Many squadrons are able to provide an instructor who will deliver a ground school program, whether at their squadron or at another squadron. Normally this instructor will have an aviation background. The resources available for an instructor to use, include:

- **Ground School Master Lesson Plans.** A series of master lesson plans originally published by Region Cadet Support Unit (RCSU) (Atlantic). These plans cover the major subject areas needed in order to prepare for the qualifying exam. Included with the lesson plans are visual aids to be used with an overhead projector. Electronic copies of this document are available online at the resources page of the RCSU (Prairie) Air Operations website. Click on the search button, then scroll until you find the particular .zip file needed.
- **Pultz Private Pilot Study Guide.** A study guide produced by the Canadian company Pultz. This document is divided into sections for use either by an instructor or a student. It includes practice exams for each section as well as threshold knowledge exams for all subject areas. These are available through flight training centres or pilot supply shops (eg, Calgary Pilot Supply).
- **Culhane Private Ground School Study Guide.** A study guide designed for the private pilot licence, sections of it can also be used for glider pilot applicants. While the guide covers all necessary subject areas, there is an emphasis on the air law section.

SELF-STUDY RESOURCES

Many of the air cadet squadrons in Canada are not located near a large centre and may be unable to provide an instructor for a ground school program. Many cadets from these squadrons must rely on Cadet Summer Training Centre (CSTC) opportunities as well as programmed squadron training in order to prepare for the qualifying exam. There are resources available for cadets to use, including:

- **Ground School Self-Study CD.** This CD is a PowerPoint®-based program. The squadrons should make a copy of the program for each cadet. The program is divided into sections based on the subject areas needed to prepare for the qualifying exam. This program is available through RCSU(Prairie) Air Operations section.
- **Transport Canada Study Guides.** Available online through Transport Canada's website. There are many study guides available therefore care must be taken in which document is downloaded. The two most useful documents will be the GLIDE study guide and the Private Pilot Licence study guide. These documents will illustrate areas of study and references for research.

Preparing for the qualifying exam can be daunting. Regardless of whether an instructor is available, it is absolutely necessary for the applicant to have a copy of the most recent edition of MacDonald, A. F., & Peppler,

I. L., *From the Ground Up*, Aviation Publishers Co. Limited. This is the main reference from which the qualifying exam is created. The *From the Ground Up* workbook is also a useful tool.

There are three ways that a cadet can normally obtain a copy of the MacDonald, A. F., & Peppler, I. L., *From the Ground Up*, Aviation Publishers Co. Limited:

- from RCSU through the squadron,
- through a book store (eg, Chapters), and
- direct from Aviation Publishers at www.aviationpublishers.com.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Name three documents that can be used by an instructor to deliver a squadron ground school program.

Q2. Name two sources where cadets can find resources for self-study.

Q3. Which text is the basis of all questions in the qualifying exam?

ANTICIPATED ANSWERS

A1. Ground school master lesson plans, Pultz Private Pilot Study Guide, and Culhane Private Ground School Study Guide.

A2. Ground School Self-Study CD and Transport Canada Study Guides.

A3. MacDonald, A. F., & Peppler, I. L., *From the Ground Up*, Aviation Publishers Co. Limited.

Teaching Point 2	**Describe the Application Procedure**
Time: 25 min	Method: Interactive Lecture

The application procedure for the Glider Pilot Scholarship (GPS) and the Power Pilot Scholarship (PPS) are the same. There are some differences in the minimum requirements, restrictions, and questions that will be asked during the exam and at the scholarship review boards.

PREREQUISITES

Age. There is a minimum age for each course, based on Transport Canada licensing standards. The minimum age for the GPS is 16 years, while the minimum age of the PPS is 17 years. IAW Cadet Administration and Training Order (CATO) 54-20, *Summer Training Directive – Royal Canadian Air Cadets*, the cadet must specifically meet this requirement by September 1 of the course year.

Cadet Proficiency Level. Applicants must meet a minimum level of cadet proficiency level training to ensure that they have had the opportunity to develop life skills and elemental knowledge necessary for flight training. For GPS, cadets must have completed proficiency level three training by June 30 of the scholarship course year. For PPS, cadets must have completed proficiency level four training by June 30 of the scholarship course year.

Secondary Education. Applicants must meet a minimum level of secondary education to ensure the cadet will be able to handle the scholarship course material and workload. For GPS cadets must have completed the equivalent of Grade 9 or Secondary 3 in Quebec. For PPS, cadets must have completed the equivalent of Grade 10 or Secondary 4 in Quebec. This requirement must be met by the nomination deadline; normally this will be mid-January prior to the course.

PHYSICAL RESTRICTIONS FOR THE GLIDER PILOT SCHOLARSHIP

The gliders used for the GPS have certain height and weight restrictions that must be met. A person's size must be such that one can sit comfortably, reach the controls, and have full movement of the controls. Cadets who have been accepted for the GPS, but exceed these restrictions by the time they get to the Region Gliding School may be returned to unit.

Height	minimum: 137.16 cm (4 feet 6 inches)
	maximum: 190.5 cm (6 feet 3 inches)
Weight	minimum: 40.82 kg (90 pounds)
	maximum: 90.72 kg (200 pounds)

Note that there are no height or weight restrictions for the PPS. The aircraft used for training on this course are larger and have a higher tolerance for weight.

A ONE-PAGE NARRATIVE

Each applicant must submit a one-page narrative as part of their application package. This narrative must describe why the cadet would like to participate in the GPS or PPS. This is an opportunity for the cadet to communicate their reasons for applying. Particular attention should be given to spelling and grammar. The cadet must sign and date the narrative.

APPLICATION FORMS

For national summer training courses there are two application forms which must be filled out. These are:

- **CF-51.** The Application and Approval - Cadet Activities (Employment - Course - Exchange) is the standard application form for activities, summer training, and staff cadet employment.
- **DND 2226.** The Air Cadet Summer Training Application is the form to be completed when applying for a national summer training course. In Eastern Region, form CAD NO 115 is to be used instead.

QUALIFYING EXAM

Each applicant for the GPS and PPS is required to write a qualifying examination on aviation subject material. The purpose of this exam is to assist in the selection of the most suitable candidates for each of the two scholarships. While the results of the exam do not encompass the entire selection process, cadets who score higher on the exam will have an increased chance of being selected.

The Director Cadets and Junior Canadian Rangers (D Cdts & JCR) produces the qualifying exam every year. The exam will be invigilated and scored by each RCSU.

MEDICAL CERTIFICATE

Cadets are responsible for attaining a Transport Canada Category 3 Aviation Medical Certification. This is to be done at no expense to the public. A photocopy of the Medical Certificate (commonly referred to as a Licence Validation Certificate or LVC) should be attached to the DND 2226 or CAD NO 115. A photocopy of the LVC must be forwarded to the Region Cadet Air Operations Officer (RCA Ops O) no later than June 1 of the year of application. Failure to do this may result in a forfeiture of the scholarship.

There are three categories of aviation medical certificates available. The Category 3 is the only one required. A Category 1 medical is only required for holders of a Commercial Pilot's Licence. Category 1 medicals must be renewed annually, while a Category 3 medical is renewed every five years. Ensure that cadets only attain the Category 3 medical as there is no immediate benefit in attaining a Category 1 medical.

Distribute the completed copy of Annex H and review. Ensure the information is accurate.

THE ASSESSMENT AND SELECTION COMMITTEE

Once all applications have been received by the Air Cadet League of Canada (ACLC) Provincial Committee, each cadet's file will be scored. Once all applications have been scored, including the narrative and the qualifying exam, the ACLC Provincial Committee will then convene a scholarship assessment committee.

The assessment committee will conduct interviews. Members of the committee may vary but usually include one member of the ACLC, one member of the RCSU, and one member from a third party. The applicant will be asked questions based on general cadet knowledge, aviation-specific knowledge, and current events. The cadet will be scored based on the answers given. This score will then be added to the overall assessment score.

The actual format of the interviews has varied over the years, ranging from formal affairs to informal sessions. Variations may also occur between ACLC Provincial Committees. Ensure that cadets are given the most recent information on the format used by the respective ACLC Provincial Committee.

Distribute the handout located at Annex I if a package is not available from the ACLC Provincial Committee.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How old must a cadet be in order to apply for the GPS?

Q2. What forms must a cadet complete to apply for the GPS or PPS?

Q3. What is the deadline for a cadet to forward a copy of their medical certificate to the RCA Ops O?

ANTICIPATED ANSWERS

A1. 16.

A2. CF-51 and DND 2226 (or CAD NO 115 in Eastern Region).

A3. June 1 of the application year.

Teaching Point 3	**Describe the Qualifying Exam**
Time: 20 min	Method: Interactive Lecture

THE QUALIFYING EXAM

The qualifying exam is to be written by all prospective applicants for the GPS and PPS. Guidelines for the qualifying exam can be found in CATO 54-20, *Summer Training Directive – Royal Canadian Air Cadets*, CATO 54-26, *Glider Pilot Scholarship Program*, and CATO 54-27, *Power Pilot Scholarship Program*. There is a quota for each squadron for the number of applicants that may write the qualifying exam.

Format

The qualifying exam is a multiple choice exam. Each question has four possible answers. There is only one correct answer per question.

Cadets will have two hours to complete the exam without assistance. There are a total of 50 questions on the exam. The first 40 questions are for all applicants to complete. These questions are based on subject areas such as principles of flight, meteorology, and navigation. Once complete, the applicants for the GPS are finished. Applicants for the PPS will remain and complete the last 10 questions, which are based primarily on the subject of aero engines.

A study guide for the exam can be found at CATO 54-26, *Glider Pilot Scholarship Program* Annex A for GPS applicants, or CATO 54-27, *Power Pilot Scholarship Program* Annex A for PPS applicants.

Pass Mark

The minimum pass mark for the qualifying exam is 50 percent. However, simply passing the exam will not ensure a successful application. The higher a cadet scores, the higher the overall assessment score will be on the application.

Preparation

Distribute the handout located at Annex J and review.

Preparation for the qualifying exam will vary depending on the individual. Regardless of whether an organized ground school program is available, there is a certain amount of self-study that will be necessary. A major factor in preparation for this exam may be the timing. While it is the responsibility of each RCSU to set the dates for the exam, it must be written prior to the application deadline. This normally means that the exam is scheduled in mid-January; shortly after the Christmas break and for many students this is at the same time as semester exams.

Studying MacDonald, A. F., & Peppler, I.L., *From the Ground Up*, Aviation Publishers Co. Limited, is the best method of preparation available to all applicants. In particular, the questions in the back of the text are very useful. The complementary workbook is also useful for studying.

Many squadrons with established ground school programs will have practice exams that are available to cadets. Depending on the resources available (reference TP 1), practice questions may be reproduced for use by the cadets. Practice exams are also available online from RCSU (Pacific) and RCSU (Atlantic).

It is recommended that cadets who are preparing for the qualifying exam be given CATO 54-26, *Glider Pilot Scholarship Program* Annex A or CATO 54-27, *Power Pilot Scholarship Program* Annex A depending on the scholarship course for which they are applying. The cadet will be able to use this as a study guide.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. How long does a cadet have to write the qualifying exam?

Q2. What is the pass mark of the qualifying exam?

Q3. What is the best resource to use as a study guide for the qualifying exam?

ANTICIPATED ANSWERS

A1. Two hours.

A2. Fifty percent.

A3. CATO 54-26, *Glider Pilot Scholarship Program* Annex A or CATO 54-27, *Power Pilot Scholarship Program* Annex A.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. On which book is the qualifying exam based?

Q2. What forms must a cadet fill out in order to apply for the GPS or PPS?

Q3. What is the best resource to use as a study guide for the qualifying exam?

ANTICIPATED ANSWERS

A1. *From the Ground Up*.

A2. CF-51 and DND 2226 (or CAD NO 115 in Eastern Region).

A3. CATO 54-26, *Glider Pilot Scholarship Program* Annex A or CATO 54-27, *Power Pilot Scholarship Program* Annex A.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Awareness of the application procedures for the GPS and PPS will assist cadets in preparing for the application process.

INSTRUCTOR NOTES/REMARKS

This EO should be scheduled in conjunction with EO M307.02 (Identify Year Three CSTC Training Opportunities, Section 2).

The learning resources and medical examiner's handouts for this lesson will have to be adapted to reflect local availability.

REFERENCES

A3-060 Director Cadets 4. (2007). CATO 54-26, *Glider Pilot Scholarship Program*. Ottawa, ON: Department of National Defence.

A3-061 Director Cadets 4. (2007). CATO 54-27, *Power Pilot Scholarship Program*. Ottawa, ON: Department of National Defence.

A3-062 Director Cadets 4. (2007). CATO 54-20, *Summer Training Directive – Royal Canadian Air Cadets*. Ottawa, ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C307.05 – PARTICIPATE IN A PRESENTATION ON THE DUKE OF EDINBURGH AWARD PROGRAM

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Contact the local Duke of Edinburgh Award program division and gather presentation material about the Duke of Edinburgh Award program.

A member of the squadron staff may present this lesson if a Duke of Edinburgh Award program representative is unavailable.

PRE-LESSON ASSIGNMENT

N/A

APPROACH

An interactive lecture was chosen for this lesson to introduce, clarify, emphasize and summarize the objectives of the Duke of Edinburgh Award program.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have participated in a presentation on the Duke of Edinburgh Award program.

IMPORTANCE

It is important for cadets to know all opportunities for growth available to them. The Duke of Edinburgh Award program is one opportunity that is widely available to cadets. By knowing what the program entails and what the rewards are, cadets will have a better understanding of the program and be able to decide if they wish to become a participant.

BACKGROUND KNOWLEDGE

The material for this lesson will be gathered from the provincial office of the Duke of Edinburgh Award program. Videos, brochures and activities used to present the information can be found at www.dukeofed.org.

The program was founded in 1956 by His Royal Highness Prince Philip, The Duke of Edinburgh K.G. K.T. in London, England, as a means to encourage and motivate youth. The goal of the Duke of Edinburgh Award program is to encourage young people's participation in activities they already enjoy and to develop personal goals and encourage achievement based on individual effort and improvement.

The Duke of Edinburgh Award program is about personal challenge, and aims to encourage and stimulate:

1. self-reliance and self-discipline,
2. perseverance and determination,
3. initiative and creativity,
4. community involvement and social responsibility,
5. value orientation and value-oriented decision making,
6. the spirit of adventure,
7. fitness of body and mind,
8. vocational, cultural and family life skills, and
9. international understanding and awareness.

The award is a lapel pin or brooch, and an inscribed certificate of achievement. Upon completion of the Gold award, the individual will be presented the award by HRH Prince Philip or a member of the royal family.

More than 30 000 young Canadians are currently participating in the Duke of Edinburgh Award program; many within the Canadian Cadet Movement.

Teaching Point 1	**Describe the Different Levels of the Program**
Time: 5 min	Method: Interactive Lecture

There are three levels within the Duke of Edinburgh Award program. Each successive level requires more commitment and becomes more demanding. The levels are Bronze, Silver and Gold. A young person may choose to participate at any time and any level, keeping in mind the prescribed age requirements.

Bronze. For youth over the age of 14. There is a minimum 6-month period of participation.

Silver. For youth over the age of 15. There is a minimum 12-month period of participation.

Gold. For youth over the age of 16. There is a minimum 18-month period of participation.

If a participant has completed a prior level, the period of participation is decreased by six months. (eg, a cadet who has completed the Bronze level can complete the Silver level in six months).

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the three levels of the program?

Q2. What is the age requirement for the program?

Q3. When can a person start the Gold level?

ANTICIPATED ANSWERS

A1. The three levels of the program are Bronze, Silver and Gold.

A2. The age requirement is a minimum of 14, although each subsequent level has an age minimum if a participant is just beginning the program.

A3. The Gold level can be started at age 16.

Teaching Point 2	**Explain the Five Sections of the Program**
Time: 10 min	Method: Interactive Lecture

The Award's activities are arranged into sections, and within each section there are many choices. There are five sections to the program. The four common sections are:

- service,
- adventurous journey,
- skills, and
- physical recreation.

At the Gold level, participants have to complete a residential project.

SERVICE

Service is a commitment to the needs of others without pay.

The goal of the service section is to encourage participants to realize that as members of a community, they have a responsibility to others and that their help is needed. By helping others, it is hoped that participants will find satisfaction sparking a commitment to community service for life.

ADVENTUROUS JOURNEY

The goal of the adventurous journey is to develop self-reliance by undertaking a journey of discovery. The adventurous journey encourages participants to develop an awareness of the natural environment, and the importance of protecting it.

The distance the cadet must travel and the duration of the journey varies for each level of the Award:

- Bronze – two days including one night away,
- Silver – three days including two nights away, and
- Gold – four days including three nights away.

The hours the cadet must spend on planned activities varies for each level:

- Bronze – an average of six hours per day,
- Silver – an average of seven hours per day, and
- Gold – an average of eight hours per day.

There are three types of journeys that can be undertaken:

- **Explorations.** A purpose with a trip. During this journey, participants must spend a minimum of 10 hours on journeying (moving without motorized assistance). The remainder of the time is spent on a special activity, (eg, historic site exploration, or studying flora and fauna). Explorations must involve pre-journey research, on-site study, and a report on the findings.
- **Expeditions.** A trip with a purpose. An Expedition is a journey where participants stay at a different campsite each night. The required hours will be spent on journeying, navigating and route finding. This may include tasks related to the purpose of the expedition.
- **Adventurous Projects.** An Adventurous Project is a journey that does not fit the above descriptions exactly, or may be a combination of the two. This type of journey would be used by those with medical restrictions or who require more challenges.

All Explorations, Expeditions and Adventurous Projects must have a clearly defined and a preconceived purpose.

SKILLS

The goal of the skills section is to encourage the discovery of personal interests and development of social and practical skills. Participants are encouraged to take up interests within a range of practical, social and cultural activities. Skills can be either a progressive activity such as stamp collecting, playing a musical instrument, a study of a topic of personal interest such as money matters, or a definite task such as building something.

PHYSICAL RECREATION

The goal of the physical recreation section is to encourage participation in physical activity and provide an opportunity to improve performance and learn to appreciate physical recreation as an important component of a healthy lifestyle.

Participation in one or more physical activities for the required number of weeks:

- Bronze – 30 hours over a minimum of 15 weeks,
- Silver – 40 hours over a minimum of 20 weeks, and
- Gold – 50 hours over a minimum of 25 weeks.

Improvement of overall performance is essential for qualification in this section.

RESIDENTIAL PROJECT

The goal of the residential project is to develop social adaptability through involvement in a group setting. It involves participants in projects or training in the company of peers who are not their everyday companions.

The residential project is applied only at the Gold level, but can be completed at any time during award participation.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are the five sections of the Duke of Edinburgh Award program?

Q2. What is the goal of the skills section?

Q3. When is the residential project completed?

ANTICIPATED ANSWERS

A1. The five sections of the program are:

- service,
- adventurous journey,
- skills,
- physical recreation, and
- residential project.

A2. The goal of the skills section is to encourage the discovery of personal interests and development of social and practical skills. Participants are encouraged to take up interests within a range of practical, social and cultural activities.

A3. The residential project can be completed at any time during award participation.

Teaching Point 3	**Describe the Relationship Between the Squadron, CSTC Programs and the Duke of Edinburgh Award Program**
Time: 5 min	Method: Interactive Lecture

This TP is designed to inform the cadet about the opportunities within the Award that correspond with activities within the Canadian Cadet Organization (CCO).

The CCO offers many opportunities for participants to work toward completing their respective level.

Within the squadron program and CSTC program, many opportunities exist for cadets to meet the requirements of the Award. Beyond the opportunities listed, many other opportunities may also exist, especially in very active cadet squadron. Some examples of cadet activities that meet the Award requirements are:

- **SERVICE**
  - participating in community service activities as part of PO 302 (Perform Community Service, Chapter 2) within the squadron program;
  - participating in opportunities as a senior cadet when instructing junior cadets during the squadron program;
  - helping with the cadet squadron newsletter;
  - volunteering to help the Royal Canadian Legion during Poppy Days; and
  - participating in a band demonstration where the squadron does not receive funds in return.
- **ADVENTUROUS JOURNEY**
  - participating in the Proficiency Level program weekend field exercise (Aircrew Survival) will qualify as practice or adventurous journeys for Bronze and Silver levels; and

- participating in most Year 2+ CSTC program exercises will qualify as practice or adventurous journeys for Bronze and Silver level.

- **SKILL**
  - participating in the cadet squadron band;
  - participating in the marksmanship team; and
  - participating in the drill team.
- **PHYSICAL FITNESS**
  - participating in recreational sports as part of PO 305 (Participate in Recreational Sports, Chapter 5),
  - participating in cadet fitness testing as part of PO 304 (Update Personal Activity Plan, Chapter 4); and
  - participating in recreational sports as part of the CSTC Program.
- **RESIDENTIAL PROJECT**
  - participation in any qualification at a CSTC.

CATO 13-19, *The Duke of Edinburgh's Award*, outlines the participation requirements of a youth as a member of the Air Cadet program.

In addition to all the award requirements that are recognized as part of the Cadet Program, many activities cadets participate in outside the cadet squadron also count toward the award, such as:

- volunteer activities,
- extracurricular sports teams,
- school clubs, and
- hobbies.

Duke of Edinburgh Award pins may be worn on the cadet uniform in accordance with CATO 55-04, *Air Cadet Dress Instructions*.

After cadets have been informed of the Duke of Edinburgh Award program, and displayed interest in participation, discuss participation with the CO.

Contact the divisional office of the Duke of Edinburgh Award program. Contact information for the offices can be found at www.dukeofed.org.

After the Division office has been contacted:

1. Collect the registration fee from each cadet who wants to participate in the program.
2. If there are only a few cadets who wish to participate, register them as individuals.
3. If the squadron be participating as a whole, register as a group.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What activities at the squadron can be completed as part of the service section of the award?

Q2. What optional activities within cadets can be used for the skill section?

Q3. When is the residential project completed?

ANTICIPATED ANSWERS

A1. As part of the service section, the following can be completed at the home squadron:

- participating in community service activities as part of PO 302 (Perform Community Service, Chapter 2) within the squadron program;
- participating in opportunities as a senior cadet when instructing junior cadets during the squadron program;
- helping with the cadet squadron newsletter;
- volunteering to help the Royal Canadian Legion during Poppy Days; and
- participating in a band demonstration where the squadron does not receive funds in return.

A2. Participating in the cadet squadron band, the marksmanship team, and the drill team may be used to complete the skill section.

A3. The residential project is completed with any qualification at a CSTC.

Teaching Point 4	**Facilitate a Question and Answer Period**
Time: 5 min	Method: Interactive Lecture

Allow cadets time to ask questions and discuss participation in the program.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in a question and answer period will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the presentation on the Duke of Edinburgh Award program will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The Duke of Edinburgh Award program is one of the largest award programs for youth across the world. Informing cadets about the program will encourage them to participate in the program. It will give them positive experiences to move toward in both the Cadet Program and in life.

INSTRUCTOR NOTES/REMARKS

Training aids should be determined by contacting the speaker prior to the presentation.

Cadets may participate in the Duke of Edinburgh Award program as an optional activity.

A member of the squadron staff may present this lesson if a Duke of Edinburgh Award representative is unavailable.

REFERENCES

C0-196 Duke of Edinburgh Award. (2008). *The Award*. Retrieved February 12, 2008, from http://www.dukeofed.org/Award.htm.

C0-197 Duke of Edinburgh Award. (2007). *Participant's Record Book*. Markham, ON: Langstaff Reed Printing Ltd.

PROFICIENCY LEVEL THREE POS AND EOS

PO 301 – Citizenship Recognize the Purpose of Service Groups Within Canada	
M301.01	Discuss Community Service Groups
C301.01	Discuss the Three Branches of the Canadian Government
C301.02	Discuss Current Events
C301.03	Tour a Local Community Service Group
C301.04	Participate in a Presentation Given by Guest Speaker from a Local Community Service Group
PO 302 – Community Service Perform Community Service	
M302.01	Perform Community Service
C102.01	Participate in a Ceremonial Parade
C102.02	Perform Community Service
PO 303 – Leadership Perform as a Team Leader	
M303.01	Define the Role of a Team Leader
M303.02	Participate in a Mentoring Relationship
M303.03	Practice Self-Assessment
M303.04	Communicate as a Team Leader
M303.05	Supervise Cadets
M303.06	Solve Problems
M303.07	Lead Cadets Through a Leadership Assignment
303 PC	(Practical Assessment of Lead Cadets Through a Leadership Assignment)
C303.01	Lead Team-Building Activities
C303.02	Deliver a Presentation About a Leader
C103.03	Participate in Team-Building Activities
C203.01	Record Entries in a Reflective Journal
C203.02	Employ Problem Solving
C203.04	Participate in a Presentation Given by a Leader
C203.05	Participate in Trust-Building Activities

C203.06	Participate in Problem-Solving Activities
PO 304 – Personal Fitness and Healthy Living Update Personal Activity Plan	
M304.01	Describe the Components of Physical Fitness
M304.02	Participate in the Cadet Fitness Assessment
M304.03	Update Personal Activity Plan
M304.04	Evaluate Personal Activity Plan
C304.01	Participate in the Cadet Fitness Assessment
C304.02	Evaluate Personal Activity Plan
C304.03	Describe Stress
C104.01	Create Team Goals
PO 305 – Recreational Sports Participate in Recreational Sports	
M305.01	Participate in Organized Recreational Team Sports
C105.01	Participate in a Sports Tabloid
C105.02	Participate in an Organized Intramural Sports Event
C105.03	Participate in an Orienteering Event
PO 306 – Air Rifle Marksmanship Participate in Recreational Air Rifle Marksmanship	
M306.01	Participate in Recreational Marksmanship Activity
C306.01	Identify Civilian Marksmanship Organizations
C306.02	Correct Marksmanship Error
C306.03	Adopt the Standing Position With the Cadet Air Rifle
C206.01	Practice Holding Techniques
C206.02	Practice Aiming Techniques
C206.03	Practice Firing Techniques
C106.01	Participate in a Recreational Marksmanship Activity
PO 307 – General Cadet Knowledge Serve in an Air Cadet Squadron	
M307.01	Identify Proficiency Level Three Training Opportunities
M307.02	Identify Year Three CSTC Training Opportunities

M307.03	Recognize the Partnership Between the Air Cadet League of Canada (ACLC) and DND
C307.01	Participate in a Presentation Given by a Guest Speaker From the Regional Cadet Support Unit
C307.02	Participate in a Presentation Given by a Guest Speaker From the Cadet Liaison Officer
C307.03	Participate in a Presentation Given by a Guest Speaker From the Air Cadet League of Canada
C307.04	Identify the Application Procedures for the Glider and Power Pilot Scholarships
PO 308 – Drill Direct a Squad Prior to a Parade	
M308.01	Prepare a Squad for Parade
M308.02	Deliver Words of Command
PC 308	(Practical Assessment of M308.02)
C308.01	Execute Flag Drill
C308.02	Deliver Words of Command
C208.01	Practice Ceremonial Drill as a Review
C208.02	Execute Drill with Arms
PO 309 – Instructional Techniques Instruct a Lesson	
M309.01	Explain Principles of Instruction
M309.02	Identify Methods of Instruction
M309.03	Explain Effective Speaking Techniques
M309.04	Recognize Questioning Techniques
M309.05	Select Appropriate Instructional Aids
M309.06	Plan a Lesson
M309.07	Instruct a 15-Minute Lesson
C309.01	Deliver a One-Minute Verbal Presentation
C309.02	Plan a Lesson
C309.03	Instruct a 15-Minute Lesson
C309.04	Identify Formations for Drill
C309.05	Plan a Drill Lesson
C309.06	Instruct a 15-Minute Drill Lesson
PO 311 – Summer Biathlon Participate in Recreational Summer Biathlon Activities	

C311.01	Practice Aiming and Firing the Cadet Air Rifle Following Physical Activity
C311.02	Participate in a Recreational Summer Biathlon Activity
PO 320 – CF Familiarization Participate in Canadian Forces (CF) Familiarization Activities	
M320.01	Describe the Role of Canada's Air Force
C320.01	Discuss Canadian Forces (CF) Careers in Aviation
C320.02	Tour a Canadian Forces (CF) Facility
C320.03	Participate in a Presentation Given by a Guest Speaker From a Local Air Force Unit
C120.03	Contact a CF Member on Deployment
PO 331 – Principles of Flight Explain Principles of Flight	
M331.01	Describe Aircraft Stability
C331.01	Review Principles of Flight
C331.02	Read Pitot Static Instruments
C331.03	Identify Aspects of Helicopter Aerodynamics
C331.04	Demonstrate Attitudes and Movements in a Flight Simulator
C331.05	Participate in a Presentation Given by a Guest Speaker From the Local Aviation Community
PO 336 – Meteorology Identify Meteorological Conditions	
M336.01	Describe Properties of the Atmosphere
M336.02	Explain the Formation of Clouds
M336.03	Explain the Effects of Air Pressure on Weather
M336.04	Explain the Effects of Humidity and Temperature on Weather
PC	(Aviation Subjects) – Combined Assessment
C336.01	Read an Aviation Routine Weather Report (METAR)
C336.02	Tour a Meteorological Facility
C336.03	Participate in a Presentation Given by a Flight Services Specialist
PO 337 – Navigation Demonstrate Air Navigation Skills	
M337.01	Measure a Distance Along a Route
M337.02	Determine a Position on a Visual Flight Rules (VFR) Navigational Chart (VNC)

C337.01	Operate a Radio for Aviation Transmissions
C337.02	Practice Air Navigation Skills
PO 340 – Aerospace Identify Aspects of Space Exploration	
M340.01	Identify Canadian Astronauts
M340.02	Discuss the History of Manned Space Exploration
C340.01	Identify Canadian Astronauts
C340.02	Discuss the Canadian Space Program
C340.03	Discuss Unmanned Space Exploration
C340.04	Describe Elements of the Night Sky
C340.05	Simulate Life in Space
C340.06	Launch a Water Rocket
C340.07	Identify Global Positioning System (GPS) Components
C340.08	Describe Aspects of the International Space Station (ISS)
C340.09	Participate in a Presentation Given by a Guest Speaker From the Astronomy Community or the Aerospace Industry
C340.10	Identify Online Stargazing Programs
PO – 360 Aerodrome Operations Recognize Aspects of Aerodrome Operations	
C360.01	Identify Types of Aerodromes
C360.02	Explain Aspects of Aerodrome Lighting
C360.03	Construct a Model of the Airspace at an Aerodrome
C360.04	Identify How Equipment is Used at an Aerodrome
C360.05	Identify Aspects of Emergency Response and Aerodrome Security
C360.06	Explain Aspects of Air Traffic Services (ATS)
PO – 370 Aircraft Manufacturing and Maintenance Recognize Aspects of Aerodrome Operations	
M370.01	Identify Components of the Pitot Static System
M370.02	Identify Aircraft Manufacturers
M370.03	Describe Routine Aircraft Inspection Procedures
C370.01	Identify Tasks Required to Maintain Aircraft

C370.02	Describe Materials Used in Aircraft Construction
C370.03	Identify Basic Power Tools Used in Aircraft Manufacturing and Maintenance
C370.04	Construct an Aluminum Model Biplane
C370.05	Tour an Aircraft Restoration Project
C270.01	Participate in a Presentation Given by a Guest Speaker From the Aircraft Manufacturing or Maintenance Industry
C270.03	Tour an Aircraft Manufacturing or Maintenance Facility
PO – 390 Aircrew Survival Participate in a Field Exercise	
M390.01	Identify Parts of the Compass
M390.02	Identify Marginal Information and Conventional Signs
M390.03	Determine Grid References (GRS)
M390.04	Determine Distances on a Map and on the Ground
M390.05	Determine Bearings on a Map and on the Ground
390 PC	Navigate a Route Using a Map and Compass
C390.01	Identify Types of Maps
C390.02	Interpret Contour Lines
C390.03	Orient a Map by Inspection
C390.04	Orient a Map Using a Compass
C390.05	Calculate Magnetic Declination
C390.06	Determine Direction Using the Sun
C390.07	Determine Direction at Night
C390.08	Use Blazing Techniques
C390.09	Identify Elements of the Night Sky
C390.10	Identify Methods of Preparing and Cooking a Small Animal or Fish
C390.11	Construct Camp Crafts
C390.12	Perform Minor First Aid in a Field Setting
C390.13	Act as a Member of a Ground Search and Rescue (SAR) Party
C390.14	Participate in a Presentation Given by a Guest Speaker from the Search and Rescue (SAR) Community
C290.04	Construct a Solar Still

PERFORMANCE OBJECTIVES

PO 301 Citizenship	PO 306 Air Rifle Marksmanship	PO 320 CF Familiarization
PO 302 Community Service	PO 307 General Cadet Knowledge	PO 331 Principles of Flight
PO 303 Leadership	PO 308 Drill	PO 336 Meteorology
PO 304 Personal Fitness and Healthy Living	PO 309 Instructional Techniques	PO 337 Navigation
PO 305 Recreational Sports	PO 311 Summer Biathlon	PO 340 Aerospace
PO 360 Aerodrome Operations	PO 370 Aircraft Manufacturing and Maintenance	PO 390 Aircrew Survival

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PERFORMANCE OBJECTIVE STATEMENTS

Recognize the Purpose of Service Groups Within Canada
Perform Community Service
Perform the Role of a Team Leader
Update Personal Activity Plan
Participate in Recreational Sports
Fire the Cadet Air Rifle During Recreational Marksmanship
Serve in an Air Cadet Squadron
Direct a Squad Prior to a Parade
Instruct a Lesson
Participate in a Recreational Summer Biathlon Activity
Participate in Canadian Forces (CF) Familiarization Activities
Describe Principles of Flight
Identify Meteorological Conditions

Demonstrate Air Navigation Skills
Identify Aspects of Space Exploration
Recognize Aspects of Aerodrome Operations
Recognize Aspects of Aircraft Manufacturing and Maintenance
Navigate a Route Using a Map and Compass

____ RCACS SPONSOR INFORMATION

Name of Squadron Sponsor: ____

Sponsoring Committee Chairperson: ____

Members of the Executive Committee:

____

____

____

____

Known Supporters:

____

____

____

____

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AIR CADET NATIONAL SUMMER TRAINING COURSES

International Air Cadet Exchange (IACE)

Power Pilot Scholarship (PPS)

Glider Pilot Scholarship (GPS)

Senior Leaders Course (SLC)

Fitness and Sports Instructor course (FSIC)

Survival Instructor Course (SIC)

Advanced Aerospace Course (AASC)

Advanced Aviation Technology–Airport Operations (AATC–AO)

Advanced Aviation Technology–Aircraft Manufacturing and Maintenance (AATC–AM)

Oshkosh Trip (OT)

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PARTNERSHIP RESPONSIBILITIES OF THE ACLC

PARTNERSHIP RESPONSIBILITIES OF THE ACLC

1. Make recommendations for the formation or disbandment of squadrons.

2. Provide financial support to squadrons as required.

3. Supervise squadron sponsoring committees.

4. Oversee, in cooperation with DND, the effective operation of Air Cadet squadrons and their sponsoring committees.

5. Administer trust accounts set up for awards to outstanding cadets.

6. Identify and provide other appropriate awards to recognize commendable cadet' and volunteers' performances.

7. Participate in the cadet selection process for national courses and exchange programs.

PARTNERSHIP RESPONSIBIITIES OF DND

1. Supervision and administration of cadet squadrons.

2. Materiel to squadron IAW the scale of issue.

3. Training, pay and allowances for Cadet Instructor Cadre (CIC) officers.

4. Funds for payment of annual funding allocations (operation and maintenance) and training bonuses.

5. Transportation for directed training.

6. Facilities and staff for cadet summer training centres (CSTCs).

7. Syllabi and training aids.

8. Medical care as authorized by regulations.

9. Liaison with cadet squadrons.

10. Officers or appropriate civilians for annual ceremonial reviews.

11. Policy regarding CIC officers, civilian instructors, and cadets.

RESOURCES AVAILABLE

- ❑ Ground school master lesson plans
- ❑ Pultz Private Pilot Study Guide
- ❑ Culhane Private Ground School Study Guide
- ❑ Ground School Self-Study CD
- ❑ Transport Canada Study Guides
- ❑ MacDonald, A. F., & Peppler, I.L., *From the Ground Up*, Aviation Publishers Co. Limited
- ❑ From the Ground Up Workbook
- ❑ Squadron ground school program
- ❑ Ground school program at another squadron

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LOCAL TRANSPORT CANADA AVIATION MEDICAL EXAMINERS

1. Name: ____

   Address: ____

   ____

   Phone: ____________________

2. Name: ____

   Address: ____

   ____

   Phone: ____________________

3. Name: ____

   Address: ____

   ____

   Phone: ____________________

Note: A search can be conducted at www.tc.gc.ca/aviation/applications/cam/en/camsearch.asp?x_lang=e

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GUIDE FOR REVIEW BOARD PREPARATION

1. Identify the following political leaders:
   (a) Prime Minister of Canada,
   (b) Governor General of Canada,
   (c) Minister of National Defence,
   (d) Premier of your province,
   (e) Lieutenant Governor of your province,
   (f) Member of Parliament for your riding, and
   (g) Provincial representative for your riding.
2. Identify the following military personnel:
   (a) Chief of Defence Staff,
   (b) Chief of Reserves and Cadets,
   (c) Cief of the Air Staff, and
   (d) RCSU Commanding Officer.
3. Identify the following League personnel:
   (a) National President,
   (b) Provincial Chairperson, and
   (c) squadron Sponsoring Committee Chairperson.
4. Watch or read the news for at least two weeks prior to the review board date. Be familiar with major current events, especially those that deal with Canadians, Canada's military, and the aviation industry.

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PREPARING FOR THE QUALIFYING EXAM

1. Ensure that you have gathered all study materials available. (See resource checklist at Annex G).
2. Go through the material once, writing down questions.
3. Find someone in the local community who may be able to help find the answers. (Ground school instructor, science teacher, etc).
4. Go through the material again. The exam is multiple choice, so concentrate on key words and concepts.
5. If possible, go through the practice exams multiple times.
6. Be sure to have all of the information relevant to the exam (eg, time, date, etc).
7. Show up early for the exam. This will give you time to become comfortable with the surroundings.
8. Whatever you do, do not leave studying to the last minute.

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CHAPTER 8

PO 308 – DIRECT A FLIGHT PRIOR TO A PARADE

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M308.01 – PREPARE A SQUAD FOR PARADE

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the drill sequence handout at Annex A and the aide-mémoire card at Annex B as required.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to introduce drill theory to the cadet.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate preparing a flight for a parade while providing an opportunity for the cadets to practice the skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to prepare a flight for parade.

IMPORTANCE

It is important for cadets to be able to prepare a flight for parade as they will be in placed in a team leader role and will need to know the formations and locations of all members on the parade square.

Teaching Point 1 **Explain Drill Theory**

Time: 20 min Method: Interactive Lecture

SQUAD FORMATIONS

> The term squad is a generic name for a group of cadets. This term can be interchanged with flight, platoon, division or any other applicable elemental or regimental term.

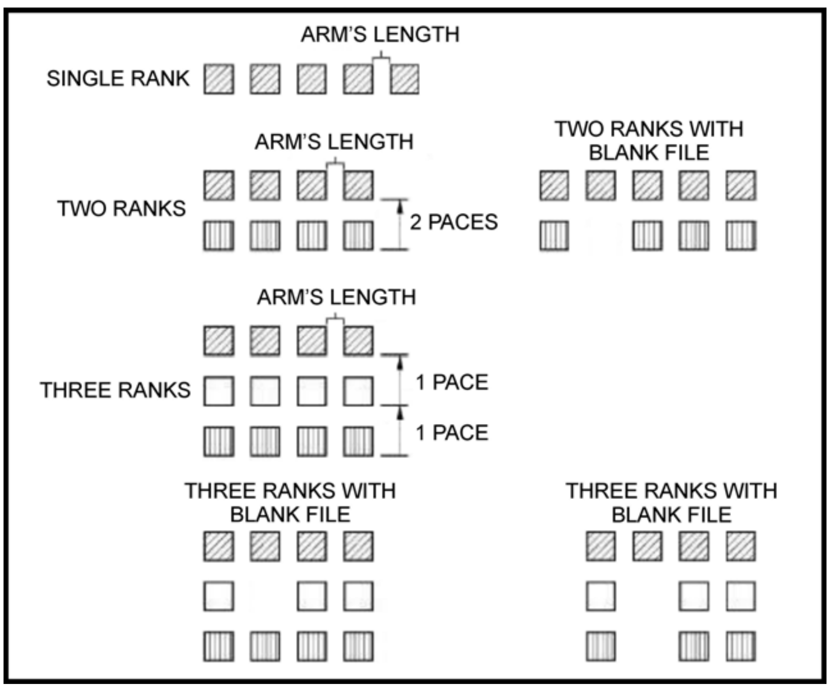
> The squad formation should be implemented when there is a parade strength of less than 32 cadets.

Squad formations are essential to maintain control and ensure uniformity. The instructor shall determine the formation to be used, based on the number of cadets present, to include:

Single Rank. A single rank shall be formed when there are five or fewer cadets.

Two Ranks. Two ranks shall be formed when there are six to nine cadets.

Three Ranks. Three ranks shall be formed when there are 10 or more cadets.



A-PD-201-000/PT-000 (p. 2-2)

Figure 8-1-1 Squad Formations

When there are not enough cadets to form complete files, a file shall be left blank (as illustrated in Figure 8-1-1). The file blank shall be the second file from the left.

In two ranks, this blank file is without a rear rank cadet, and in three ranks, this blank file is without a centre and/or rear rank cadet.

The symbol for the Parade Commander (Pde Comd) is:

The symbol for the Parade Deputy Commander (Dcomd) is:

The symbol for the Squadron Warrant Officer (SWO) is:

The symbol for Flight Commander (Flt Comd) is:

The symbol for the Flight Sergeant (Flt Sgt) is:

The symbol Flight Marker (Marker) is:

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-1-2 Parade Appointment Symbols

SQUADRON FORMATIONS

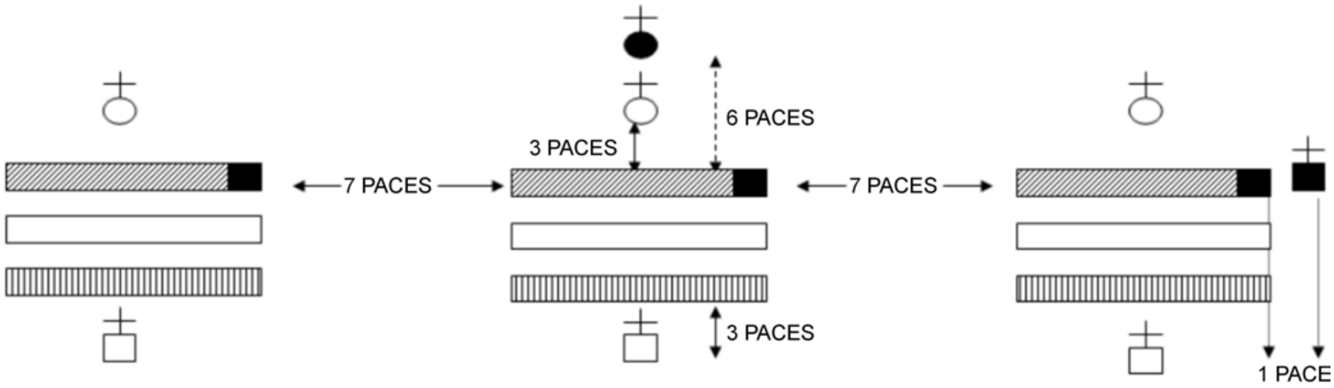
A squadron consists of two or more flights. The aim of squadron drill is to manoeuvre the flight as one under the command of a parade commander and assistance of a parade deputy commander. Other senior non-commissioned officers (NCOs) not directly involved with the flights, shall be supernumeraries and form supernumerary ranks as directed by the parade commander. There shall be seven paces between flights for all formations.

When space is limited, intervals and distances between flights may be decreased.

There are three squadron formations used by cadets, to include:

Line. A squadron is formed in line when flights are formed up side-by-side, seven paces apart and aligned facing the front, with parade appointments located in the front and rear of the formation (as illustrated in Figure 8-1-3).

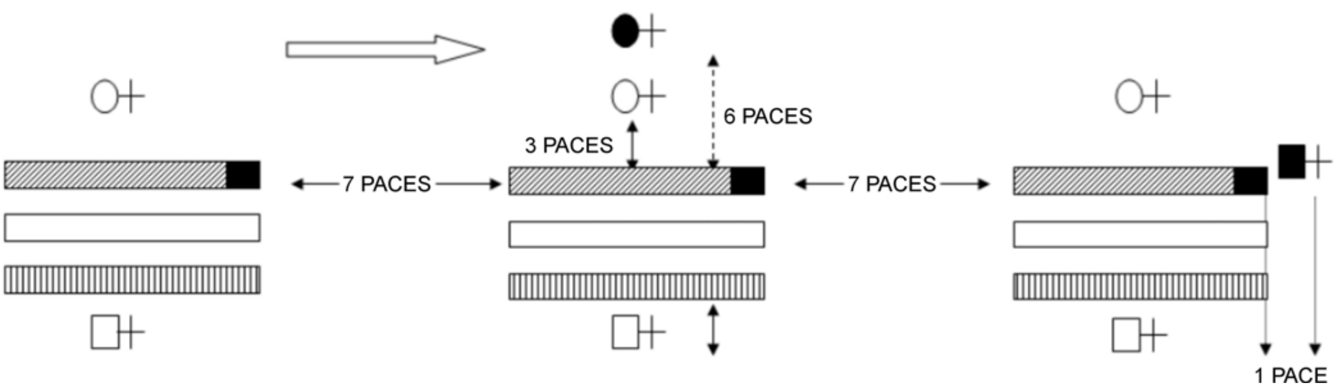
To be formed in threes and in line is the common formation when a squad forms up.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-1-3 Squadron in Line

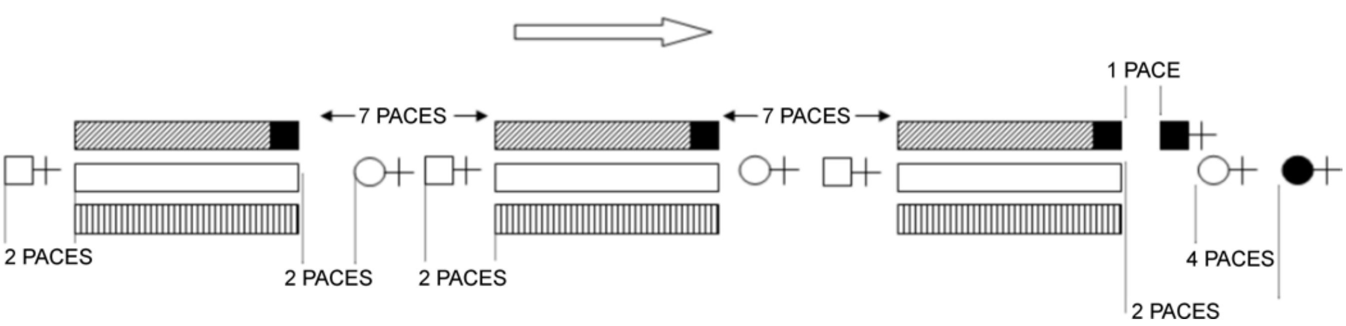
Column of Threes. A squadron is formed in column of threes when flights are turned to the right or left of the front, with parade appointments located in their positions in the front and rear of the formation and turned to the right or left with the flight (as illustrated in Figure 8-1-4).



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-1-4 Squadron in Column of Threes

Column of Route. A squadron is formed in column of route when flights are turned to the right or left, with parade appointments positioned to lead or follow the formation (as illustrated in Figure 8-1-5).



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-1-5 Squadron in Column of Route

LOCATION OF PARADE APPOINTMENTS

The unique nature of the cadet squadron allows for the adjustment of parade positions to be filled by cadet WOs and cadet senior NCOs. The following parade positions are normally filled by cadets when conducting a formal parade:

Parade Commander (Pde Comd). With a squadron in line or in column of threes, the Pde Comd is centred three paces in front of the line of flight commanders, facing the same direction as the flights except when addressing the squadron. With a squadron in column of route, the Pde Comd is centred four paces in front of the leading flight.

Parade Deputy Commander (DComd). The DComd is an appointment that is seldom assigned in a cadet squadron. If applicable, the DComd is centred three paces in front of the second single file from the right flank of the squadron and in line with the Flt Comd.

Squadron Warrant Officer (SWO). With a squadron in line or in column of threes, the SWO is located one pace to the right of the No. 1 Flight marker, in line with the front rank. With a squadron in column of route, the SWO is located one pace in front of the directing flank of the leading flight.

Flight Commander (Flt Comd). With a squadron in line or in column of threes, the Flt Comd is centred three paces in front of the flight. With a squadron in column of route, the Flt Comd is centred two paces in front of their flight.

Flight Sergeant (Flt Sgt). With a squadron in line or in column of threes, the Flt Sgt is centred three paces in rear of the flight. With a squadron in column of route, the Flt Sgt is centred two paces in the rear of their flight.

Prior to handing over to the Flt Comd, the Flt Sgt will be centred three paces in front of the flight. After handing over to the Flt Comd, the Flt Sgt assumes their position as stated above.

Flight Marker (Marker). The marker is the individual placed in the first rank of the first file to indicate the position which a body of cadets will occupy when covering and falling in. In all squad and squadron formations, the marker remains in the same location.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the three squad formations?

Q2. What are the three squadron formations?

Q3. Where is the Flt Comd located when the formation is in line?

ANTICIPATED ANSWERS

A1. The three squad formations are:

- single rank,
- two ranks, and
- three ranks.

A2. The three squadron formations are:

- line,

- column of threes, and
- column of route.

A3. The Flt Comd is located three paces in front and centre of the flight.

Teaching Point 2 | **Explain, Demonstrate and Have the Cadet Assume the Role of a Team Leader in Preparing a Squad for Parade**

Time: 60 min | Method: Demonstration and Performance

When preparing a squad for parade, the team leader, acting as the Flt WO, is responsible to ensure the squad is ready for parade by:

1. having the squad on the parade square by falling in a squad;
2. knowing who is present or absent by calling the roll;
3. ensuring uniformity of the squad by sizing in single rank and reforming threes (twos);
4. ensuring the squad is properly spaced by dressing a squad;
5. ensuring all cadets are well turned out by inspecting a squad; and
6. continuing with the parade by handing over the squad.

The purpose of this TP is to aid the cadets' comprehension of the process they have executed during Proficiency Level One and Two when preparing for parade during a training sessions.

If the time allotted is not sufficient for all cadets to assume the role of a team leader in preparing a squad for parade, additional time during nightly opening and closing parades shall be used to provide all cadets the opportunity for performance.

ACTIVITY

OBJECTIVE

The objective of this activity is to confirm the ability of a Proficiency Level Three cadet, as a team leader, to prepare a squad for parade.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

Distribute a copy of the drill sequence handout at Annex A and an aide-mémoire card at Annex B to each cadet.

This activity will be conducted IAW Annex A.

For this activity, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill.
3. Select a cadet to assume the role of team leader and practice the complete skill.

Note: Assistant instructors may be employed for demonstration purposes.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in preparing a squad for parade will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 2 (308 PC).

CLOSING STATEMENT

When preparing a squad for parade with confidence and determination, it will affect how cadets respond to the orders given. Delivering words of command can allow a flight to move as a team in an organized and efficient manner as all members learn to work together.

INSTRUCTOR NOTES/REMARKS

Cadets shall perform these skills and be given feedback during weekly opening and closing parades, and ceremonial parades.

Assistant instructors may be required for this lesson.

REFERENCES

A0-002 A-PD-201-000/PT-000 Director History and Heritage 3-2. (2005). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M308.02 – DELIVER WORDS OF COMMAND

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy, cut out, fold and laminate the aide-mémoire cards with the words of command located at Annex C for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to orient the cadets to the parts of a command and to generate interest.

Demonstration was chosen for TP 2 as it allows the instructor to demonstrate the voice techniques the cadets are expected to acquire.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to deliver words of command.

IMPORTANCE

It is important for cadets to know how to deliver words of command. Words of command that are delivered in a clear and concise manner, with confidence and determination, will affect how cadets respond to orders. Words of command are required to move a flight in an organized and efficient manner.

Teaching Point 1	**Explain the Parts of a Command**
Time: 10 min	Method: Interactive Lecture

CAUTIONARY COMMAND

A cautionary command shall be given at the beginning of every command to warn the squad that a movement will be performed. It includes additional instructions to the command such as “advance” or “retire”.

> The direction of the movements are indicated based on the initial front rank.

The additional instructions are based on the direction a squad falls in (as illustrated in Figure 8-2-1). In general:

- **Advance.** Indicates a turn or movement in the direction of the front rank (is used whenever turning into line).
- **Retire.** Indicates a turn or movement in the direction of the rear rank (is used whenever turning into line).
- **Move to the Right/Left.** Indicates a turn or movement in the direction of the indicated flank (eg, the right/left markers).

EXECUTIVE COMMAND

An executive command is to signal that the movement is to be carried out.

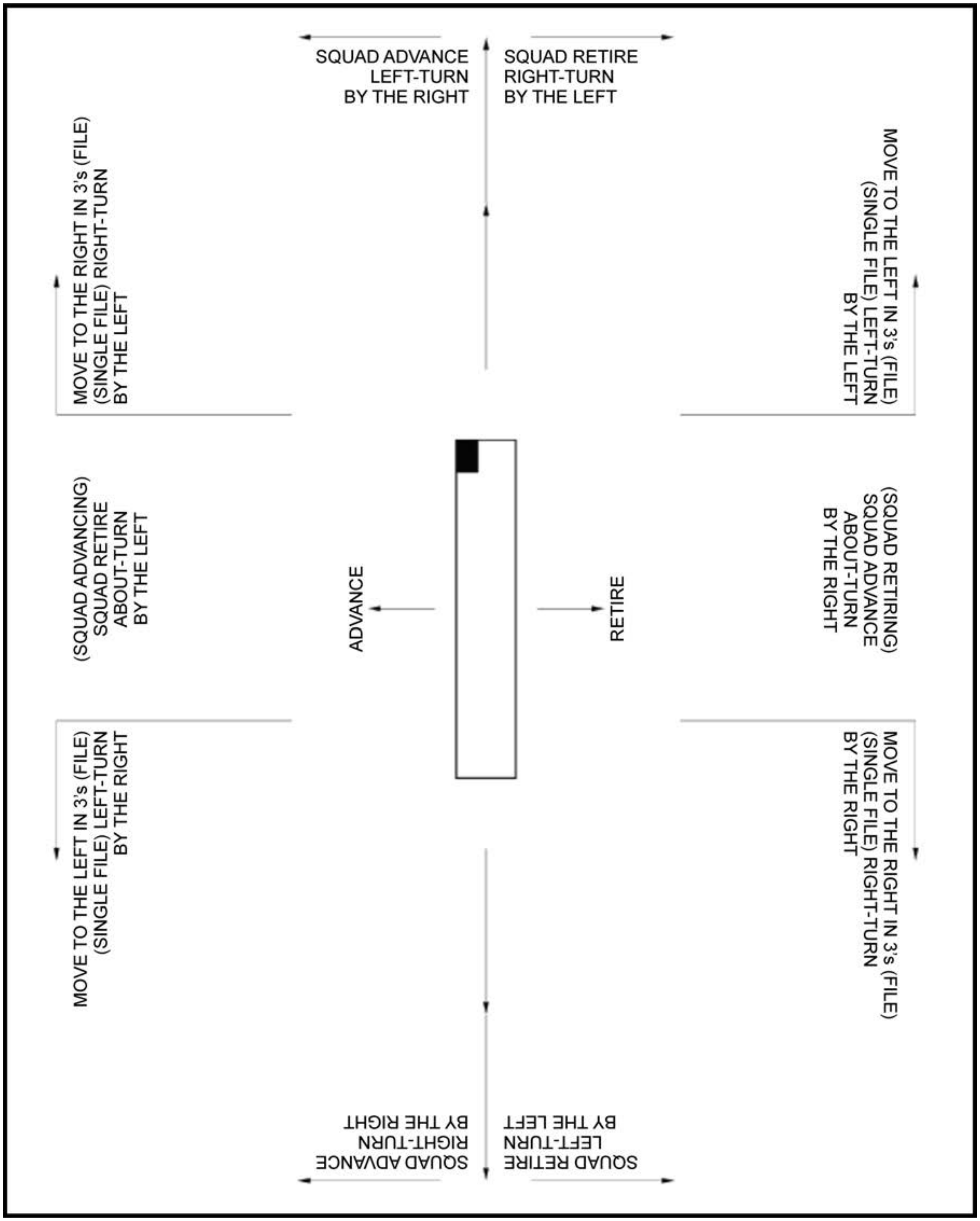
When written, a dash shall separate the cautionary command from the executive command.

The following are examples of words of command. In these examples, the word “TURN” indicates the executive command.

- “SQUAD RETIRE, RIGHT—TURN,”
- “SQUAD ADVANCE, LEFT—TURN,” and
- “SQUAD MOVE TO THE RIGHT IN COLUMN OF ROUTE, RIGHT—TURN.”

On the march, the cautionary command should be drawn out over at least two paces of quick time and the interval between the cautionary and executive commands should be two paces.

> The order, “As You Were”, should only be given when another word of command cannot be given to have a squad adopt a previous position or to cancel an incorrect order before it has been completed.



A-PD-201-000/PT-000 (p. 3-4)

Figure 8-2-1 Advance/Retire and Directing Flanks

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why are cautionary commands given?

Q2. What is the purpose of the executive command?

Q3. When commands are written, what is the purpose of the dash?

ANTICIPATED ANSWERS

A1. To warn the squad that a movement will be performed.

A2. To signal that the movement is to be carried out.

A3. To separate the cautionary from the executive command.

Teaching Point 2	**Demonstrate and Explain the Requirements for a Well-Delivered Command**
Time: 15 min	Method: Demonstration

As each point is discussed, give an example of a command being delivered correctly and incorrectly, using the specified technique.

VOICE

The voice used to deliver commands has a strong effect on how others will respond. The following points should be considered:

Volume. The volume used to deliver a command is very important in drill. Often, commands must be presented to a group over a band or over other cadets giving commands to another group. The volume should be adjusted based on the number of individuals, the distance the command must carry and whether there is a band or not.

Projection. The projection of the voice is its ability to reach a desired distance. Erect posture, proper breathing, a relaxed throat and an open mouth will help a voice project.

Distinctness. How clearly and distinctly a command is pronounced will affect how others respond. If a command is not clear and distinct some cadets may not understand the command and perform the wrong movement. Clear enunciation and pronunciation of commands is key in distinctness.

Inflection. Inflection is the change in pitch of the voice. The cautionary command is usually started with a pitch near the level of the normal speaking voice and rising toward the end. The executive command should not have any change in inflection but should be delivered with a higher pitch than the cautionary command.

Snap. The snap of a command is the quality that demands an immediate response. It expresses the confidence and decisiveness of the commander.

ACCURACY

Commands must be given with accuracy at all times. Proper use of cautionary commands will alert the cadets to what is coming. The executive command will signal the cadets that the movement is to be carried out. When delivering executive commands on the march, it is important that it be delivered on the correct foot.

CONFIDENCE

All words of command must be given with confidence. This portrays that it is an order that must be promptly and smartly obeyed. A command delivered with confidence will help build a sense of security in the commander from the members of the squad.

CORRECT POSTURE

Poor posture restricts the ability to breathe deeply as it restricts the movement of the diaphragm. Maintaining good posture will allow a cadet to breathe deeply allowing the command to come deep from the diaphragm instead of from the throat causing less strain on the throat and allowing the command to be given with more volume.

BREATHING CONTROL

Breathe deeply and relax the muscles in the neck and vocal cords in order to give the voice more control and a higher volume. This will allow the voice to come from deep in the diaphragm instead of higher in the throat.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. If a command is not pronounced clearly and distinctly, what affect may it have on the squad being commanded?

Q2. Why should commands be delivered with confidence?

Q3. How does poor posture affect delivering commands?

ANTICIPATED ANSWERS

A1. Cadets may not understand the command and perform the wrong movement.

A2. It portrays that it is an order that must be promptly and smartly obeyed.

A3. It restricts the ability to breathe deeply, restricting the movement of the diaphragm, which will cause commands to come from the throat.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What order is given to cancel an incorrect order before it has been completed?

Q2. What are the five points of voice to be considered for a well-delivered command?

Q3. What gives the voice more control and a higher volume?

ANTICIPATED ANSWERS

A1. The order, “As You Were”.

A2. Volume, projection, distinction, inflection and snap.

A3. Breathing deeply and relaxing the muscles in the neck and vocal cords.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

When words of command are delivered in a clear and concise manner and with confidence and determination, it will affect how cadets respond to the order. Delivering words of command can allow a platoon to move as a team in an organized and efficient manner as all members learn to work together.

INSTRUCTOR NOTES/REMARKS

Cadets shall be provided the opportunity to deliver words of command and be given feedback during weekly opening and closing parades, and ceremonial parades.

Additional time for this EO is available in EO C308.02 (Deliver Words of Command, Section 4).

REFERENCES

A0-002 A-PD-201-000/PT-000 Director History and Heritage 3-2. (2005). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C308.01 – EXECUTE FLAG DRILL

Total Time:	180 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

For further direction and information on cadet flags and banners, refer to CATO 12-05, *Cadet Flags and Banners*, Paragraphs 1 to 9.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to present basic background material on flags and flag parties.

Demonstration and performance was chosen for TPs 2 to 6 as it allows the instructor to demonstrate and explain the skills the cadets are expected to acquire while providing an opportunity for the cadets to practice flag drill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet, as a member of a flag party, shall have executed flag drill.

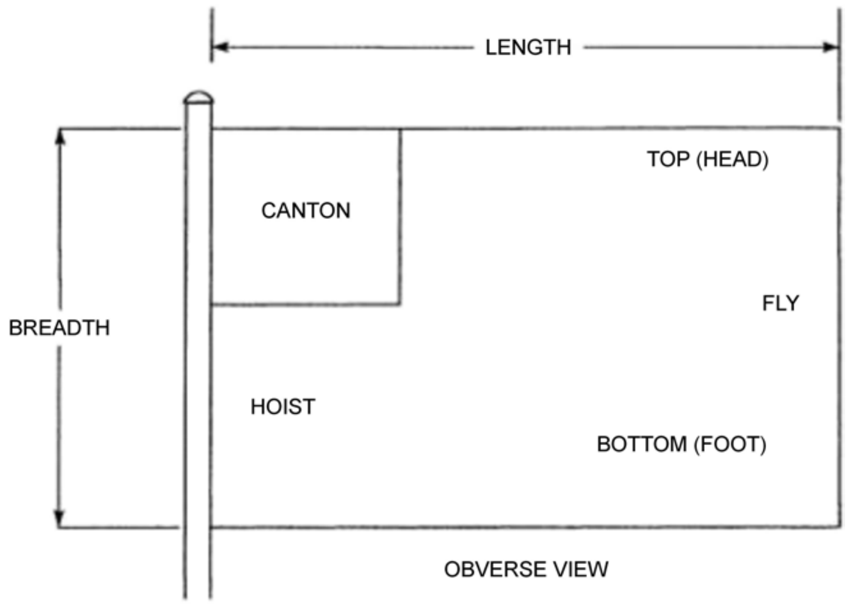
IMPORTANCE

It is important for cadets to execute flag drill so they are able to take part in ceremonies and parades as members of the flag party at the squadron, cadet summer training centre (CSTC) and other community events as required.

Colours and flags have many meanings and are symbols of such things as achievements, nationality and identity. It is considered an honour to be a member of the flag party.

Teaching Point 1	**Explain Details of Flags, the Pike, the Colour Carrying Belt and the Composition of a Flag Party**
Time: 10 min	Method: Interactive Lecture

FLAGS



A-AD-200-000/AG-000, The Honours, Flags and Heritage Structure of the Canadian Forces (p. 4-1-8)

Figure 8-3-1 Details of a Flag

Flags. As a generic term (including colours), flags are pieces of bunting or other material, attachable to a pike, staff or halyard, and used as a means of identification or for signalling.

Canton. The upper half of the hoist. It is also called the First Quarter and sometimes the Upper Hoist. The canton is considered the place of honour on a flag.

Hoist. The half of the flag nearest to the halyard.

Halyard. The rope that raises or lowers a flag.

Fly. The half of the flag furthest from the halyard.

Staff (Flagstaff). A pole on which a flag is mounted for display.

> Colours are consecrated ceremonial flags carried to mark the identity of Canadian Forces (CF) formations and units. They belong to a separate class and are not paraded with other flags. Cadet flags are not consecrated (made sacred and devoted to service by the Chaplain General as symbols of honour and duty), therefore shall not be referred to as colours.

Commanding Officers of cadet squadrons and CSTCs shall ensure that flags and banners are not referred to as colours, adorned with honours or consecrated and not issued at public expense.

Flags are used to identify individuals and groups. Many flags which originated as the insignia of individuals gradually came to represent the state or agencies within the state.

Authorized Flags and Banners

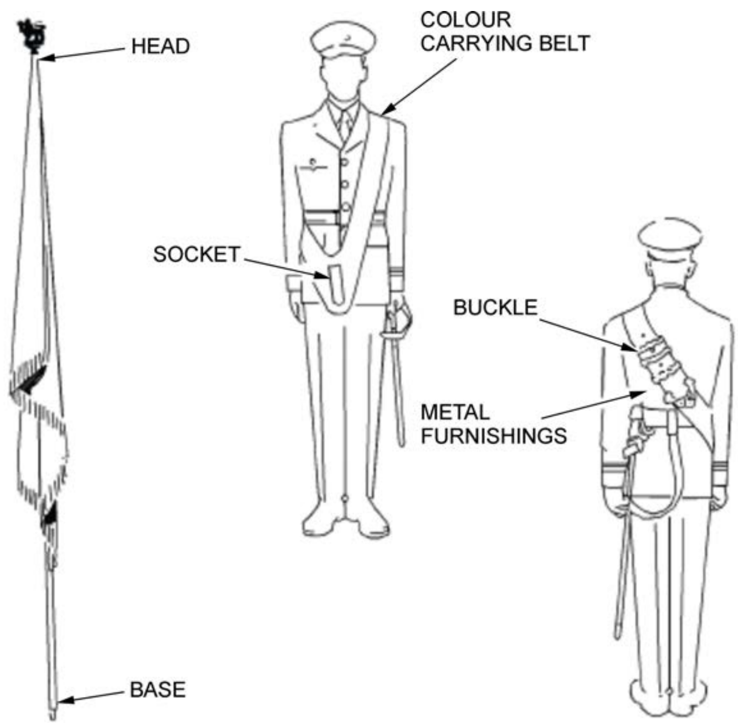
The following is a list of flags and banners that may be carried on parade by cadet squadrons:

1. the Royal Canadian Sea Cadets Ensign,
2. the Royal Canadian Army Cadets Flag,
3. the Royal Canadian Air Cadets Ensign, and
4. the Royal Canadian Air Cadets Squadron Banner.

The following is a list of flags and banners that should only be carried on ceremonial parades to indicate a cadet formation:

1. the Royal Canadian Army Cadets Banner,
2. the Royal Canadian Army Cadets Trumpet Banner,
3. the Royal Canadian Army Cadets Pipe Banner,
4. the Royal Canadian Air Cadets Banner, and
5. the Royal Canadian Air Cadets Pipe Banner.

THE PIKE



A-PD-201-000/PT-000 (p. 8-2-3)

Figure 8-3-2 Details of the Pike and Colour Carrying Belt

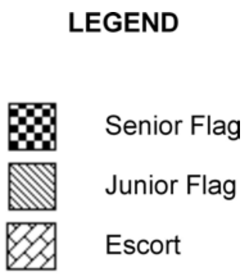
Pike. A pole on which colours or other flags are mounted for carrying or displaying.

Pike Head. The decorative ornament (finial) on the top of a pike, staff or pole.

COLOUR CARRYING BELT

The colour carrying belt is worn over the left shoulder by members of the flag party carrying flags. The socket is the “pocket” where the pike base is placed while the flag is in the carry position.

COMPOSITION OF A FLAG PARTY

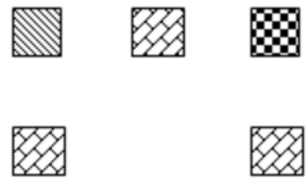


Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-3-3 Flag Party Legend

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-3-4 Flag Party for One Flag



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 8-3-5 Flag Party for Two Flags

The composition of a flag party carrying one flag (as illustrated in Figure 8-3-3) consists of the flag party commander (cadet carrying the flag) and two escorts (cadets on either side of the flag).

The composition of a flag party carrying two flags (as illustrated in Figure 8-3-4) consists of one senior escort (cadet between the flags), the flag party commander and one flag bearer (cadets carrying the flags) and two senior NCOs (cadets directly behind the flags).

The flag party commander and/or flag bearer is appointed to carry, handle and protect the flags.

The senior escort and/or escort are appointed to safeguard the flags. They remain with the flags and may or may not carry drill-purpose rifles.

When a cadet flag party carries the national flag and either the Air Cadet Ensign or the Squadron Banner, the national flag occupies the position of honour on the right (on the left from the spectators view) and is normally carried by a senior cadet.

Normally, the national flag does not have an escort. It may be given an escort with a drill-purpose rifle if the cadets on parade are carrying drill-purpose rifles.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a pike?

Q2. Over which shoulder is the colour carrying belt worn?

Q3. How many members are in a flag party with only one flag?

ANTICIPATED ANSWERS

A1. A pike is a pole on which colours or other flags are mounted for carrying or displaying.

A2. The colour carrying belt is worn over the left shoulder.

A3. There are three members in a flag party with only one flag: the flag party commander and two escorts.

Teaching Point 2 — **Demonstrate, Explain and Have the Cadets Practice Adopting the Order, Stand at Ease From the Order, Stand Easy From the Stand at Ease, Stand at Ease From the Stand Easy and Order From the Stand at Ease With a Flag**

Time: 15 min — Method: Demonstration and Performance

Develop and use a vocabulary of short, concise words to impress on the cadets that the movements must be performed smartly. For example, the words “crack”, “drive”, “seize” and “grasp” suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

Proper drill movements shall be combined with a professional demeanour throughout the period of instruction.

Check for faults and correct them immediately as they occur.

Each TP is to be conducted as follows:

1. Have the cadets fall in, in an effective squad formation (eg, hollow square, semi-circle or single rank).
2. Demonstrate and explain each movement, as time allows.
3. Give the cadets time to practice each movement on their own.
4. After all movements have been demonstrated and practiced, deliver commands and have all the cadets perform them as a squad.

Capitalization indicates the words of command for each movement.

Cadence is to be maintained while completing these movements.

THE ORDER (ATTENTION)

A-PD-201-000/PT-000 (p. 8-3-2)

Figure 8-3-6 The Order (Attention)

To assume the position of the order (attention), the cadets shall:

1. Stand with heels together and in line, with the feet turned out to form an angle of 30 degrees.
2. Maintain balance and distribute weight evenly on both feet.
3. Keep the shoulders squared and to the front.
4. Hold the head erect with the neck touching the back of the collar, eyes steady, looking directly to the front.
5. Hold the pike vertical in the right hand, along the right side.
6. Keep the base of the pike on the ground at the right foot in line with the small toe.
7. Hold the pike and flag with an all-round grasp with the right hand, with the back of the hand pointed outwards at the point of the pike where the lowest corner of the flag hangs.
8. Ensure the flag hangs naturally down the pike and is not pulled taut.
9. Keep the right elbow at the side.
10. Hold the left arm at the position of attention.

STAND AT EASE FROM THE ORDER

A-PD-201-000/PT-000 (p. 8-3-2)

Figure 8-3-7 Stand at Ease

On the command, STAND AT—EASE, the cadets shall:

1. bend the left knee and place the left foot smartly on the ground 25 cm (approximately 10 inches) to the left;
2. maintain the left arm in the position of attention; and
3. maintain the pike and flag in the position of the order.

Timing for this movement is one.

STAND EASY FROM STAND AT EASE

On the command, STAND—EASY, the cadets shall:

1. maintain the feet at the position of stand at ease;
2. keep the left arm at the side; and
3. relax the body.

Timing for this movement is one.

STAND AT EASE FROM STAND EASY

On the command, SQUAD, the cadets shall resume the position of stand at ease.

Timing for this movement is one.

ORDER FROM STAND AT EASE

On the command, ATTEN—TION, the cadets shall:

1. bend the left knee and bring the left foot to the position of attention, keeping the left arm at the side; and
2. maintain the pike and flag in the position of the order.

Timing for this movement is one.

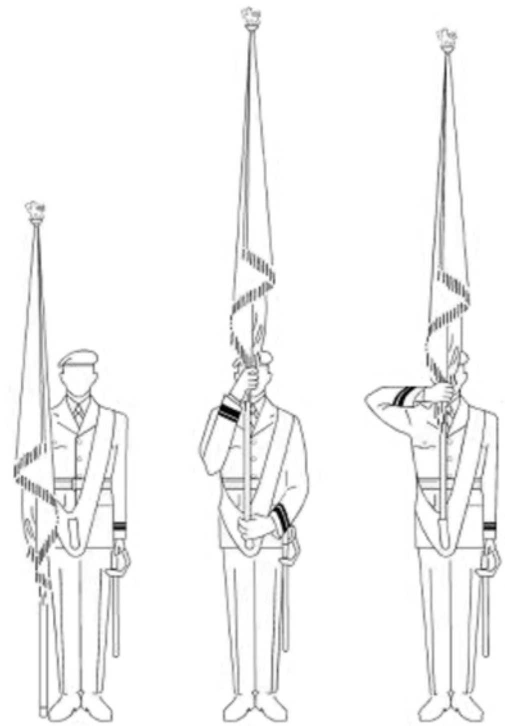
CONFIRMATION OF TEACHING POINT 2

The cadets' practicing of the order, stand at ease and stand easy, with a flag, will serve as the confirmation of this TP.

Teaching Point 3 — **Demonstrate, Explain and Have the Cadets Practice Adopting the Carry From the Order, Order From the Carry, Let Fly From the Carry and Catch the Flag From the Let Fly**

Time: 25 min — Method: Demonstration and Performance

CARRY FROM THE ORDER



A-PD-201-000/PT-000 (p. 8-3-4)

Figure 8-3-8 Carry From the Order

On the command, CARRY—FLAGS, the cadets shall:

1. on the first movement:

   (a) with the right hand, carry the flag to a vertical position in front of the centre of the body, keeping the right forearm along the side of the pike, and keeping the base of the pike just over the socket of the carrying belt; and

   (b) simultaneously, bring the left hand to the socket and guide in the base of the pike; and

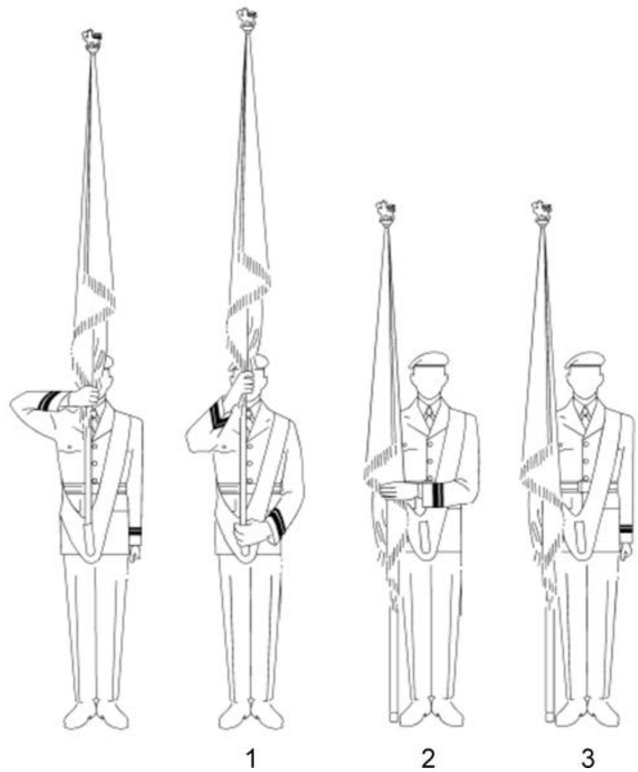
2. on the second movement:

   (a) cut the left hand to the side in the position of attention; and

   (b) simultaneously, bring the right forearm parallel to the ground so that upon completion of the movement, the right hand is opposite the mouth with the back of the right hand facing out, the wrist straight and the forearm parallel to the ground.

Timing for this movement is one-two-three, one.

ORDER FROM THE CARRY



A-PD-201-000/PT-000 (p. 8-3-6)

Figure 8-3-9 Order From the Carry

On the command, ORDER—FLAGS, the cadets shall:

1. on the first movement:
   - (a) bring the right forearm from a horizontal to a vertical position along the pike and with the right hand, raise the pike clear of the socket of the carrying belt; and
   - (b) simultaneously, bring the left hand to the socket to steady the pike and the carrying belt; and
2. on the second movement:
   - (a) carry the flag with the right hand to the position of the order; and
   - (b) simultaneously, move the left hand across the body to steady the pike with the forearm parallel to the ground, the back of the hand facing out, and the fingers of the left hand together, extended and pointing to the right; and
3. on the third movement, cut the left hand to the side in the position of attention.

Timing for this movement is one-two-three, one-two-three, one.

LET FLY FROM THE CARRY

	Let fly is used either as a salute to dignitaries or to allow for the identification of the flag.

A-PD-201-000/PT-000 (p. 8-3-17)

Figure 8-3-10 Let Fly From the Carry

On the command LET FLY THE—FLAG(S), the cadets shall:

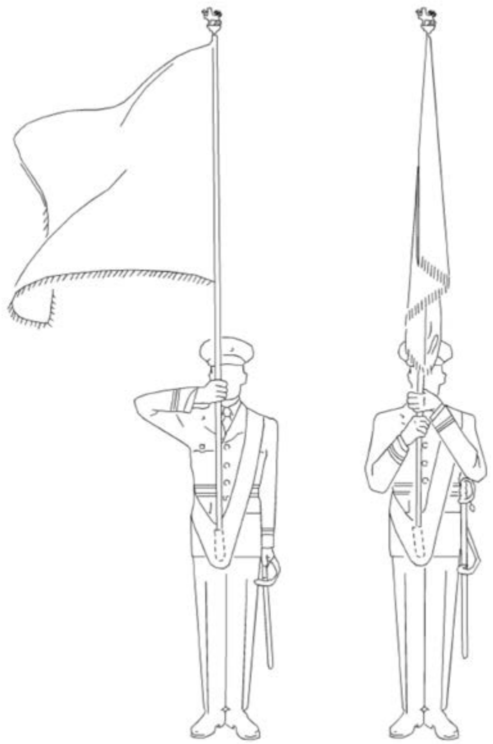
1. maintain the grip of the pike; and
2. simultaneously release the flag with a downward movement of the right hand.

This drill movement is also used on the commands:

- GENERAL SALUTE—SALUTE; and
- EYES—RIGHT during a march past (the flag is let fly on the next left foot).

	Timing for this movement is one.

CATCH THE FLAG FROM THE LET FLY



A-PD-201-000/PT-000 (p. 8-3-18)

Figure 8-3-11 Catch the Flag From the Let Fly

On the command, CATCH THE— FLAG(S), the cadets shall:

1. on the first movement:

   (a) grasp the flag with the left hand and bring it in to the pike; and

   (b) simultaneously, grasp the corner of the flag with the right hand, back of the hand outwards, at the point of the pike where the lowest corner of the flag reached; and

2. on the second movement, cut the left hand to the side to the position of attention and raise the right forearm to the horizontal position.

This drill movement is also used on the commands:

- ATTEN—TION following the General Salute; and
- EYES—FRONT during the march past.

Timing for this movement is one-two-three, one.

Depending on the wind direction, the flag may be grasped with the right hand after securing the pike in the left hand. If, because of wind strength, the flag cannot be caught, the flag shall be brought to the position of the order, the flag secured and returned to the carry.

CONFIRMATION OF TEACHING POINT 3

The cadets' practicing of carry from the order, order from the carry, let fly and catch the flag will serve as the confirmation of this TP.

Teaching Point 4 — **Demonstrate, Explain and Have the Cadets Practice Marching and Halting in Quick Time and Spiral Countermarching With Flags**

Time: 35 min — Method: Demonstration and Performance

MARCHING AND HALTING IN QUICK TIME WITH FLAGS

On the command, QUICK—MARCH, the cadets shall:

1. shoot the left foot forward one half pace (35 cm [14 inches]), with the toe up;
2. strike the heel on the ground first and keep the toe pointed directly forward;
3. simultaneously, swing the left arm back waist high;
4. maintain the right arm in the position of the carry; and
5. continue to march with subsequent standard paces (75 cm [30 inches]).

> Timing for this movement is left-right-left.

On the command, SQUAD—HALT, the cadets shall:

1. place the right foot flat on the ground naturally, using the heel as a brake;
2. simultaneously swing the left arm forward, breast-pocket high;
3. take a half pace (35 cm [14 inches]) with the left foot, placing it flat on the ground, swinging the left arm back;
4. bend the right knee and straighten it in double time; and
5. simultaneously, cut the left arm to the side as quickly as possible and assume the position of attention.

> The command SQUAD—HALT is given as the left foot is on the ground.

> Timing for this movement is one-one-two.

Practice the movements with:

- the **instructor** calling the time;
- the **squad** calling the time; and
- the squad **judging** the time.

Emphasize any movements that the cadets had difficulty with during the lesson.

SPIRAL COUNTERMARCHING WITH FLAGS

An adapted form of the spiral countermarch is used to reverse the direction that the flag party is facing without using as much space as is required for a double wheel by the flag party.

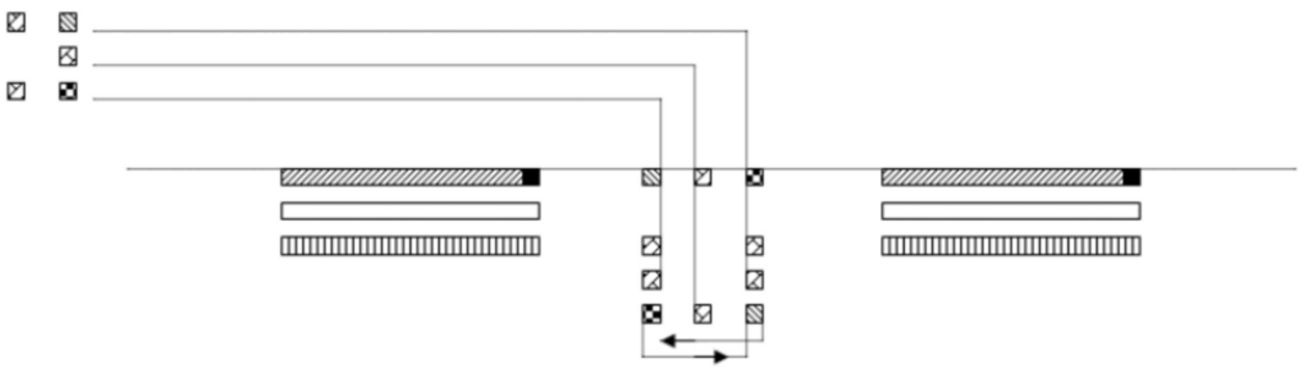


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Figure 8-3-12 Spiral Countermarch

On the command, FLAG PARTY, SPIRAL COUNTER—MARCH:

1. all cadets shall maintain the same cadence;
2. the cadets in the file on the right shall perform two consecutive left wheel movements;
3. the cadets in the centre and the file on the left shall perform two consecutive right wheel movements; and
4. the escorts in the rear rank shall follow the flag bearer to their front into position while maintaining dressing.

It is recommended to end this lesson here and teach TPs 5 and 6 during a second session.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in practicing marching and halting, and spiral countermarching with flags will serve as the confirmation of this TP.

Teaching Point 5	Demonstrate, Explain and Have the Cadets Practice Forming to the Right and Left With Flags
Time: 40 min	Method: Demonstration and Performance

A form changes the direction faced by a flag party in line while maintaining its formation.

CHANGE DIRECTION BY FORMING AT THE HALT

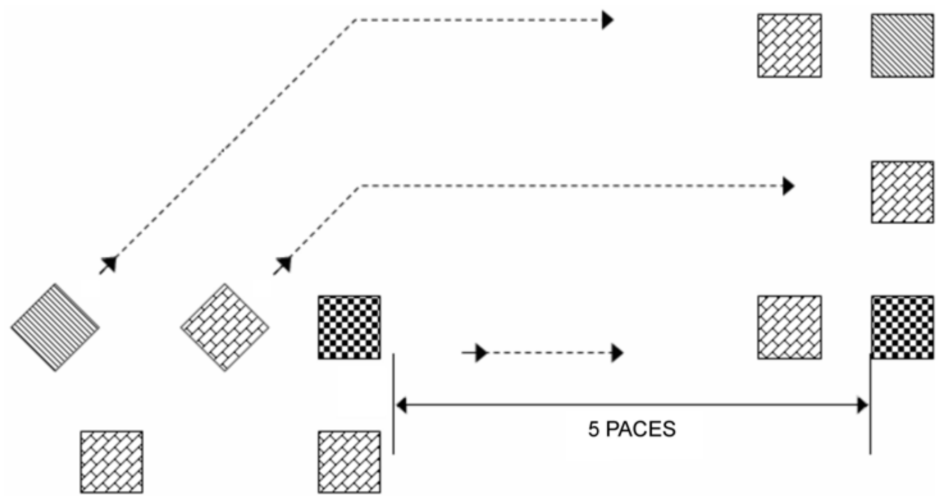

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Figure 8-3-13 Right Form

To change direction by forming at the halt to the halt, the following movements shall occur:

On the command AT THE HALT, CHANGE DIRECTION RIGHT (LEFT), RIGHT (LEFT)—FORM:

1. the leading person on the directing flank turns right (left);
2. simultaneously, the remainder of the front rank makes a right (left) incline; and
3. the rear ranks stand fast.

On the command QUICK—MARCH:

1. the leading person of the directing flank marches forward five paces and halts;
2. simultaneously, the remainder of the squad steps off, wheeling as necessary to regain their original position to the left (right) of the directing flank; and
3. each successive file halts in succession from right to left (left to right), facing the new direction.

CHANGE DIRECTION BY FORMING ON THE MARCH

The command CHANGE DIRECTION RIGHT (LEFT), RIGHT (LEFT)—FORM is given as the left (right) foot is on the ground.

To change direction by forming on the march, the following movements shall occur:

On the command CHANGE DIRECTION RIGHT (LEFT), RIGHT (LEFT)—FORM:

1. the leading person of the directing flank makes a right (left) turn, marches forward six paces and marks time;
2. simultaneously, the remainder of the front rank makes a right (left) incline and steps off toward the new position in line with the right (left) flag;
3. the remainder of the squad wheels as necessary to regain their original position to the left (right) of the directing flank; and
4. each successive file marks time, in succession from right to left (left to right), facing the new direction.

On the command FOR—WARD or FLAG PARTY—HALT, the squad acts as ordered.

The commands FOR—WARD and FLAG PARTY—HALT are given as the left foot is on the ground.

Practice the movements with:

- the **instructor** calling the time;
- the **squad** calling the time; and
- the squad **judging** the time.

Emphasize any movements that the cadets had difficulty with during the lesson.

CONFIRMATION OF TEACHING POINT 5

The cadets' practicing of change direction by forming at the halt and on the march will serve as the confirmation of this TP.

Teaching Point 6 | **Demonstrate, Explain and Have the Cadets Practice Marching On and Marching Off the Flags**

Time: 45 min | Method: Demonstration and Performance

The flag party shall march on and march off the parade from the same flank, either left or right.

MARCHING ON THE FLAG(S)

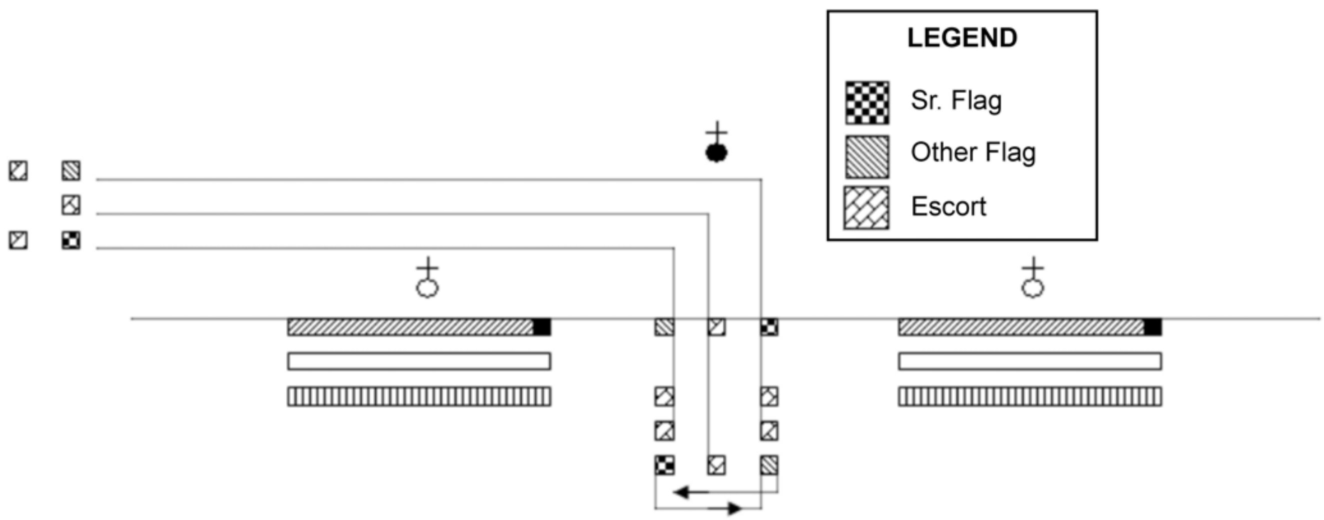

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Figure 8-3-14 March on the Flag(s) From the Left Flank

On the command, MARCH ON THE—FLAG(S), members of the flag party shall perform the following:

1. the flag party commander shall order the cautionary FLAG PARTY;
2. the parade commander shall order TO THE FLAG(S)—SALUTE; and
3. the flag party commander shall order BY THE RIGHT (CENTRE), QUICK—MARCH.

The flag party shall march to its position by a series of forms (as illustrated in Figure 8-3-14).

On the command, FLAG PARTY, SPIRAL COUNTER—MARCH:

The series of forms shall be conducted as follows:

1. On the command FLAG PARTY, QUICK—MARCH, the flag party shall move as a unit to a location on the parade square centred on the parade commander.
2. On the command FLAG PARTY, CHANGE DIRECTION RIGHT (LEFT), RIGHT (LEFT)—FORM, the flag party shall perform a right (left) form on the march. Upon completion of the form, the cadets shall mark time.
3. The flag party shall resume marching on the command FOR—WARD.
4. The flag party shall perform a spiral countermarch. On the command, FLAG PARTY, SPIRAL COUNTER—MARCH:

(a) all cadets shall maintain the same cadence;

(b) the cadets in the file on the right shall perform two consecutive left wheel movements;

(c) the cadets in the centre and the file on the left shall perform two consecutive right wheel movements; and

(d) the escorts in the rear rank shall follow the flag bearer to their front into position while maintaining dressing.

5. Upon completion of the spiral countermarch, the flag party shall move to a predetermined location on the parade square.

6. Upon halting in its parade position, the flag party commander orders FLAG PARTY, TO THE FLAG(S) —SALUTE.

> If the flag party is armed, the flag party commander will order FLAG PARTY, TO THE FLAG(S), PRESENT—ARMS.
>
> Once the flag escort is at the present, the parade commander will order SLOPE—ARMS, and the parade, now including the flag party will slope arms.

Until the flag party is ordered off at the conclusion of the parade, it shall execute the parade commander's commands rather than the flag party commander's commands, except in the following circumstances:

- During an inspection, the flag shall remain in the carry position when the parade commander orders the squadron AT—EASE.
- When required to move to a flank independently, the flag party shall do so under command of its flag party commander by executing forms at the halt or on the march.

MARCHING OFF THE FLAG(S)

On the command, MARCH OFF THE—FLAG(S), members of the flag party shall perform the following:

1. the flag party commander shall order the cautionary FLAG PARTY;
2. the parade commander shall order TO THE FLAG(S)—SALUTE; and
3. the flag party commander shall order BY THE RIGHT (CENTRE), QUICK—MARCH.

The series of forms shall be conducted as follows:

1. On the command FLAG PARTY, QUICK—MARCH, the flag party shall move as a unit to a location on the parade square centred on the parade commander.
2. On the command FLAG PARTY, CHANGE DIRECTION LEFT (RIGHT), LEFT (RIGHT)—FORM, the flag party shall perform a left (right) form on the march. Upon completion of the form, the cadets shall mark time.
3. The flag party shall resume marching on the command FOR—WARD.
4. The flag party shall move to the left (right) flank and march off the parade square.

CONFIRMATION OF TEACHING POINT 6

The cadets' participation in practicing marching on and off as members of a flag party will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

Have the cadets execute flag drill on the march while judging the time.

Continue delivering commands as time allows, focusing on movements with which the cadets experience difficulty.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Flag drill is the foundation for all other flag drill movements. Drill develops many qualities through self-discipline and practice. Drill that is well-rehearsed, closely supervised and precise is an exercise in obedience and alertness that creates teamwork.

INSTRUCTOR NOTES/REMARKS

It is recommended that this lesson be conducted in two separate sessions. Conduct TPs 1 to 4 in the first session and TPs 5 and 6 in the second session.

Squadrons wishing to deviate from the lesson structure for local/Air Force traditions may do so, but are limited to the six periods allocated.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C308.02 – DELIVER WORDS OF COMMAND

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy, cut out, fold and laminate the aide-mémoire cards with the words of command located at Annex C for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow the cadets to experience delivering words of command in a safe, controlled environment.

INTRODUCTION

REVIEW

The review associated with this lesson is from EO M308.02 (Deliver Words of Command, Section 2), to include:

QUESTIONS

Q1. Why are cautionary commands given?

Q2. What is the purpose of the executive command?

Q3. If a command is not pronounced clearly and distinctly, what affect may it have on the squad being commanded?

Q4. How does poor posture affect delivering commands?

ANTICIPATED ANSWERS

A1. To warn the squad that a movement will be performed.

A2. To signal that the movement is to be carried out.

A3. Cadets may not understand the command and perform the wrong movement.

A4. It restricts the ability to breathe deeply, restricting the movement of the diaphragm, which will cause commands to come from the throat.

OBJECTIVES

By the end of this lesson the cadet shall have delivered words of command.

IMPORTANCE

It is important for cadets to know how to deliver words of command, as words of command that are delivered in a clear, concise manner, with confidence and determination, will affect how cadets respond to orders. Words of command are required to move a flight in an organized and efficient manner.

Teaching Point 1	Demonstrate and Have the Cadets Practice Delivering Words of Command
Time: 50 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for each cadet to practice delivering words of command.

RESOURCES

Aide-mémoire cards located at Annex C.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Demonstrate delivering words of command.
2. Distribute the aide-mémoire cards to each cadet.
3. Divide the cadets into groups of no more than four cadets.
4. Have each cadet, within their group, practice delivering words of command with emphasis on voice, accuracy, confidence, correct posture and breathing control. Have the cadets practice commands at the halt and on the march with the other members of the group acting as the squad. Each cadet will be allotted approximately 10 minutes in front of their group.
5. Circulate among the groups and assist the cadets as necessary, offering suggestions and advice for improvement.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in delivering words of command will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

When words of command are delivered in a clear and concise manner and with confidence and determination, it will affect how cadets respond to the order. Delivering words of command can allow a flight to move as a team in an organized and efficient manner as all members learn to work together.

INSTRUCTOR NOTES/REMARKS

Cadets shall be provided the opportunity to deliver words of command and be given feedback during weekly opening and closing parades, and ceremonial parades.

This EO will be used as additional practice time for EO M308.02 (Deliver Words of Command, Section 2).

REFERENCES

N/A.

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DRILL SEQUENCE HANDOUT (PREPARING A FLIGHT FOR PARADE)

Flight in Line

When a flight is formed in line, the team leader, assuming the role of the SWO, shall be positioned three paces in front and centred on the flight.

Steps to Preparing a Flight for Parade

The steps to preparing a flight for parade include:

1. The flight shall form up in three ranks at the edge of the parade square and stand at ease.
2. The team leader shall carry on with forming up a flight as detailed below.

Item	Command	Given By	Execution	Observation
a.		Team Leader	The Team Leader shall march to a position three paces in front of, and facing, the position the marker is to occupy.	The flight is formed up just off the parade square, standing easy. The right hand cadet of the front rank is the designated “Marker”.
b.	MARKER	Team Leader	The Marker shall come to attention, answer by rank, observe the standard pause, march in a direct line to, and halt three paces in front of and facing, the Team Leader. The Marker shall remain at attention.	The flight shall come to the position of stand at ease. The Team Leader, after placing the Marker, shall turn right and march to a position three paces in front of and centre facing where the flight shall fall in.
c.	FLIGHT FALL—IN	Team Leader	The flight shall come to attention, observe the standard pause and march onto the parade ground. It shall halt on the left of and covering off the marker and remain at attention.	A direct route shall be taken by the flight.

3. The team leader shall carry on with calling the roll as detailed below.

Item	Command	Given By	Execution	Observation
a.	ANSWER TO YOUR NAME, STAND AT—EASE	Team Leader	Each flight member shall come to attention as their name is called, answer accordingly and stand at ease.	The team leader shall read each name from a roll and mark the attendance for each cadet.

4. The team leader shall carry on with sizing in a single rank and reforming threes (twos) as detailed below.

Item	Command	Given By	Execution	Observation
a.	TALLEST ON THE RIGHT, SHORTEST ON THE LEFT, IN A SINGLE RANK—SIZE	Team Leader	The flight shall turn right, observe the standard pause, then arrange themselves according to height, with tallest on the right and shortest on the left in one single rank, shoulder to shoulder dressing and covering off front to rear.	The team leader shall ensure the cadets are arranged as ordered before proceeding.
b.	FLIGHT—NUMBER	Team Leader	The flight shall call out their number in sequence from the right.	The team leader shall ensure that no numbers are missed.
c.	ODD NUMBERS ONE PACE FORWARD, EVEN NUMBERS ONE PACE STEP BACK—MARCH	Team Leader	The flight shall act as ordered.	
d.	NUMBER ONE STAND FAST, ODD NUMBERS RIGHT, EVEN NUMBERS LEFT—TURN	Team Leader	The flight shall act as ordered.	
e.	REFORM THREES (TWOS), QUICK—MARCH	Team Leader	The flight reform ranks with Number 1 as the marker and remainder filling in the next open position.	When each person arrives in their new position, they shall halt, at arm's-length interval, observe the standard pause, turn left and remain at attention.

5. The team leader shall carry on with dressing a flight as detailed below.

Item	Command	Given By	Execution	Observation
a.	RIGHT—DRESS	Team Leader	The flight shall act as ordered.	
b.	EYES—FRONT	Team Leader	The flight shall act as ordered.	

6. The team leader shall carry on with inspecting a flight as detailed below.

Item	Command	Given By	Execution	Observation
a.	OPEN ORDER—MARCH	Team Leader	The flight shall act as ordered.	
b.	RIGHT—DRESS	Team Leader	The flight shall act as ordered.	
c.	EYES—FRONT	Team Leader	The flight shall act as ordered.	
d.		Team Leader	The team leader will inspect the front and rear of each cadet, starting at the right marker and proceeding around each rank in turn. The inspection of a cadet shall start at the head and work down to the feet.	The purpose of an inspection is to ensure a standard of personal hygiene and grooming, and that each cadet is properly dressed, with all clothing, badges, etc, are worn correctly, clean, and in good repair.
e.	CLOSE ORDER—MARCH	Team Leader	The flight shall act as ordered.	
f.	RIGHT—DRESS	Team Leader	The flight shall act as ordered.	
g.	EYES—FRONT	Team Leader	The flight shall act as ordered.	
h.	STAND AT—EASE	Team Leader	The flight shall act as ordered.	

7. As the flight commander approaches, the team leader shall carry on with handing over a flight as detailed below.

Item	Command	Given By	Execution	Observation
a.	ATTEN—TION	Team Leader	The flight shall act as ordered.	The team leader calls the flight to attention as the flight commander approaches.
b.		Team Leader		The flight commander halts two paces in front of the team leader, who reports the flights strength and condition.
c.		Team Leader		Upon being ordered to fall in, the team leader turns right, by a series of wheels proceeds around the right flank and takes their position behind the flight.
d.		Flight Commander		The flight commander marches forward two paces to take up their position.

AIDE-MÉMOIRE CARD – PREPARING A FLIGHT FOR PARADE

PREPARING A FLIGHT FOR PARADE

FALLING IN:

- MARKER.
- FLIGHT FALL—IN.

CALLING THE ROLL:

- ANSWER TO YOUR NAME, STAND AT—EASE.

SIZING IN A SINGLE RANK:

- TALLEST ON THE RIGHT, SHORTEST ON THE LEFT, IN A SINGLE RANK—SIZE.
- FLIGHT—NUMBER.
- ODD NUMBERS ONE PACE FORWARD, EVEN NUMBERS ONE PACE STEP BACK—MARCH.
- NUMBER ONE STAND FAST, ODD NUMBERS RIGHT, EVEN NUMBERS LEFT—TURN.
- REFORM THREES (TWOS), QUICK—MARCH.

DRESSING:

- RIGHT—DRESS.
- EYES—FRONT.

PRE-INSPECTING:

- OPEN ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.

POST-INSPECTING:

- CLOSE ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.
- STAND AT—EASE.

HANDING OVER:

- ATTEN—TION.

PREPARING A FLIGHT FOR PARADE

FALLING IN:

- MARKER.
- FLIGHT FALL—IN.

CALLING THE ROLL:

- ANSWER TO YOUR NAME, STAND AT—EASE.

SIZING IN A SINGLE RANK:

- TALLEST ON THE RIGHT, SHORTEST ON THE LEFT, IN A SINGLE RANK—SIZE.
- FLIGHT—NUMBER.
- ODD NUMBERS ONE PACE FORWARD, EVEN NUMBERS ONE PACE STEP BACK—MARCH.
- NUMBER ONE STAND FAST, ODD NUMBERS RIGHT, EVEN NUMBERS LEFT—TURN.
- REFORM THREES (TWOS), QUICK—MARCH.

DRESSING:

- RIGHT—DRESS.
- EYES—FRONT.

PRE-INSPECTING:

- OPEN ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.

POST-INSPECTING:

- CLOSE ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.
- STAND AT—EASE.

HANDING OVER:

- ATTEN—TION.

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AIDE-MÉMOIRE CARD – PREPARING A SQUAD FOR PARADE

PREPARING A SQUAD FOR PARADE

FALLING IN:

- MARKER.
- SQUAD FALL—IN.

CALLING THE ROLL:

- ANSWER TO YOUR NAME, STAND AT—EASE.

SIZING IN A SINGLE RANK:

- TALLEST ON THE RIGHT, SHORTEST ON THE LEFT, IN A SINGLE RANK—SIZE.
- SQUAD—NUMBER.
- ODD NUMBERS ONE PACE FORWARD, EVEN NUMBERS ONE PACE STEP BACK—MARCH.
- NUMBER ONE STAND FAST, ODD NUMBERS RIGHT, EVEN NUMBERS LEFT—TURN.
- REFORM THREES (TWOS), QUICK—MARCH.

DRESSING:

- RIGHT—DRESS.
- EYES—FRONT.

PRE-INSPECTING:

- OPEN ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.

POST-INSPECTING:

- CLOSE ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.
- STAND AT—EASE.

HANDING OVER:

- ATTEN—TION.

PREPARING A SQUAD FOR PARADE

FALLING IN:

- MARKER.
- SQUAD FALL—IN.

CALLING THE ROLL:

- ANSWER TO YOUR NAME, STAND AT—EASE.

SIZING IN A SINGLE RANK:

- TALLEST ON THE RIGHT, SHORTEST ON THE LEFT, IN A SINGLE RANK—SIZE.
- SQUAD—NUMBER.
- ODD NUMBERS ONE PACE FORWARD, EVEN NUMBERS ONE PACE STEP BACK—MARCH.
- NUMBER ONE STAND FAST, ODD NUMBERS RIGHT, EVEN NUMBERS LEFT—TURN.
- REFORM THREES (TWOS), QUICK—MARCH.

DRESSING:

- RIGHT—DRESS.
- EYES—FRONT.

PRE-INSPECTING:

- OPEN ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.

POST-INSPECTING:

- CLOSE ORDER—MARCH.
- RIGHT—DRESS.
- EYES—FRONT.
- STAND AT—EASE.

HANDING OVER:

- ATTEN—TION.

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CHAPTER 9

PO 309 – INSTRUCT A LESSON

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M309.01 – EXPLAIN THE PRINCIPLES OF INSTRUCTION

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

The activity in TP 2 uses learning stations. Learning stations are a form of group work where the cadets learn by sorting through the information presented. When setting up learning stations, ensure there is enough room for each cadet to be comfortable and have adequate space for writing down information. When the cadets arrive at a learning station, all required information shall be available. These stations should be placed close together to minimize time for movement; however far enough apart to avoid interruptions from other groups. For this lesson, choose and set up six learning stations for the principles of instruction.

Photocopy the Principles of Instruction Information Sheets located at Annex A and the Principles of Instruction Worksheets located at Annex B for each station.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to present the principles of instruction and to generate interest.

An in-class activity was chosen for TP 2 as it is an interactive way for the cadets to apply the principles of instruction.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have explained the principles of instruction and how they are applied when planning and instructing a lesson.

IMPORTANCE

It is important for the cadets to explain the principles of instruction and how they are applied when planning and instructing a lesson to make training enjoyable and successful and to help the instructor make informed decisions while in front of a class. The ability to keep a class interested, motivated and eager to learn are invaluable skills that will provide a positive learning experience for the cadets.

Teaching Point 1	**Describe the Principles of Instruction**
Time: 10 min	Method: Interactive Lecture

THE PRINCIPLES OF INSTRUCTION

> **Principle.** A fundamental truth or law as the basis of reasoning or action.

In order to create an environment that promotes participation and learning, an instructor follows a set of guidelines or principles to plan and instruct a lesson. The following are the fundamental guidelines known as the principles of instruction:

- **Interest.** Cadets are more receptive to learning when they are curious and have an emotional connection to a topic. The instructor must arouse, create and maintain the interest of the cadets. Without interest, the cadets will be less inclined to listen and will not learn.
- **Comprehension.** Comprehension or understanding relates to the cadet’s ability to understand the material taught. The cadets’ readiness to learn new material is influenced by what has previously been taught; new content should not exceed the knowledge level of the cadets. If the cadets do not understand, they are unable to learn.
- **Emphasis.** During a period of instruction, there will be some information that may be of particular importance. The instructor can emphasize this important information through the use of voice control, training aids and in-class activities.
- **Participation.** Cadets are more likely to retain information if they are both mentally and physically involved in learning. The instructor should conduct activities that contain action, activity and excitement. Cadets learn by doing.
- **Accomplishment.** The lesson must impart a sense of accomplishment to each cadet. The cadets should leave the class with the satisfaction that they were able to accomplish something in the lesson.
- **Confirmation.** Confirmation is an essential part of learning and instructing. It gives both the instructor and the cadet the opportunity to see how well the information is understood.

> The acronym ICEPAC is useful for remembering the principles of instruction.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. List the principles of instruction.

Q2. What will occur if a lesson lacks interest?

Q3. What is the acronym that can be used to remember the principles of instruction?

ANTICIPATED ANSWERS

A1. The principles of instruction are:

- interest,
- comprehension,
- emphasis,
- participation,
- accomplishment, and
- confirmation.

A2. Without interest the cadets will be less inclined to listen and will not learn.

A3. The acronym that can be used to remember the principles of instruction is ICEPAC.

Teaching Point 2	**Conduct an Activity Where the Cadets Will Apply the Principles of Instruction**
Time: 40 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets practice the application of the principles of instruction.

RESOURCES

- Principles of instruction information sheets,
- Principles of instruction worksheets, and
- Pens/pencils.

ACTIVITY LAYOUT

Set up six learning stations, to include:

- principles of instruction information sheets,
- principles of instruction worksheets, and
- pens/pencils.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into six groups and place each group at one of the principles of instruction learning stations.
2. Assign each group a leader. Have the group leader assign a recorder and a reader.
3. Using the principle and topic at the top of the page, have the groups fill out the principle of instruction worksheet (it is necessary for each group to fill out only one worksheet).
4. After five minutes, have the groups rotate clockwise to the next station. Have the cadets complete the next principle of instruction worksheet.

Have the groups bring their worksheets with them as they rotate through the stations.

It is important to circulate around the room to facilitate the activities and help the cadets as required. If possible, assign other instructors to aid with supervision and facilitation.

5. Rotate the groups through the remaining stations.
6. Have the cadets share the information they recorded with the rest of the cadets. In most cases the groups will have recorded the same information for each station. If a group has listed different information it will be shared after the presentation is finished.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the principles of instruction learning stations will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Describing the principles of instruction and knowing how to apply them when planning and instructing a lesson assists in making training enjoyable and successful and helps the instructor make informed decisions while in front of a class. The ability to keep a class interested, motivated and eager to learn are invaluable skills that will provide a positive learning experience.

INSTRUCTOR NOTES/REMARKS

The learning stations must be set up prior to beginning this lesson.

The cadets will be divided into six groups and will rotate through the stations during the in-class activity in TP 2.

REFERENCES

A1-041 A-P9-050-000/PT-006 Canadian Forces Individual Training and Education System. (1997). *Conduct of Instructional Programmes* (Vol. 6). Ottawa, ON: Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M309.02 – IDENTIFY METHODS OF INSTRUCTION

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy Annexes C and D for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to describe types of lessons as it allows the instructor to deliver new information while encouraging the cadets to actively participate by asking and responding to questions.

An in-class activity was chosen for TPs 2 and 3 as it is an interactive way to reinforce the topic and confirm the cadets' comprehension of types of lessons and methods of instruction.

INTRODUCTION

REVIEW

N/A

OBJECTIVES

By the end of this lesson the cadet shall have identified a method of instruction appropriate for a specific type of lesson and given topic.

IMPORTANCE

It is important for cadets to know that there are many methods of instruction that can be used for knowledge and skill lessons. Varying the method of instruction is one way for instructors to create interest and encourage learning.

Teaching Point 1	**Describe Types of Lessons**
Time: 5 min	Method: Interactive Lecture

TYPES OF LESSONS

Knowledge and skill are the two types of lessons.

> The main differences between a knowledge lesson and a skill lesson are how the cadets participate during the lesson and how the instructor confirms learning at the end of a teaching point or lesson.
>
> In a knowledge lesson, the cadets participate by asking and responding to questions and discussing lesson content. The instructor confirms learning by posing questions to the class or conducting an activity.
>
> In a skill lesson, the cadets participate by practicing and performing a skill while the instructor observes the cadets' performance to confirm learning.

Knowledge Lesson

A knowledge lesson gives the cadets the theoretical aspects of a subject. The instructor presents basic information about a topic, typically following the who, what, where, when and why (5 Ws) format. Delivering an effective knowledge lesson requires the instructor to:

1. select an instructional method;
2. research the lesson information thoroughly;
3. summarize the information;
4. prepare questions to encourage class participation;
5. prepare questions for confirmation; and
6. prepare training aids.

> All lessons require the instructor to create and maintain interest. It is especially important that instructors ensure that knowledge lessons are interesting because they are not hands-on.

Skill Lesson

A skill lesson demonstrates the skill to be learned in a step-by-step sequence. Conducting an effective demonstration requires the instructor to:

1. plan carefully;
2. breakdown the skill to be taught into sequential steps;
3. rehearse the sequence to ensure that it is accurate and clear;
4. prepare a written lesson plan;
5. prepare and/or obtain all material needed to demonstrate and practice the skill in advance;
6. organize the class so the demonstration can be seen;

7. allow the cadets to practice the steps under supervision;
8. provide assistance or re-demonstrate as necessary; and
9. allow the cadets to continue to practice under supervision until all have achieved the skill.

Mastery of a particular skill may require practice beyond class time depending upon the learners and difficulty of the skill.

Learning is a combination of knowledge, attitudes and skills that promote the development of a cadet.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the main differences between knowledge and skill lessons?

Q2. How do instructors confirm learning in a skill lesson?

Q3. Why is it more difficult to create and maintain interest in a knowledge lesson?

ANTICIPATED ANSWERS

A1. Knowledge and skill lessons differ mainly in how cadets participate during the lesson and how instructors confirm learning at the end of a teaching point or lesson.

A2. Instructors confirm learning in a skill lesson by observing the cadets perform the skill.

A3. It is more difficult to create and maintain interest in a knowledge lesson because it is not hands-on.

Teaching Point 2	**Conduct an Activity Where the Cadets Will Describe Methods of Instruction**
Time: 25 min	Method: In-Class Activity

BACKGROUND KNOWLEDGE

INSTRUCTIONAL METHODS

Instructors should be familiar with and able to use a variety of methods of instruction. Some of the more widely used instructional methods are described and located at Annex C.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets describe methods of instruction.

RESOURCES

- Methods of instruction information sheets,
- Flip chart paper,
- Coloured markers, and
- Pens/pencils.

ACTIVITY LAYOUT

Set up four work stations and label them “description”, “pre-lesson preparation”, “typical applications” and “lesson development”. At each station have:

- three sheets of flip chart paper, and
- coloured markers.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into four groups and place each group at one of the labelled work stations.
2. Give the cadets a copy of Annex C.
3. Assign each group a leader. The group leader will be responsible for assigning a recorder and reader.
4. Have each group research their information (description, pre-lesson preparation, typical applications, or lesson development) from Annex C for each method of instruction and record the key points on the flip chart paper. (10 minutes)
5. Have the groups share their information with the class. (10 minutes)

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets’ participation in the activity will serve as the confirmation of this TP.

Teaching Point 3 — **Conduct an Activity Where the Cadets Will Select an Appropriate Method of Instruction for a Given Topic**

Time: 20 min — Method: In-Class Activity

The instructional method is determined by the:

- lesson material,
- environment in which the training will take place,
- resources available to the instructor,
- time available to the instructor, and
- needs of the cadets.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets consider criteria and select an appropriate method of instruction for each topic.

RESOURCES

List of lesson topics located at Annex D.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Give the cadets a copy of Annex D.
2. Introduce the objective of the activity and have the cadets work individually for 10 minutes matching the lesson topics to the instructional methods described in TP 2.
3. Stress that some topics can be taught using more than one method of instruction but they are to chose the one they consider to be the most appropriate.
4. Have the cadets share their work with the class by identifying and explaining their choice of instructional method for a topic.

No single instructional method is best for all objectives. Providing instruction using a variety of methods can often enhance learning.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is one application of the interactive lecture?

Q2. How does the instructor confirm learning when using the demonstration and performance instructional method?

Q3. What instructional method is being used when the cadets participate in "real life" operations that illustrate what was discussed or learned in the classroom?

Q4. Give two examples of in-class activities?

Q5. Games create variety and arouse interest. It is critical they do what?

Q6. Which instructional method is being used when cadets produce a product, carry out an application or demonstrate a process?

ANTICIPATED ANSWERS

A1. Interactive lectures can be used to review previously taught material, present background information, introduce a new subject, give instructions on procedures, illustrate the application of rules, principles or concepts and introduce a demonstration, discussion or performance.

A2. During a demonstration and performance, the instructor confirms learning by observing the cadet perform the operation, skill or movement.

A3. Field trip.

A4. In-class activities include learning stations, videos, brainstorming, debating and group work.

A5. It is critical that games support learning.

A6. Practical activity.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 3 (309 PC).

CLOSING STATEMENT

Being able to select a method of instruction appropriate for a given lesson is an important skill for an instructor. Cadets will be more likely to pay attention, participate in classroom activities, answer questions and generally have a positive learning experience if instructors select an appropriate instructional method and plan the learning activities.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A1-041 A-P9-050-000/PT-006 Director Training and Education Policy. (2002). *Canadian Forces Individual Training and Education System* (Vol. 6). Ottawa, ON: Department of National Defence.

A1-042 A-P9-050-000/PT-005 Director Training and Education Policy. (2001). *Canadian Forces Individual Training and Education System* (Vol. 5). Ottawa, ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M309.03 – DESCRIBE EFFECTIVE-SPEAKING TECHNIQUES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 3 to present basic material and to orient the cadets to aspects of voice control and how to prepare for effective-speaking.

A group discussion was chosen for TP 2 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about physical presence while speaking in front of a group.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described elements of voice control, elements of physical presence and effective-speaking preparation.

IMPORTANCE

It is important for the cadets to describe elements of voice control and physical presence to be a confident instructor. The ability to effectively prepare for a presentation and control nervousness are invaluable skills that help to provide a positive learning experience for both the instructor and the trainee.

Teaching Point 1	Explain Elements of Voice Control
Time: 10 min	Method: Interactive Lecture

The cadets may have been exposed to people from other communities, provinces and even countries with accents different from their own. Brainstorm with the cadets how elements of voice control can affect how the message is received and write down the responses. After the brainstorming is complete, compare the class list to the list below.

ELEMENTS OF VOICE CONTROL

One of the most important and effective tools of communication is voice control. The ability to use voice control to communicate effectively and place emphasis on important information is a fundamental skill that will be used while in front of an audience.

Pitch. How high or low a voice is. A change in pitch usually does not add any significance to a message. However, a pitch change will be noticed by the audience and will keep people involved.

Tone. The quality of the sound of a voice. Effective communicators will often change the tone of their voice to give emphasis to a single word or phrase to convey emotion and conviction.

Monotone. A sound without change of pitch or tone.

Volume. The quantity or power of sound or fullness of tone. A change in volume often signifies emphasis on a particular phrase or point. Environmental factors such as outside noise and room size must be taken into consideration to ensure the audience can hear the message being sent.

Speed. The rate or rapidity in which words are spoken. Speaking too fast or too slow can be distracting to an audience. It is important to communicate at a pace that ensures the audience can understand every word being said.

Pause. A break in speaking or reading. A pause is an important part of the communication process. A pause gives the audience an opportunity to digest what has been said and to ask questions. A pause is also an effective way to announce a change in subject or an important point.

Articulation. The clear and distinct pronunciation of a word. It is important to properly pronounce and articulate words to ensure the audience can understand the message being sent.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Name the six elements of voice control.

Q2. What can a change in volume signify when sending a message?

Q3. What is the purpose of pausing while speaking?

ANTICIPATED ANSWERS

A1. The six elements of voice control are:

- pitch,
- tone,
- volume,
- speed,
- pause, and
- articulation.

A2. A change in volume can signify emphasis on a particular phrase or point.

A3. A pause gives the audience an opportunity to digest what has been said and to ask questions. A pause is also an effective way to announce a change in subject or an important point.

Teaching Point 2	**Discuss Elements of Physical Presence**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The purpose of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

ELEMENTS OF PHYSICAL PRESENCE

It is estimated that 93 percent of the total meaning of a message comes from non-verbal communication and only 7 percent of meaning comes from the words themselves. Being aware of physical presence and its effect on a message being sent is an important element of effective communication.

Body Language

Body language or non-verbal communication is the process of communicating through conscious and unconscious gestures and expressions. Understanding that body language affects how a message is received and interpreted is an important tool for communicating effectively.

Facial Expressions. While 93 percent of the total meaning of a message comes from non-verbal communication, most of that meaning is communicated by the eyes, eyebrows and mouth. The movement of the eyes, eyebrows and mouth can result in an infinite variety of expressions to complement the spoken word. It is important that facial expressions match the tone of the message being sent to create emphasis and believability. A smile is the most important of all facial expressions. A smile adds sincerity to a message and will add to the likeability of the individual in front of the audience.

Eye Contact. Maintaining eye contact is an effective way of engaging an audience and building interest. Pausing two or three seconds on each member of the audience will make them feel as though they are involved in a one-on-one conversation. It is important to look at the entire room and scan from left to right, back to front.

Look for friendly, sympathetic faces to gain confidence and ease nervousness.

Gestures. The combination of hand, arm and shoulder movements can make a wide variety of gestures that can help add meaning to a message. Effective communicators will let their hands and arms move naturally to help give emphasis and emotion to a message. It is important not to point directly at members of the audience or let gestures become distracting.

Movement. Being aware of movement while in front of an audience is very important to communication. Movement will keep listeners engaged and interested in what is being said. Moving around the front of the room, toward and away from an audience and from side to side can help emphasize points. Too much or frantic movement can become distracting and will affect how a message is received.

Hands placed in pockets are typically a sign of nervousness or overconfidence.

Dress and Deportment.

Effective communicators are aware of their dress and deportment. Audiences will react differently to an individual who is well dressed and acts professionally, than an individual who is poorly dressed and acts unprofessionally.

Dress. Effective communicators will always appear in clean, well-pressed and appropriate attire. Dressing appropriately for the event will help create confidence and credibility.

Deportment. An audience that sees an individual as being prepared, on time, appropriately dressed and confident will be much more receptive, than to an individual who is unprepared, late, poorly dressed and nervous. The most important element of deportment is displaying an interest in the subject; this will be noticed by the audience and will generate interest in the presentation.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. How could you use facial expressions to emphasize something that is funny?

Q2. As an effective-speaker how could you make the audience feel like they are part of the presentation?

Q3. How would you expect an instructor to present themselves in terms of dress and deportment?

Q4. What is one of the most important elements of deportment?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce the answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the group discussion will serve as the confirmation of this TP.

Teaching Point 3 — **Explain Effective-Speaking Preparation**

Time: 5 min — Method: Interactive Lecture

Effective-speaking preparation is the most critical component of effective communication. Preparation will help to ensure confidence, control nervousness and increase the likelihood of success when in front of an audience.

The following are the steps to effective-speaking preparation:

1. **Practicing.** Proper rehearsal will aid in memorizing content, which will allow for more eye contact and movement while in front of an audience. Memorizing the introduction and conclusion are the two most critical elements; a strong introduction will aid in gaining confidence and will draw the interest of the audience, a strong conclusion will aid in leaving a lasting impression on the audience. If possible, practice in front of a small group, speak aloud even when practicing alone and always practice while standing.

2. **Controlling Nervousness.** The feeling of nervousness prior to speaking in front of a group is normal and often can help if channeled effectively. The following actions can be taken to control nervousness:

   (a) **Room Layout.** Become familiar with the layout of the room prior to speaking.

   (b) **Materials.** Ensure notes, handouts and presentation aids are organized.

   (c) **Equipment.** Ensure any equipment being used is in working order and ready to use.

   (d) **Practice.** Spend time going over notes and rehearsing content.

   (e) **Attitude.** Enter the room with a smile and a positive and confident attitude.

   (f) **Breathing.** Take a deep breath before entering the room. Slow down the delivery if necessary and breathe from the diaphragm while speaking, not from the chest.

3. **Identifying a Friendly Face.** While walking in front of an audience, identify a friendly face. Making eye contact with a friendly face while beginning to speak will often give confidence while beginning the introduction and ultimately lead to success when addressing an audience.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are the three steps to effective-speaking preparation?

Q2. What actions can be taken to control nervousness?

Q3. What is the benefit of identifying a friendly face?

ANTICIPATED ANSWERS

A1. The three steps to effective-speaking preparation are:

(1) practice,

(2) control nervousness, and

(3) identify a friendly face.

A2. The actions that can be taken to control nervousness are:

- become familiar with the layout of the room prior to speaking,
- ensure notes, handouts and presentation aids are well organized,
- ensure any equipment being used is in working order and ready to use,
- spend time going over notes and rehearse content,
- enter the room with a smile and a positive and confident attitude, and
- take a deep breath before entering the room.

A3. Making eye contact with a friendly face while beginning to speak will often give confidence while beginning the introduction and ultimately lead to success when addressing an audience.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is meant by tone?

Q2. What are the two elements of physical presence?

Q3. What are the four aspects of body language?

ANTICIPATED ANSWERS

A1. The quality of the sound of a voice.

A2. The two elements of physical presence are:

- body language, and
- dress and deportment.

A3. The four aspects of body language are:

- facial expressions,
- eye contact,
- gestures, and
- movement.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing how to apply elements of voice control and physical presence will make instructing enjoyable and successful by helping develop presence while in front of an audience. The ability to effectively prepare for a presentation and control nervousness are invaluable skills that may help to develop a more confident instructor.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C1-133 (ISBN 0-9695066-2-7) Bender, P. (2000). *Secrets of Power Presentations*. Toronto, ON: The Achievement Group.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO M309.04 – DESCRIBE QUESTIONING TECHNIQUES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Arrange for officers or senior cadets to assist in conducting the activity and recording data regarding the cadets' performance.

Review the activity instructions with the officers and senior cadets assisting with the activity.

Photocopy Annexes E, F, G, and H for the officers and senior cadets assisting with the activity.

Photocopy Annex E for each cadet.

Assign spaces in the training area for workstations to conduct the activity if more than one group is used.

Make photocopies of Annex F for each station if necessary.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 to 3 as it allows the instructor to describe the purposes, qualities and types of questions while encouraging the cadets to actively participate by asking and responding to questions.

An in-class activity was chosen for TP 4 as it is an interactive way to reinforce the topic and confirm the cadets' comprehension of questioning techniques.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described questioning techniques by listing the purposes of questioning, listing the qualities of a good question, defining types of questions and by listing the steps to posing questions while instructing.

IMPORTANCE

Asking questions throughout a lesson helps the instructor to determine the cadets' level of comprehension of previously taught material, to create interest in the lesson and to confirm the cadets' comprehension of new material. Proper questioning techniques will help instructors ask questions properly to accomplish these goals and to develop confidence in their instructional abilities.

Teaching Point 1	**Describe the Purposes of Questioning**
Time: 5 min	Method: Interactive Lecture

PURPOSES OF QUESTIONING

Questions that are carefully developed and incorporated into a lesson plan may improve learning. In fact, instructors' use of questions has such an impact on learning that it can be considered an indicator of their overall effectiveness. Instructors may improve their questioning technique by carefully planning what questions to ask, when and how to ask them so as to improve their instructional ability.

Questions can be posed throughout a lesson to:

- determine the cadets' level of comprehension of previously taught related material;
- create and maintain interest by keeping the cadets mentally alert and making them feel more involved in the lesson;
- guide and provoke thinking by carefully selecting questions and following answers with other questions as the lesson progresses; and
- confirm learning, especially for knowledge lessons, by asking questions at the end of each TP and at the end of the lesson.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why is questioning such an important aspect of instruction?

Q2. How can instructors improve their questioning technique?

Q3. What are four purposes of questioning?

ANTICIPATED ANSWERS

A1. Questioning has a big impact on learning and is considered an indicator of an instructor's effectiveness.

A2. By planning what questions to ask and when and how to ask them.

A3. To determine comprehension of previously learned material, create and maintain interest, guide and provoke thinking, and to confirm learning.

Teaching Point 2 | **Describe the Qualities of a Good Question**

Time: 5 min | Method: Interactive Lecture

QUALITIES OF A GOOD QUESTION

Questions used during a lesson should be written out ahead of time. Instructors who consistently pay attention to writing good quality questions will improve their instruction and learn to instinctively phrase good questions when the situation demands it during a lesson.

> Often the cadets who are being instructed ask questions for clarification. Effective instructors create a classroom atmosphere that encourages cadets to ask questions, which are relevant to the lesson.

The exact wording of a question is determined by its purpose and the situation in which it is asked. While the wording may vary, all questions should be:

- brief, complete and easily understood;
- stated clearly using simple language;
- a challenge to cadets to apply their knowledge;
- not so difficult that only a few cadets can answer; and
- relevant to the lesson by reinforcing and supporting the teaching points.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why should questions be written out ahead of time?

Q2. How can instructors learn to ask better quality questions while instructing?

Q3. What are five qualities of good questions?

ANTICIPATED ANSWERS

A1. Questions written out ahead of time are of better quality and will improve instruction.

A2. By crafting good quality questions, the question-making process will become instinctive.

A3. Brief and complete, clearly stated, challenging, not too difficult, and relevant.

Teaching Point 3 | **Describe Types of Questions**

Time: 5 min | Method: Interactive Lecture

> All questions may be categorized as either participatory or evaluative. Participatory questions are used during a lesson to create and maintain interest, to keep cadets mentally alert and to guide thought. Evaluative questions are used at the beginning of a lesson to

determine retention of previously taught material or at the end of a TP or lesson to confirm comprehension of new material.

There are many types of questions but those most commonly recognized include:

Lead-Off. Questions, which are used to begin a lecture or start a discussion. This type of question does not necessarily require a verbal or written response and is designed to get the cadets thinking about the topic of the lesson or the issue being discussed.

Example: “What does being a good cadet mean to you?”

Follow-Up. Questions that are used to further stimulate the cadets’ thinking about the topic of the lesson or point of discussion. As the name suggests they are supplementary questions related to the initial lead-off question or are questions, which are phrased on the spot to probe an answer to a previous question or extend a point of discussion.

Example: “Identify an item, just mentioned in question one, that can be considered both a good and bad cadet quality.”

Overhead. Questions that are asked to the whole group without indicating who is to reply. There will be several answers to this type of question and everyone should be given a chance to respond.

Example: “Identify one factor that can determine if a cadet quality is good or bad”

Direct. Questions that are the opposite of overhead questions because someone is directed to answer. These questions can be used to draw in those who are reluctant to take part in discussions, to prompt cadets who are inattentive or to get a discussion back on track.

Example: “Cadet I.M. Reluctant, can you think of another factor which determines if a cadet quality is good or bad?”

Reverse or Relay. Questions are used to keep the discussion in the hands of the cadets. Instead of answering a question posed by a cadet the instructor can reverse the question and return it to the person who asked it or relay it to another member of the class.

Example: “Cadet C. Legs, can you answer Cadet I.M. Reluctant’s question?”

Never use reverse or relay as an escape mechanism for questions you cannot answer. Always admit that you don’t know the answer and follow up later rather than use reverse and relay.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Which type of question does not necessarily require a response?

Q2. Which type of question can be used to encourage cadets to take part in a discussion?

Q3. What is one thing to avoid when using reverse and relay questions?

ANTICIPATED ANSWERS

A1. Lead-off.

A2. Direct.

A3. Trying to hide the fact that an instructor doesn't know the answer to a question.

Teaching Point 4	**Conduct an Activity Where the Cadets Will Practice Posing Questions Using the Pose, Pause, Pounce, Ponder and Praise Sequence**
Time: 10 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to introduce cadets to a posing questions sequence that they can follow when asking questions while instructing, particularly during M309.07 (Instruct a 15-Minute Lesson, Section 7).

RESOURCES

- Posing questions sequence handout located at Annex E,
- Questions handout located at Annex F,
- Posing questions rubric located at Annex G, and
- Posing questions checklist located at Annex H.

ACTIVITY LAYOUT

Set up work stations, if necessary, labelled A, B, C, etc. and place the following at each station:

- a copy of the posing questions sequence handout,
- a copy of the questions, and
- pens/pencils.

If possible brief the assisting staff and the cadets prior to the lesson.

The activity can be used with one group of five to ten cadets or several smaller groups if numbers warrant. The objective is to have each cadet follow the question posing sequence for at least one question but they can ask more than one if necessary. If the group is larger than five other questions can be devised using the children's story, "Goldilocks and the Three Bears."

ACTIVITY INSTRUCTIONS

Divide cadets into groups, if necessary, and assign a supervisor and letter name to each group.

1. Brief the assisting staff that they will be expected to:
   (a) assign each cadet in their group a number from one to five indicating the order in which they will take part in the activity;

(b) move their groups to the appropriately named area to conduct the activity;

(c) read the introduction to the children's story, "Goldilocks and the Three Bears" to the cadets;

(d) ask Cadet # 1 to pose the first question from Annex F and record information on the checklist describing their performance;

(e) carry out the same procedure for each succeeding cadet;

(f) provide feedback to each cadet regarding their performance;

(g) return the group to the main area; and

(h) give the completed posing questions checklist to the instructor.

2. Ensure that assisting staff have a copy of Annexes E, F, G and H.

3. Brief the cadets that they will:

(a) listen to a short introduction to the children's story, "Goldilocks and the Three Bears";

(b) use a question posing sequence to ask one question to their group based on the children's story, "Goldilocks and the Three Bears"; and

(c) be supervised and corrected on the spot if they do not follow the posing questions sequence properly.

4. Have the cadets begin the activity.

5. Circulate throughout the training area observing the groups as they take part in the activity.

6. Debrief the cadets on their performance.

Remind cadets that the activity was designed to introduce a posing questions sequence that they can follow when asking questions while instructing, particularly during M309.07 (Instruct a 15-Minute Lesson, Section 7).

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the four purposes for asking questions?

Q2. List two qualities of a good question.

Q3. List two types of questions most commonly recognized.

Q4. List the five parts of the question posing sequence.

ANTICIPATED ANSWERS

A1. The four purposes of questions are:

- to determine the cadets' level of comprehension of previously taught material;
- to create and maintain interest;
- to guide and provoke thinking; and
- to confirm learning of new material.

A2. Good questions should be brief and complete, written clearly using simple language, challenging, not too difficult and relevant to the lesson.

A3. The types of questions most commonly recognized are lead-off questions, follow-up questions, overhead questions, direct questions and reverse or relay questions.

A4. The five parts of the question posing sequence are pose, pause, point, ponder and praise.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The question is an important tool for the instructor. It is useful for instructors to know the purposes, qualities and types of questions but should keep in mind that this knowledge alone will not necessarily improve questioning technique. Carefully writing out questions before hand and asking them properly are just as important when using questions while instructing a lesson.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A1-041 A-P9-050-000/PT-006 Director Training and Education Policy. (2002). *Canadian Forces Individual Training and Education System* (Vol. 6). Ottawa, ON: Department of National Defence.

A1-042 A-P9-050-000/PT-005 Director Training and Education Policy. (2001). *Canadian Forces Individual Training and Education System* (Vol. 5). Ottawa, ON: Department of National Defence.

A1-048 A-CR-CCP-913/PT-001 Cadet Instructors List Training School. (1978). *Technique of Instruction*. Ottawa, ON: Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO M309.05 – SELECT APPROPRIATE INSTRUCTIONAL AIDS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

The activity in TP 2 uses learning stations. Learning stations are a form of group work where the cadets learn by sorting through the information presented. When setting up learning stations, ensure there is enough room for each cadet to be comfortable and have adequate space for writing down information. When the cadets arrive at a learning station, all required information shall be available. These stations should be placed close together to minimize time for movement; however far enough apart to avoid interruptions from other groups. For this lesson, choose and set up five learning stations.

Photocopy the handouts located at Annexes I and J and place a copy of each at the appropriate learning station.

Samples of instructional aids available at the squadron should be used during this lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to introduce instructional aids, as it allows the instructor to deliver new information while encouraging the cadets to actively participate by asking and responding to questions.

An in-class activity was chosen for TP 2 as it is an interactive way to introduce the cadets to the different types of instructional aids and to confirm the cadets' comprehension of the material presented.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified and selected appropriate instructional aids for a given topic.

IMPORTANCE

It is important for cadets to know that selecting appropriate instructional aids is an important part of pre-lesson preparation. Using instructional aids during a lesson helps stimulate the cadets' interest and helps them comprehend and recall the new material.

Teaching Point 1	**Describe Instructional Aids**
Time: 5 min	Method: Interactive Lecture

INSTRUCTIONAL AIDS

Instructional aids consist of various types of learning support that emphasize and clarify teaching points. Instructional aids include handouts, verbal support, audiovisual aids, simulators and real equipment. Instructional aids can be produced locally or purchased externally but must:

- be relevant to the teaching point;
- support learning; and
- be appropriate to the cadets' background and needs.

Instructional aids can be categorized as:

- **Training Aids.** Training aids refer to all types of learning support instructors use to instruct the lesson.
- **Learning Aids.** Learning aids refer to all the materials the cadets use to participate in the lesson and comprehend the material.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How can instructional aids support learning?

Q2. How can instructional aids be obtained?

Q3. What is the difference between a training aid and a learning aid?

ANTICIPATED ANSWERS

A1. Instructional aids support learning by emphasizing and clarifying teaching points.

A2. Instructional aids can be produced locally or purchased externally.

A3. A training aid is used by the instructor to instruct the lesson and a learning aid is used by the cadet to participate in the lesson and comprehend the material.

Teaching Point 2 — **Conduct an Activity Where the Cadets Will Identify Types of Instructional Aids and Select an Instructional Aid Appropriate for a Given Topic**

Time: 45 min — Method: In-Class Activity

BACKGROUND KNOWLEDGE

The saying “a picture is worth a thousand words”, describes the effectiveness of instructional aids. New instructional aids are being developed all the time and it is important for instructors to know what aids are available, when to use them and how to use them. Some of the more common instructional aids are described in Annex I.

> “Show ’em as well as tell ’em!” Cadets will remember more for longer periods of time.

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets identify types of instructional aids and select an instructional aid appropriate for a given topic.

RESOURCES

- Instructional aids information sheets,
- Worksheets,
- Stopwatch,
- Signalling device,
- Flip chart paper,
- Coloured markers, and
- Pens/pencils.

ACTIVITY LAYOUT

Set up and label five learning stations “Instructional Aids”, “Verbal Support”, “Audiovisual Aids”, “Simulators and Training Equipment” and “Select an Instructional Aid.”

ACTIVITY INSTRUCTIONS

1. Divide the cadets into five groups and place one group at each learning station.
2. Assign each group a leader. Have the group leader assign a recorder and a reader.
3. Have the cadets read the information sheets and fill out a worksheet on each aspect of instructional aids. It is necessary for each group to fill out only one worksheet.
4. After eight minutes, have the groups rotate clockwise to the next station, where they will have another eight minutes to complete a worksheet.

5. Rotate the groups through the remaining stations.
6. Have the cadets share the information they recorded from each station.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the instructional aids activity in TP 2 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 3 (309 PC).

CLOSING STATEMENT

Instructional aids appeal to all five senses but mainly to our senses of sight and hearing. It has often been reported that 75 percent of all learning happens through sight and that you remember 50 percent more when you both see and hear the information. It naturally follows therefore, that learning is enhanced when instructional aids are used.

INSTRUCTOR NOTES/REMARKS

Samples of instructional aids available at the squadron should be used during this lesson.

REFERENCES

A1-041 A-P9-050-000/PT-006 Director Training and Education Policy. (2002). *Canadian Forces Individual Training and Education System*. (Vol. 6). Ottawa, ON: Department of National Defence.

A1-042 A-P9-050-000/PT-005 Director Training and Education Policy. (2001). *Canadian Forces Individual Training and Education System*. (Vol. 5). Ottawa, ON: Department of National Defence.

A1-043 A-P9-050-000/PT-004 Director Training and Education Policy. (1999). *Canadian Forces Individual Training and Education System*. (Vol. 4). Ottawa, ON: Department of National Defence.

A1-048 A-CR-CCP-913/PT-001 Cadet Instructors List Training School. (1978). *Technique of Instruction*. Ottawa, ON: Department of National Defence.

C1-141 Dynamic Flight, Inc. *Instructional Aids and Training Technologies*. (2003). Retrieved March 20, 2008, from http://www.dynamicflight.com/avcfibook/inst_aids/.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO M309.06 – PLAN A LESSON

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the lesson specification and instructional guide handout located at Annex K, the blank lesson plan located at Annex L and the plan a lesson checklist located at Annex M for each cadet.

Photocopy the lesson specifications and instructional guides located at Annexes O to AC as required.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 to 3 to present basic material on how to research lesson content and how to prepare for a lesson.

A practical activity was chosen for TP 4 to allow the cadets to plan a lesson in a structured and controlled environment. This activity contributes to the development of lesson-planning skills and will serve as preparation for EO M309.07 (Instruct a 15-Minute Lesson, Section 7).

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to research lesson content and develop a lesson plan.

IMPORTANCE

It is important for cadets to research lesson content, prepare a lesson location and plan a lesson because these are critical steps to the success of a period of instruction. The preparation of a lesson location sets the tone for the lesson and a well-developed lesson plan provides structure and organization, guides the instructor through each stage of the lesson and ensures that all essential information is delivered.

Teaching Point 1 | **Explain How to Research Lesson Content**

Time: 10 min | Method: Interactive Lecture

Some common abbreviations and terms used by training officers and instructors:

- **QSP.** Qualification Standard and Plan.
- **PO.** Performance Objective.
- **EO.** Enabling Objective.
- **TP.** Teaching Point.
- **PC.** Performance Check.
- **EC.** Enabling Check.
- **IG.**Instructional Guide.

RESEARCHING LESSON CONTENT

To plan for a lesson, the cadets will need to research lesson content and become familiar with the conditions, standard, TPs, lesson content and the time allocated for the EO and TPs.

The Canadian Forces employs an acronym that is used to provide a framework for the instructor to gather and organize the reference material into an efficient and practical lesson plan. The initialism is CCSAM.

Collect. During this step, the instructor researches the material to be covered in the period of instruction using course documents such as the lesson specification, IG and listed references. In situations where no course documents exist, the instructor will research the material to be taught using whatever references exist.

Consider. During this step, the instructor sifts through all of the material found in the collection step and determines what is relevant and current.

Select. During this step, instructor selects the material that is appropriate for the lesson. The instructor also selects the method of instruction to be used.

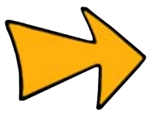
Arrange. During this step, the instructor arranges the material into stages that allow for the information to be presented in a logical sequence.

Master. During this step, the instructor writes the lesson plan.

The use of CCSAM is a good general practice. In most cases for cadet training these steps have been completed during the development of the lesson specifications and IGs. The instructor may need to only transpose the information into the pertinent parts of their lesson plan.

Distribute the lesson specification and instructional guide handout located at Annex K to each cadet.

ENABLING OBJECTIVE AND LESSON SPECIFICATION



Enabling objectives and lesson specifications can be found in Chapter 4.

Performance objectives are broken down into a series of enabling objectives and lesson specifications. The enabling objective consists of Paragraphs 1. to 3. (as illustrated in Figure 9-6-1). The information in these paragraphs will answer three questions:

1. What will the cadet be expected to be able to do by the end of this lesson?
2. Under what conditions will the cadet be expected to carry out the performance?
3. How well or to what standard will the cadet be expected to perform?

EO M205.01 – PARTICIPATE IN ORGANIZED RECREATIONAL TEAM SPORTS

DO WHAT?

1. **Performance.** Participate in Organized Recreational Team Sports.
2. **Conditions**
   a. Given:
      (1) sports equipment;
      (2) safety equipment;
      (3) supervision; and
      (4) assistance as required.
   b. Denied: N/A.
   c. Environmental: Appropriate sporting venue.

UNDER WHAT CONDITIONS?

3. **Standard.** In accordance with specified references, the cadet shall:
   a. follow the rules and regulations of the specific sport;
   b. participate in a warm-up;
   c. participate in the given sport; and
   d. participate in a cool-down.

HOW WELL?

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 9-6-1 Enabling Objective

Paragraphs 4 to 11 are known as the lesson specification. The lesson specification provides information about the content to be taught, teaching methods, time, references, training aids, learning aids, test details and remarks.

In Paragraph 4., the TPs are usually described in a table where information is provided on the content taught in each TP, the suggested teaching method, the time for each TP and references (as illustrated in Figure 9-6-2).

CONTENT TO BE TAUGHT

LENGTH OF TP

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Introduce cadets to a specific sport's rules and regulations, to include: a. an overview of how to play the sport; and b. rules and regulations of the sport.	Interactive Lecture	10 min	C0-001
TP2	Conduct a warm-up session, composed of light cardiovascular exercises, meant to: a. stretch the muscles; b. gradually increase respiratory action and heart rate; c. expand the muscles' capillaries to accommodate the increase in blood circulation; and d. raise muscle temperature to facilitate reactions in muscle tissue.	Practical Activity	10 min	C0-002 (pp. 109 to 113) C0-089
TP3	Supervise the cadets' participation in a given sports activity.	Practical Activity	50 min	

REFERENCE NUMBER

SUGGESTED TEACHING METHOD

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Figure 9-6-2 Teaching Points

Paragraph 5. outlines how much time is spent on the introduction/conclusion and the different teaching methods. Paragraph 6. offers substantiation or reasons why certain teaching methods were recommended for each TP. Paragraph 7. provides a list of references used to compile the content in Paragraph 4. (as illustrated in Figure 9-6-3).

5. **Time**

a.	Introduction/Conclusion:	10 min
b.	Interactive Lecture:	10 min
c.	Practical Activity:	70 min
d.	Subtotal:	90 min
e.	Total (three sessions):	270 min

6. **Substantiation**

   a. An interactive lecture was chosen for TP1 to illustrate the application of rules, principles, or concepts of the specific sport to be played.

   b. A practical activity was chosen for TP2–4 as it allows cadets to participate in sports activities in a safe and controlled environment. This activity contributes to the development of sports skills in a fun and challenging setting.

7. **References**

   a. C0-001 (ISBN 0-88011-807-5) Hanlon, T. (1998). *The Sports Rules Book: Essential Rules for 54 Sports*. USA: Human Kinetics Publishers, Inc.

   b. C0-002 (ISBN 0-88962-630-8) LeBlanc, J., and Dickson, L. (1997). *Straight Talk About Children and Sport: Advice for Parents, Coaches, And teachers.* Oakville, ON and Buffalo, NY: Mosaic Press.

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 9-6-3 Paragraphs 5–7

Paragraphs 8. and 9. list the training aids and learning aids required for the lesson. Training aids are the materials that are required by the instructor to instruct the lesson and learning aids are the materials that will be required by the cadet to participate in the lesson (as illustrated in Figure 9-6-4).

8. **Training Aids**

   a. Sports/safety equipment appropriate for the activity;

   b. First aid kit;

   c. Whistles; and

   d. Stopwatch.

9. **Learning Aids.** Sports equipment.

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Figure 9-6-4 Training Aids and Learning Aids

Paragraph 10. is test details, which is information about the evaluation to be conducted. Paragraph 11. is remarks, which describe any other information that may be useful to the Training Officer or instructor (as illustrated in Figure 9-6-5).

10. **Test Details.** N/A.

11. **Remarks**

a. The CCO list of approved sports is located at A-CR-CCP-802/PF-001, Annex A.

b. Recreational sports can be carried out as nine periods during a supported day or over three sessions of three periods each.

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Figure 9-6-5 Test Details and Remarks

Test details will be described in one of the following ways:

- **N/A.** No evaluation for this EO.
- **This EO is assessed IAW Chapter 3, Annex B, Appendix 3 (209 PC).**There is a performance check (PC) associated with this EO, refer to Chapter 3, Annex B for details.
- **This EO is assessed IAW Chapter 3, Annex B, Appendix 3 (209 EC 01).**There is an enabling check (EC) associated with this EO, refer to Chapter 3, Annex B for details.

INSTRUCTIONAL GUIDE

The IG is used in conjunction with the QSP and other resources to conduct training. IGs should be reviewed in conjunction with lesson specifications so that the instructor can adequately plan and prepare their lesson. IGs do not replace lesson plans but offer written content, supporting figures and suggestions on how to instruct a lesson. The following are the six sections of an IG:

1. preparation,
2. introduction,
3. body,
4. conclusion,
5. references, and
6. annexes.

Preparation

The preparation section provides information about where to find the lesson specification and any instructions to the instructor such as reviewing lesson content, photocopying handouts, pre-lesson assignments and the approach and substantiation as to why certain teaching methods were recommended for each TP.

Introduction

The introduction section provides information to the instructor about review that may be necessary, what the cadet will be expected to do by the end of the lesson and why the knowledge/skills are important.

The Body

The body of the IG contains all of the TPs and content listed in Paragraph 4. of the lesson specification in greater detail. The body provides suggested teaching methods, note boxes with special instructions or information (as illustrated in Figure 9-6-6), lesson content, figures, activities and confirmation questions.

Note Boxes:

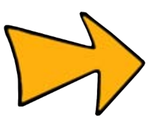
	Special note to the instructor.
	Key information to pass along the cadets.
	Refer to the following CF regulations and policies.
	Points of interest or special instructions the instructor should pass along to the cadets.

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Figure 9-6-6 Note Boxes

The Conclusion

The conclusion section states any homework/reading/practice that may be required of the cadet and the method of evaluation as stated in the lesson specification. The conclusion section also provides a closing statement to be spoken aloud to the cadets and any additional instructor notes/remarks.

References

The reference section lists the references used to create the lesson specification and instructional guide. In some cases, an IG may direct the instructor to a specific reference to be used during a lesson. In most cases this section is only used to identify where the content of the lesson has been drawn from.

Annexes

The annex section contains information that may range from pre-made training aids, learning aids such as handouts and additional information for activities.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Where can a lesson specification be found?

Q2. What information can be found in the preparation section of an instructional guide?

Q3. What information can be found in the body of an instructional guide?

ANTICIPATED ANSWERS

A1. In Chapter 4 of the QSP.

A2. The preparation section provides information about where to find the lesson specification and any instructions to the instructor such as reviewing lesson content, photocopying handouts, pre-lesson assignments and the approach and substantiation as to why certain teaching methods were recommended for each TP.

A3. The body of the IG contains all of the TPs and content listed in Paragraph 4. of the lesson specification in greater detail. The body provides suggested teaching methods, note boxes with special instructions or information (as illustrated in Figure 9-6-6), lesson content, figures, activities and confirmation questions.

Teaching Point 2	Explain How to Prepare for a Lesson
Time: 5 min	Method: Interactive Lecture

PREPARING FOR A LESSON

A well-prepared and positive learning environment can enhance a lesson and the learning experience. The cadets' attention will not only be focused on the instructor but also on the environment around them. Effort put into lesson preparation and presentation can be wasted if the environment is not prepared for optimal learning.

Selecting a Lesson Location

When selecting a lesson location the instructor should consider the following:

- the type of training to be conducted (eg, leadership versus aviation subjects);
- any activities outlined in the instructional guide;
- the size of the group being trained;
- the size of the location;
- the lighting of the location;
- the ventilation of the location;
- the suitability of the location regarding noise distractions; and
- the suitability of the location regarding the use of visual aids.

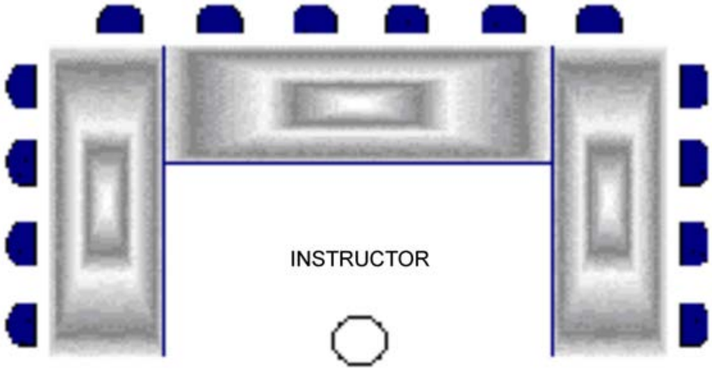
Setting Up the Location

After selecting a lesson location, the instructor must take steps to ensure the location is clean and arranged properly for an optimal training environment.

Cleanliness. A clean training area will prevent distractions and will positively affect motivation. Cadets will notice a messy, disorganized area immediately and will be distracted before the class begins. The room must be clean and well-organized with the boards wiped clean, debris picked up, garbage cans empty, etc.

Seating Arrangements. Cadets must be able to see the instructor, the visual aids and each other to achieve maximum participation. Some arrangements will not be possible given the allotted space. The following descriptions and diagrams depict possible seating arrangements:

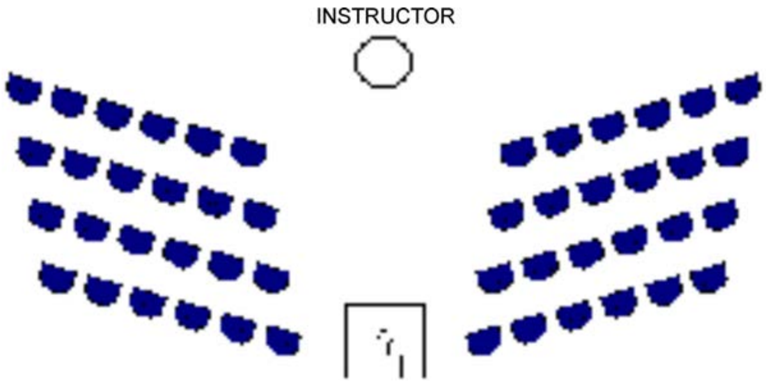
- **U-Shaped.** Allows the instructor to see all cadets easily and also allows trainees to see each other.



E. Jenson, Super Teaching: Mastering Strategies for Building Trainee Success, The Brain Store Inc. (p. 109)

Figure 9-6-7 U-Shaped

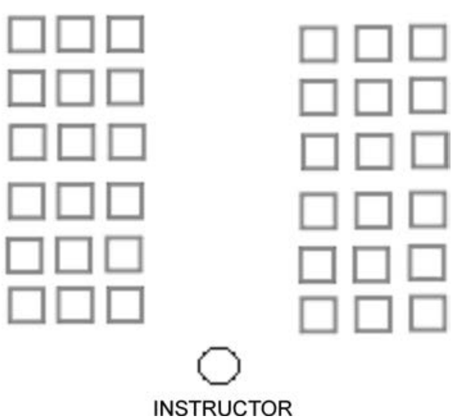
- **Chevron Shape.**Found mostly in auditorium-style rooms and can accommodate large groups.



E. Jenson, Super Teaching: Mastering Strategies for Building Trainee Success, The Brain Store Inc. (p. 109)

Figure 9-6-8 Chevron Shape

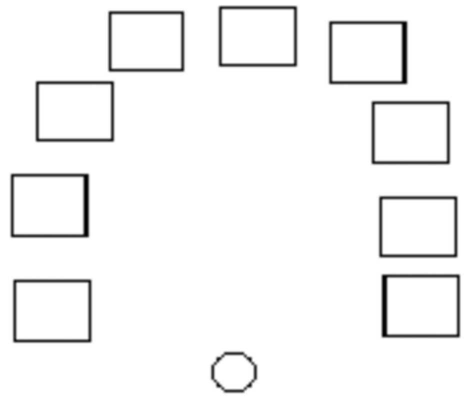
- **Horseshoe.** Can be employed for two groups. This set-up works well during debates and in-class activities.



E. Jenson, Super Teaching: Mastering Strategies for Building Trainee Success, The Brain Store Inc. (p. 109)

Figure 9-6-9 Horseshoe

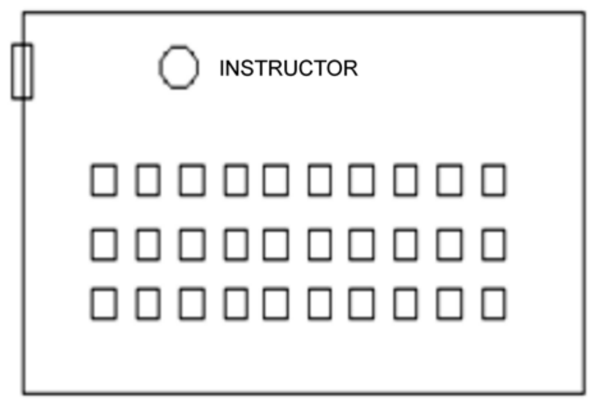
- **Semicircle.**Instructor has a good view of the cadets.



E. Jenson, Super Teaching: Mastering Strategies for Building Trainee Success, The Brain Store Inc. (p. 109)

Figure 9-6-10 Semicircle

- **Standard in Line.** Allows for more frontal coverage with less depth front to back.



E. Jenson, Super Teaching: Mastering Strategies for Building Trainee Success, The Brain Store Inc. (p. 109)

Figure 9-6-11 Standard in Line

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What should the instructor consider when selecting a lesson location?

Q2. Why is it important to have a clean lesson location?

Q3. What are three seating arrangements?

ANTICIPATED ANSWERS

A1. When selecting a lesson location the instructor should consider the following:

- the type of training to be conducted (eg, leadership versus aviation subjects);
- any activities outlined in the instructional guide;
- the size of the group being trained;
- the size of the location;

- the lighting of the location;
- the ventilation of the location;
- the suitability of the location regarding noise distractions; and
- the suitability of the location regarding the use of visual aids.

A2. Cadets will notice a messy, disorganized area immediately and will be distracted before the class begins.

A3. Seating arrangements are:

- u-shaped,
- chevron shape,
- horseshoe,
- semicircle, and
- standard in line.

Teaching Point 3 — **Describe the Lesson Plan Format**

Time: 10 min — Method: Interactive Lecture

LESSON PLAN FORMAT

The lesson plan is a way for the instructor to organize the lesson and summarize the information included in the lesson specification, the IG and their personal ideas. Lesson plans provide a set of detailed directions for delivering one or more periods of instruction.

The lesson plan is arranged in this specific order:

Part		Purpose
1.	Introduction	Builds the cadets' interest and motivation.
2.	Body	Presents and explains each TP.
3.	End of Lesson Confirmation	Confirms cadets' comprehension of the lesson.
4.	Conclusion	Summarizes key points and identifies future lessons.

Introduction

The introduction is the instructor's first verbal interaction with the cadets. It should capture the cadets' interest. The following should be included in the introduction of a lesson plan:

- **What.** A description of what the cadets will be expected to accomplish at the end of the lesson.
- **Where.** A description of how and where the lesson fits into the Cadet Program.
- **Why.** A description of why it is important for the cadets to achieve the objectives.

Read the Objective and Importance paragraphs in the IG for help in writing the introduction of the lesson plan.

Body

The body of the lesson plan is where the content is presented, explained and supported. Each TP directs the instructor and the cadets.

Each TP in the lesson includes:

- **Introduction.** Briefly introduce the content to be taught during the TP.
- **Teaching Method.** Identify which teaching method has been chosen for the TP.
- **Lesson Content.** Present the content of the TP in a clear and logical order, from easy to difficult, known to unknown and simple to complex.
- **Confirmation.** May be oral questions, games, role play, in-class activities or practical activities. IGs offer suggestions for how to confirm TPs. Instructors may choose to use those confirmation suggestions or develop their own.

End of Lesson Confirmation

The lesson plan should outline procedures to be used to confirm the learning of the TP. End of lesson confirmations are carried out to ensure that the cadets have understood the whole lesson and that any weaknesses in performance are identified so they can be corrected.

Confirmation activities are based on the lesson objectives. The end of lesson confirmation may be oral questions, games, role play, in-class activities or practical activities. IGs offer suggestions for how to conduct end of lesson confirmations. Instructors may choose to use those confirmation suggestions or develop their own.

Conclusion

The conclusion of a lesson summarizes the key points and links them to the coming lessons and their practical use.

A Summary of Important Points and Weak Areas. The summary reviews the main TPs. The depth of the summary will be determined by the lesson objectives and the results of the cadets' end of lesson confirmation. If the cadets achieved the objectives successfully, the summary may be brief. If they experienced some difficulties, the instructor should identify them here and indicate how the issue will be addressed.

Re-Motivation Statement. The re-motivation statement restates the importance of the lesson (the "why") and re-motivates the cadets. The instructor should also take this time to address any precautions the cadets should be aware of when applying the knowledge in a practical setting and give an overview of the next lesson.

Read the Closing Statement paragraph in the IG for help in writing the conclusion of the lesson plan.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are the four sections of a lesson plan?

Q2. What three questions are answered in the introduction?

Q3. What are the four sections of a teaching point?

ANTICIPATED ANSWERS

A1. The four sections of a lesson plan are:

- introduction,
- body,
- end of lesson confirmation, and
- conclusion.

A2. The three questions answered in the introduction are:

- what,
- where, and
- why.

A3. The four sections of a teaching point are:

- introduction,
- teaching method,
- lesson content, and
- confirmation.

Teaching Point 4	**Supervise and Provide Assistance While the Cadets Plan a Lesson**
Time: 25 min	Method: Practical Activity

In EO M309.07 (Instruct a 15-Minute Lesson, Section 7) the cadets will be expected to instruct a lesson using a lesson plan, an instructional aid and the appropriate instructional method. The lesson plan created in this EO will be used to instruct that lesson.

Distribute the blank lesson plan located at Annex L and the plan a lesson checklist located at Annex M to each cadet.

As the cadets begin to place information in the lesson plan, they will need to know what information to place in the two columns not discussed in the previous TP.

Time. This column reminds the instructor how long to spend on each section of the lesson.

Notes. The instructor can place information in this column as a reminder of when to distribute a handout, to pass along special information to the class or information about a confirmation activity.

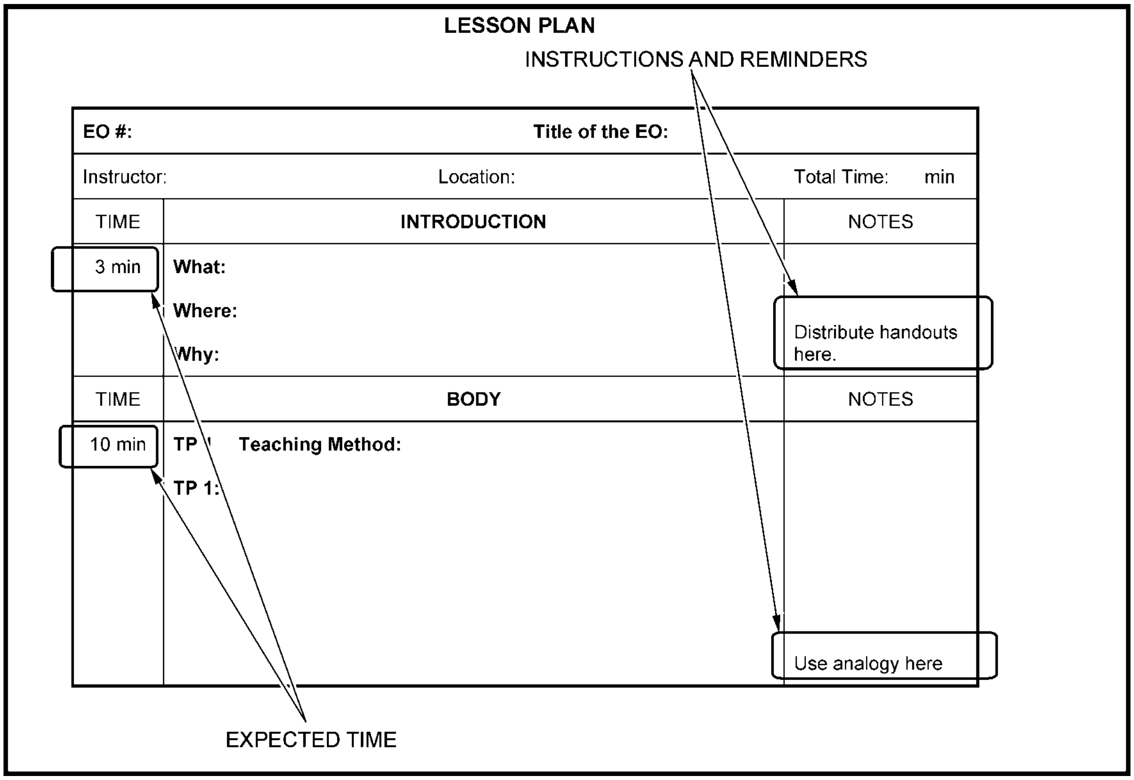


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Figure 9-6-12 Lesson Plan

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets plan a 15-minute lesson.

RESOURCES

- List of approved 15-minute topics located at Annex N, and
- Modified lesson specifications and instructional guides located at Annexes O to AC.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have each cadet choose a topic from the list of approved 15-minute topics.
2. Have the cadets use the lesson specification and IG for their chosen topic to help develop their lesson plan. Cadets shall be expected to teach their chosen lesson as part of M309.07 (Instruct a 15-Minute Lesson, Section 7).
3. Circulate around the room facilitating the activity and helping the cadets as required.

Ensure that cadets request all resources required to instruct their lesson.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' completion of a lesson plan will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

The cadets should be prepared to instruct their lesson at the beginning of M309.07 (Instruct a 15-Minute Lesson, Section 7).

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 3 (309 PC).

CLOSING STATEMENT

Researching lesson content, preparing a lesson location and planning a lesson are critical steps in preparing a period of instruction. The preparation of a lesson location sets the tone for the lesson to be taught and a well-developed lesson plan provides structure and organization, guides the instructor through each stage of the lesson and ensures that all essential information is delivered.

INSTRUCTOR NOTES/REMARKS

EO M309.06 (Plan a Lesson) should be scheduled at least one week prior to EO M309.07 (Instruct a 15-Minute Lesson, Section 7).

EO C309.02 (Plan a Lesson, A-CR-CCP-803/PG-001, Chapter 4, Section 10) may be scheduled as additional time for this EO.

REFERENCES

A1-042 A-P9-050-000/PT-005 Director Training and Education Policy. (2001). *Canadian Forces Individual Training & Education System* (Vol. 5). Ottawa, ON: Department of National Defence.

C1-133 (ISBN 0-9695066-2-7) Bender, P. (2000). *Secrets of Power Presentations*. Toronto, ON: The Achievement Group.

C1-140 (ISBN 1-890460-02-8) Jenson, E. (1999). *Super Teaching: Mastering Strategies for Building Trainee Success*. San Diego, CA: The Brain Store Inc.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 7

EO M309.07 – INSTRUCT A 15-MINUTE LESSON

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the Instructional Techniques Assessment Form located at Annex AD for each cadet.

Ensure that all resources requested by the cadets are available.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way for cadets to develop instructional skills in a safe and controlled environment.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have instructed a 15-minute lesson using a lesson plan, an appropriate method of instruction and an appropriate instructional aid.

IMPORTANCE

It is important for cadets to instruct a 15-minute lesson as it gives them the opportunity to practice instructional techniques in a peer setting and to receive feedback to further develop their confidence.

Teaching Point 1 | **Have the Cadets Instruct a 15-Minute Lesson**

Time: 85 min | Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets instruct a 15-minute lesson in a peer setting using a lesson plan, an appropriate method of instruction and an appropriate instructional aid.

RESOURCES

- Presentation aids (eg, whiteboard/flip chart/OHP) appropriate for the classroom/training area, and
- Instructional Techniques Assessment Form.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets provide a copy of their lesson plan to the assessor.
2. Determine the order in which cadets will instruct their lessons.
3. Have one cadet prepare the classroom/training area for their lesson.
4. Have one cadet instruct a 15-minute lesson using a written lesson plan, an appropriate method of instruction and an appropriate instructional aid (as prepared in EO M309.06 [Plan a Lesson, Section 6]).
5. Assess the cadet's lesson using the Instructional Techniques Assessment Form.
6. Upon completion of the lesson, provide feedback to the cadet.
7. Repeat Steps 3. to 6. until all cadets have instructed a lesson.

The Instructional Techniques Assessment Form located at Annex AD is used to provide feedback on the cadet's lesson and to introduce the cadet to the type of instructional techniques assessment they will receive in their future level training. The grey areas of the form are those applicable to the 309 PC (eg, the standard required for the achievement of PO 309). The remainder of the form is intended solely for the purposes of assessment for learning, providing the cadets with the feedback they need to improve their skills.

8. Debrief the cadets by providing feedback, focusing on:
   (a) best practices,
   (b) general trends and key areas for improvement, and
   (c) re-motivation, highlighting the effort and accomplishments of the group.

If the group of cadets is large, divide them up into smaller groups and assign other instructors to aid with assessment and feedback.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participating in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' instructing a 15-minute lesson will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 3 (309 PC).

CLOSING STATEMENT

Practicing instructional skills in a peer setting allows for the development of skills necessary to become a competent instructor while further developing confidence and a sense of accomplishment.

INSTRUCTOR NOTES/REMARKS

Additional time for this EO is available in EO C309.03 (Instruct a 15-Minute Lesson, A-CR-CCP-803/PG-001, Chapter 4, Section 10).

REFERENCES

A1-041 A-P9-050-000/PT-006 Director Training and Education Policy. (2002). *Canadian Forces Manual of Individual Training and Education* (Vol. 6). Ottawa, ON: Department of National Defence.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 8

EO C309.01 – DELIVER A ONE-MINUTE VERBAL PRESENTATION

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the list of topics located at Annex AE and the verbal presentation feedback form located at Annex AF for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A group discussion was chosen for TP 1 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about public speaking.

An interactive lecture was chosen for TP 2 as it allows the instructor to explain the expectations of the cadets for the one-minute verbal presentation.

A practical activity was chosen for TP 3 as it is an interactive way to help the cadets develop effective-speaking skills in a safe and controlled environment.

INTRODUCTION

REVIEW

Review EO M309.03 (Describe Effective-Speaking Techniques, Section 3).

OBJECTIVES

By the end of this lesson the cadet shall have delivered a one-minute verbal presentation.

IMPORTANCE

It is important for cadets to practice effective-speaking techniques because this will develop the skills required to present information and build the self-confidence needed to speak in front of others.

Teaching Point 1 | **Review Effective-Speaking Techniques**

Time: 15 min | Method: Group Discussion

BACKGROUND KNOWLEDGE

The purpose of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

ELEMENTS OF VOICE CONTROL

One of the most important and effective tools of communication is voice control. The ability to use voice control to communicate effectively and place emphasis on important information is a fundamental skill that will be used while in front of an audience.

Pitch. How high or low a voice is. A change in pitch usually does not add any significance to a message however a pitch change will be noticed by the audience and will keep people involved.

Tone. The quality of the sound of a voice. Effective communicators will often change the tone of their voice to give emphasis to a single word or phrase to convey emotion and conviction.

Monotone. A sound without change of pitch or tone.

Volume. The quantity or power of sound or fullness of tone. A change in volume often signifies emphasis on a particular phrase or point. Environmental factors such as outside noise and room size must be taken into consideration to ensure the audience can hear the message being sent.

Speed. The rate or rapidity in which words are spoken. Speaking too fast or too slow can be distracting to an audience. It is important to communicate at a pace that ensures the audience can understand every word being said.

Pause. A break in speaking or reading. A pause is an important part of the communication process. A pause gives the audience an opportunity to digest what has been said and to ask questions. A pause is also an effective way to announce a change in subject or an important point.

Articulation. The clear and distinct pronunciation of a word. It is important to properly pronounce and articulate words to ensure the audience can understand the message being sent.

ELEMENTS OF PHYSICAL PRESENCE

It is estimated that 93 percent of the total meaning of a message comes from non-verbal communication and only 7 percent of meaning comes from the words themselves. Being aware of physical presence and its effect on a message being sent is an important element of effective communication.

Body Language

Body language or non-verbal communication is the process of communicating through conscious and unconscious gestures and expressions. Understanding that body language affects how a message is received and interpreted is an important tool for communicating effectively.

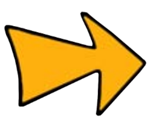
Facial expressions. While 93 percent of the total meaning of a message comes from non-verbal communication, most of that meaning is communicated by the eyes, eyebrows and mouth. The movement of the eyes, eyebrows and mouth can result in an infinite variety of expressions to complement the spoken word. It is important that facial expressions match the tone of the message being sent to create emphasis and believability. A smile is the most important of all facial expressions. A smile adds sincerity to a message and will add to the likeability of the individual in front of the audience.

Eye Contact. Maintaining eye contact is an effective way of engaging an audience and building interest. Pausing two or three seconds on each member of the audience will make them feel as though they are involved in a one-on-one conversation. It is important to look at the entire room and scan from left to right, back to front.

Look for friendly, sympathetic faces to gain confidence and ease nervousness.

Gestures. The combination of hand, arm and shoulder movements can make a wide variety of gestures that can help add meaning to a message. Effective communicators will let their hands and arms move naturally to help give emphasis and emotion to a message. It is important not to point directly at members of the audience or let gestures become distracting.

Movement. Being aware of movement while in front of an audience is very important to communication. Movement will keep listeners engaged and interested in what is being said. Moving around the front of the room, toward and away from an audience and from side to side can help emphasize points. Too much or frantic movement can become distracting and will affect how a message is received.



Hands placed in pockets are typically a sign of nervousness or overconfidence.

Dress and Deportment

Effective communicators are constantly aware of their dress and deportment. Audiences will react differently to an individual who is well dressed and acts professionally when in front of them, than an individual who is poorly dressed and acts unprofessionally.

Dress. Effective communicators will always appear in clean, well-pressed and appropriate attire. Dressing appropriately for the event will help create confidence and credibility.

Deportment. An audience that sees an individual as being prepared, on time, appropriately dressed and confident will be much more receptive, than to an individual who is unprepared, late, poorly dressed and nervous. The most important element of deportment is displaying an interest in the subject; this will be noticed by the audience and will generate interest in the presentation.

PREPARATION

Effective speaking preparation is the most critical component of effective communication. Preparation will help ensure confidence, control nervousness and increase the likelihood of success when in front of an audience.

The following are the steps to effective-speaking preparation:

1. **Practicing.** Proper rehearsal will aid in memorizing content, which will allow for more eye contact and movement while in front of an audience. Memorizing the introduction and conclusion are the two most critical elements; a strong introduction will aid in gaining confidence and will draw the interest of the audience, a strong conclusion will aid in leaving a lasting impression on the audience. If possible, practice in front of a small group, speak aloud even when practicing alone and always practice while standing.

2. **Controlling Nervousness.** The feeling of nervousness prior to speaking in front of a group is normal and often can help if channeled effectively. The following actions can be taken to control nervousness:

   (a) **Room Layout.** Become familiar with the layout of the room prior to speaking.

   (b) **Materials.** Ensure notes, handouts and presentation aids are organized.

   (c) **Equipment.** Ensure any equipment being used is in working order and ready to use.

   (d) **Practice.** Spend time going over notes and rehearsing content.

   (e) **Attitude.** Enter the room with a smile and a positive and confident attitude.

   (f) **Breathing.** Take a deep breath before entering the room. Slow down the delivery if necessary and breathe from the diaphragm while speaking, not from the chest.

3. **Identifying a Friendly Face.** While walking in front of an audience, identify a friendly face. Making eye contact with a friendly face while beginning to speak will often give confidence while beginning the introduction and ultimately lead to success when addressing an audience.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. How can voice be varied to maintain class interest?

Q2. How does physical presence affect how a message is received?

Q3. What is one of the most important elements of deportment?

Q4. What are some ways for controlling nervousness?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

Teaching Point 2	**Explain the Expectations of the One-Minute Verbal Presentation**
Time: 10 min	Method: Interactive Lecture

EXPECTATIONS OF THE ONE-MINUTE VERBAL PRESENTATION

The expectations of the one-minute verbal presentation are to practice the following skills:

1. using effective speaking techniques to communicate ideas; and
2. speaking clearly and confidently in front of a group of peers.

Instructions

1. Each cadet is required to deliver a one-minute verbal presentation on a topic chosen from the list located at Annex AE.
2. Each cadet is permitted to use one piece of paper not larger than 8 1/2 inches by 11 inches for outline notes. Cadets are not permitted to read their presentations directly from the paper.
3. Cadets will not be given assistance during their presentations other than the signal from the timekeeper.
4. Cadets will be given feedback using the feedback form located at Annex AF. The feedback positively emphasizes what the cadet did well and areas for improvement.
5. Aids such as a podium, OHP or flip charts should be made available (where possible), if requested by the cadet, prior to the presentation.
6. A timekeeper will be present to signal the cadet when they are nearing the one-minute mark.

Hand out the list of topics located at Annex AE and have the cadets choose what topic they will speak about.

Hand out the Verbal Presentation Feedback Form located at Annex AF to each cadet and discuss how it will be used.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the aim of the one-minute verbal presentation?

Q2. When should aids required for the presentation be requested?

ANTICIPATED ANSWERS

A1. To practice the skills for effectively communicating ideas by speaking clearly and confidently.

A2. Prior to the presentation.

Teaching Point 3 — **Conduct an Activity Where the Cadets Will Deliver a One-Minute Verbal Presentation**

Time: 25 min — Method: Practical Activity

This activity should be conducted on a separate training night from TP 1 & 2 to allow the cadets an opportunity to prepare their verbal presentations.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets deliver a one-minute verbal presentation.

RESOURCES

- Presentation aids (eg, whiteboard/flip chart/OHP) appropriate for the classroom/training area,
- Other presentation aids as requested by the cadets, and
- Verbal Presentation Feedback Form.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

During the activity:

- Use the Verbal Presentation Feedback Form located at Annex AF to record feedback on what the cadet has done well and areas for improvement.
- Ensure that the requested presentation aids are available prior to the start of the activity.
- Ensure that a timekeeper is present to signal the cadets when they near the one-minute mark. If the cadets go over time, note this in their feedback. Abruptly cutting them off may be more damaging than the negative feedback.

1. Brief the cadets on the following instructions for this activity:
   (a) Each cadet is required to deliver a one-minute verbal presentation on a chosen topic.
   (b) Each cadet is permitted to use one piece of paper not larger than 8 1/2 inches by 11 inches for outline notes. Cadets are not permitted to read their presentations directly from the paper.
   (c) No assistance will be provided.
2. Determine the order in which the cadets will deliver their presentations.
3. Have each cadet deliver a presentation. At the end of the presentation, provide one-on-one feedback to the cadet using the Verbal Presentation Feedback Form (Annex AF). Have the next cadet prepare for their presentation while the one-on-one feedback interview is in progress.

> Instructions for the one-on-one feedback interview:
>
> 1. Conduct in a private setting.
> 2. Put the cadet at ease.
> 3. Ask how they think they did.
> 4. Ask what they think went well. Discuss two positive points about their presentation.
> 5. Ask what they think needs improvement. Discuss two areas for improvement.
> 6. Finish the feedback interview on a positive note.
>
> Positive feedback is essential and should take into account that this may be the first time the cadet has delivered a prepared presentation in front of a group.

4. Continue until all the cadets have had the opportunity to present.
5. Summarize the common feedback for the group and discuss how to improve the presentations.

> It is essential that the cadets leave the lesson with a positive attitude.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in a one-minute verbal presentation will serve as confirmation for this TP.

END OF LESSON CONFIRMATION

The cadets' participation in a one-minute verbal presentation will serve as confirmation for this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Practicing effective speaking techniques in front of peers will build self-confidence and develop presentation skills needed for instructing cadets.

INSTRUCTOR NOTES/REMARKS

TP 3 should be scheduled on a separate training night after TPs 1 and 2 have been conducted.

This EO should be scheduled after EO M309.03 (Employ Effective Speaking Techniques, Section 3) and before EO M309.06 (Plan a Lesson, Section 6).

REFERENCES

C1-133 (ISBN 0-9695066-2-7) Bender, P. (2000). *Secrets of Power Presentations*. Toronto, ON: The Achievement Group.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 9

EO C309.04 – IDENTIFY FORMATIONS FOR DRILL INSTRUCTION

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PT-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to introduce the formations used for drill instruction.

A demonstration was chosen for TP 2 as it allows the instructor to demonstrate the procedures for forming a hollow square and reforming the squad.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified the formations for drill instruction.

IMPORTANCE

It is important for cadets to identify formations for drill instruction to be able to select the most effective formation for the lesson being taught. The choice of formation is important because it allows all of the cadets to see the instructor.

Teaching Point 1	Describe the Formations for Drill Instruction
Time: 5 min	Method: Interactive Lecture

FORMATIONS FOR DRILL INSTRUCTION

The choice of formation is important because it allows all of the cadets to see the instructor. The three formations that are recommended are a single file, a semicircle and a hollow square.

Single File. Used for groups of five cadets or less which can form up into one rank.

Semicircle. Used for groups of six to nine cadets which can be formed up in two ranks. There is no formal drill command for forming a semicircle.

Hollow Square. Used for groups of 10 or more cadets which are formed up in three ranks.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. When is a single file formation used?

Q2. What formation should be used for a squad in two ranks?

Q3. How many ranks must the squad be in to form a hollow square?

ANTICIPATED ANSWERS

A1. Groups of five cadets or less.

A2. Semicircle.

A3. Three ranks.

Teaching Point 2	Demonstrate the Procedure for Forming a Hollow Square and Reforming a Squad
Time: 20 min	Method: Demonstration

Proper drill movements shall be combined with a professional demeanour throughout the period of instruction.

Check for faults and correct them immediately when they occur.

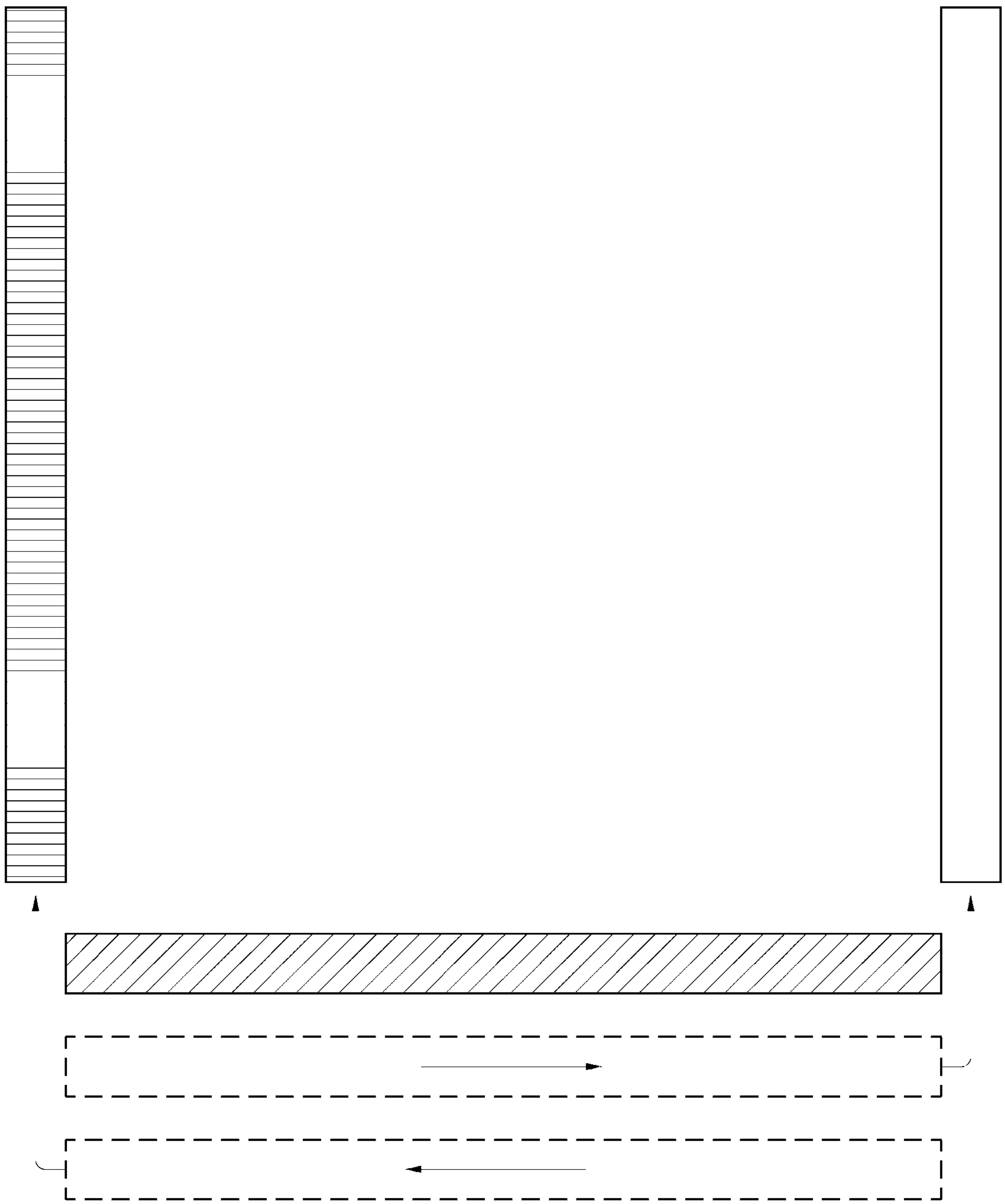
Capitalization indicates the words of command for each movement.

FORM HOLLOW SQUARE

> The squad shall be in line in three ranks prior to forming the hollow square.

The following procedure is used to form a hollow square (as illustrated in Figure 9-9-1):

1. On the command FORM HOLLOW SQUARE, CENTRE RANK RIGHT, REAR RANK LEFT–TURN, the squad acts as ordered.
2. On the command CENTRE RANK LEFT WHEEL, REAR RANK RIGHT WHEEL, QUICK–MARCH, the squad acts as ordered.
3. The command MARK–TIME shall be given when the rear individuals of the centre and rear ranks are one pace in front of the front rank.
4. On the command SQUAD–HALT, the squad acts as ordered.
5. On the command CENTRE RANK LEFT, REAR RANK RIGHT–TURN, the squad acts as ordered.



A-PD-201-000/PT-000 (p. 3-23)

Figure 9-9-1 Forming a Hollow Square

REFORM THREE RANKS

The reverse procedure to forming a hollow square is used to reform a squad into three ranks.

The following procedure is used to reform three ranks:

1. On the command REFORM THREE RANKS, CENTRE RANK LEFT, REAR RANK RIGHT–TURN, the squad acts as ordered.
2. On the command CENTRE RANK RIGHT WHEEL, REAR RANK LEFT WHEEL, QUICK–MARCH, the squad acts as ordered.
3. The command MARK–TIME shall be given when the squad has reformed three ranks.
4. On the command SQUAD–HALT, the squad acts as ordered.
5. On the command CENTRE RANK RIGHT, REAR RANK LEFT–TURN, the squad acts as ordered.

If time permits, have the cadets practice forming a hollow square with their peers. Simulate three ranks for groups less than 10 cadets.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How must a squad be formed before forming a hollow square?

Q2. When should the instructor give the command to mark time when forming a hollow square?

Q3. What procedure is used to reform three ranks?

ANTICIPATED ANSWERS

A1. In three ranks.

A2. The rear individuals of the centre and rear ranks are one pace in front of the front rank.

A3. The reverse procedure to forming a hollow square.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What three formations are used for drill instruction?

Q2. What formation should be used for a group of seven cadets?

Q3. How many cadets are needed to form a hollow square?

ANTICIPATED ANSWERS

A1. Single file, semicircle and hollow square.

A2. Semicircle.

A3. 10 or more.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Drill instruction requires the instructor to demonstrate each individual squad of a movement so the cadets can see what is expected. The choice of formation is important because it allows all of the cadets to see the instructor.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000 Director History and Heritage 3-2. (2005). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 10

EO C309.05 – PLAN A DRILL LESSON

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy Annexes AG to AJ for each cadet.

Photocopy the lesson specifications and instructional guides located at Annexes AK to AQ as required.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to present the drill instruction sequence and to stimulate an interest in planning a drill lesson.

A practical activity was chosen for TP 3 to guide the cadets through the process of planning a drill lesson.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified the drill instruction sequence and written a drill lesson plan.

IMPORTANCE

It is important for cadets to know the essential elements of a drill lesson and be able to develop a written drill lesson plan as it allows them to be better prepared to deliver drill instruction. Drill that is well taught and executed develops individual pride, mental alertness, precision and esprit de corps.

Teaching Point 1	**Describe the Drill Instruction Sequence**
Time: 10 min	Method: Interactive Lecture

INTRODUCTION

The lesson shall be introduced as follows:

1. Order the squad into a suitable formation such as a single rank, hollow square or semicircle.
2. Review the previous lesson.
3. Describe the new movement.
4. Describe why it is important to learn the movement.
5. Describe where and when the movement will be used.
6. Describe how the cadets will be assessed.

BODY

The lesson shall be taught using the following process:

1. Demonstrate the complete movement, calling out the time.
2. Explain the complete movement.
3. Demonstrate the first part of the movement (Squad 1).
4. Explain the first part of the movement.
5. Give the squad the opportunity to ask questions.
6. Practice the first movement (collectively, individually, collectively) (as illustrated in Figure 9-10-1).
7. Demonstrate and explain the second part of the movement (Squad 2) and any subsequent parts of the movement (Squads) following Steps 3. to 6.
8. Give two complete demonstrations.
9. Practice the complete movement with:
   (a) the instructor calling the time;
   (b) the squad calling the time; and
   (c) the squad judging the time.

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)

For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

In order to adopt the position of attention from stand at ease, the cadet shall:

On the command ATTENTION BY NUMBERS, SQUAD – ONE, bend the left knee and shift the balance to the right.

PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 9-10-1 Drill Instruction Sequence

END OF LESSON CONFIRMATION

The end of lesson confirmation must meet the following criteria:

1. It shall be a performance of the movement taught.
2. It shall be conducted as a squad.
3. It will emphasize any aspects of the movement that the cadets experienced difficulty with during the lesson.

CONCLUSION

The lesson shall be summarized as follows:

1. Restate the movement taught and where or when it will be used;
2. Re-motivate the cadets by:
   (a) commenting on the cadets' progress; and
   (b) re-stating why the drill movement just learned is important.
3. Describe the next lesson.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Describe one action an instructor shall take during the introduction of a drill lesson.

Q2. List the sequence for practicing drill movements.

Q3. What shall an instructor do in the conclusion of a drill lesson?

ANTICIPATED ANSWERS

A1. During the beginning of a drill lesson, an instructor shall:

(1) Order the squad into a suitable formation.

(2) Review the previous lesson.

(3) Describe the new movement.

(4) Describe why it is important to learn it.

(5) Describe where and when the movement will be used.

(6) Describe how the cadets will be assessed.

A2. The sequence for practicing drill movements is to practice the squad collectively, individually, collectively.

A3. In the conclusion the instructor shall:

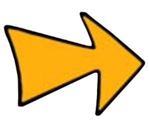
(1) Restate the movement taught and where or when it will be used.

(2) Re-motivate the cadets by commenting on the cadets' progress and by re-stating the reason for learning the movement.

(3) Describe the next lesson.

Teaching Point 2 | **Review the Lesson-Planning Process**

Time: 10 min | Method: Interactive Lecture



Before beginning the activity for planning a drill lesson, review the lesson-planning process taught in M309.06 (Plan a Lesson, Section 6) summarized below.

Distribute the lesson plan handout located at Annex AG to each cadet.

THE LESSON-PLANNING PROCESS

The Canadian Forces employs an initialism that is used to provide a framework for the instructor to gather and organize the reference material into an efficient and practical lesson plan. The initialism is CCSAM.

Collect. During this step, the instructor researches the material to be covered in the period of instruction using course documents such as the lesson specification, IG and listed references. In situations where no course documents exist, the instructor will research the material to be taught using whatever references exist.

Consider. During this step, the instructor sifts through all of the material found in the collection step and determines what is relevant and current.

Select. During this step, the instructor selects the material that is appropriate for the lesson. The instructor also selects the method of instruction to be used.

Arrange. During this step, the instructor arranges the material into stages that allow for the information to be presented in a logical sequence.

Master. During this step, the instructor writes the lesson plan.

LESSON SPECIFICATION

Lesson specifications are found in A-CR-CCP-803/PG-001, Chapter 4. The two sections of a lesson specification are the enabling objective (EO) and the lesson specification.

Enabling Objective

The EO is the first three paragraphs of the lesson specification and will answer three questions:

- What will the cadet be expected to be able to do by the end of this lesson?
- Under what conditions will the cadet be expected to carry out the performance?
- How well or to what standard will the cadet be expected to perform?

Lesson Specification

The lesson specification, (paragraphs 4. to 11.), contains information about:

- the content to be taught broken down into teaching points;
- the teaching method(s) to be used and why they were chosen;
- the time for each teaching point (TP);
- the references used;
- the training aids to be used;
- the learning aids to be used;
- the test details; and
- remarks for the instructor.

INSTRUCTIONAL GUIDE (IG)

The IG is used in conjunction with the QSP and other resources to conduct training. IGs should be reviewed in conjunction with lesson specifications so that the instructor can adequately plan and prepare their lesson. The following are the six sections of an IG:

Preparation. This section provides information to the instructor regarding:

- pre-lesson instructions;
- pre-lesson assignment; and
- instructional approach or method.

Introduction. This section provides information to the instructor regarding:

- any review that may be necessary;
- what the cadet will be expected to do by the end of the lesson; and
- why the knowledge/skill is important.

Body. This section provides information to the instructor regarding:

- the TPs and their content as listed in paragraph 4 of the lesson specification in greater detail;
- suggested teaching methods;
- note boxes with special instructions or information;
- lesson content;
- figures;
- activities; and
- confirmation questions or activities.

Conclusion. This section provides information to the instructor regarding:

- any homework/reading/practice that may be required of the cadet;
- the method of evaluation to be used as stated in the lesson specification;
- a closing statement to be spoken aloud to the cadet; and
- any additional instructor notes/remarks.

References. This section lists the sources of information used to create the lesson specification and instructional guide.

Annexes. This section contains background information for the TPs, pre-made instructional aids and additional information for activities.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. List the five parts of the lesson-planning process.

Q2. What is included in the EO portion of a lesson specification?

Q3. What are the six sections of an instructional guide?

ANTICIPATED ANSWERS

A1. The five parts of the lesson planning process are collect, consider, select, arrange and master.

A2. The information included in the EO is what the cadet will be expected to learn, what materials, supervision and equipment will be available to the cadet and what standard the cadet will be expected to achieve.

A3. The six sections of an IG are preparation, introduction, body, conclusion, references and annexes.

Teaching Point 3	**Supervise and Provide Assistance While the Cadets Plan a Drill Lesson**
Time: 30 min	Method: Practical Activity

In EO C309.06 (Instruct a 15-Minute Drill Lesson, Section 11), the cadets shall be expected to instruct a drill lesson using a lesson plan, the drill instruction sequence and the appropriate drill formation. The lesson plan created in this EO will be used to instruct that drill lesson.

Distribute the blank lesson plan located at Annex AH and the plan a drill lesson checklist located at Annex AI to each cadet.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets plan a 15-minute drill lesson.

RESOURCES

- List of approved 15-minute drill topics located at Annex AJ, and
- Modified lesson specifications and instructional guides located at Annexes AK to AQ.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have each cadet choose a topic from the list of approved 15-minute drill topics.
2. Have the cadets use the lesson specification and IG for their chosen topic to help develop their drill lesson plan. Cadets shall be expected to teach their chosen lesson as part of C309.06 (Instruct a 15-Minute Drill Lesson, Section 11).
3. Circulate around the room facilitating the activity and helping the cadets as required.

Ensure that cadets request all resources required to instruct their lesson.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' planning a drill lesson will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

The cadets shall be prepared to instruct their lesson at the beginning of C309.06 (Instruct a 15-Minute Lesson, Section 11).

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Instructors must continually work to improve the quality of instruction. Being able to plan drill lessons is a critical step in boosting the instructor's confidence and improving the quality of drill instruction.

INSTRUCTOR NOTES/REMARKS

EO C309.05 (Plan a Drill Lesson, Section 10) should be scheduled at least one week prior to EO C309.06 (Instruct a 15-Minute Drill Lesson, Section 11).

REFERENCES

A0-002 A-PD-201-000/PT-000 Director History and Heritage 3-2. (2005). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: Department of National Defence.

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 11

EO C309.06 – INSTRUCT A 15-MINUTE DRILL LESSON

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the Drill Instructional Techniques Assessment Form located at Annex AR for each cadet.

Ensure that all resources requested by the cadets are available.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way for cadets to develop drill instructional skills in a safe and controlled environment.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have instructed a 15-minute drill lesson using a written lesson plan and the drill instruction sequence.

IMPORTANCE

It is important for cadets to instruct a 15-minute drill lesson as it gives them the opportunity to practice drill instructional skills in a peer setting and to receive feedback to further develop instructional skills and confidence.

Teaching Point 1 | **Supervise While the Cadets Instruct a 15-Minute Drill Lesson**

Time: 85 min | Method: Practical Activity

ACTIVITY

Time: 85 min

OBJECTIVE

The objective of this activity is to have cadets instruct a 15-minute drill lesson in a peer setting using a written lesson plan and the drill instruction sequence.

RESOURCES

Drill Instructional Techniques Assessment Form.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets provide a copy of their lesson plan to the assessor.
2. Determine the order in which cadets will instruct their lessons.
3. Have one cadet form up the squad for their drill lesson.
4. Have one cadet instruct a 15-minute drill lesson using a written lesson plan and the drill instruction sequence (as prepared in EO C309.05 [Plan a Drill Lesson, Section 10]).
5. Assess the cadet's lesson using the Drill Instructional Techniques Assessment Form.
6. Upon completion of the lesson, provide feedback to the cadet.
7. Repeat Steps 3. to 6. until all cadets have instructed a lesson.

The Drill Instructional Techniques Assessment Form located at Annex AR is used to provide feedback on the cadet's lesson and to introduce the cadet to the type of instructional techniques assessment they will receive in their future level training. The form is intended solely for the purposes of assessment for learning, providing the cadets with the feedback they need to improve upon their own skills.

8. Debrief the cadets by providing feedback, focusing on:
   (a) best practices,
   (b) general trends and key areas for improvement, and
   (c) re-motivation, highlighting the effort and accomplishments of the group.

If the group of cadets is large, divide them up into smaller groups and assign other instructors to aid with assessment and feedback.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadet's instructing a 15-minute drill lesson will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Practicing drill instructional skills in a peer setting allows for the development of fundamental skills necessary to become a drill instructor while further developing confidence and providing a sense of accomplishment.

INSTRUCTOR NOTES/REMARKS

This EO shall be conducted after EO C309.04 (Identify Formations for Drill Instruction, Section 9) and EO C309.05 (Plan a Drill Lesson, Section 10).

Additional time may be required for class sizes greater than five cadets.

REFERENCES

A0-002 A-PD-201-000/PT-000 Director Heritage and History 3-2 (2005). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: Department of National Defence.

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PRINCIPLES OF INSTRUCTION INFORMATION SHEET

INTEREST

Cadets are more receptive to learning when they are curious and have an emotional connection to a topic. The instructor must arouse, create and maintain the interest of the cadets. Without interest, the cadets will be less inclined to listen and will not learn.

- **Principle.** People learn when they are interested in the material or skill.
- **Action.** Instructors must arouse, create and maintain the cadets' interest. The instructor should employ imaginative means to keep curiosity, while taking into account experience and interests.

Ensure Interest	Technique
Information	Inform the cadets why they are learning the skill or knowledge. Explain all of the benefits of this new knowledge or skill.
Enthusiasm	Show enthusiasm. Smile and have fun. Make eye contact. Vary the pitch, resonance, articulation, speed, volume, inflection and rhythm of your speech.
Variety	Use more than one instructor. Use verbal support to back up a statement or to clarify an idea. Use a variety of different training aids. Try different teaching methods.
Realism	Try a different location for your class. If you are teaching meteorology, go outside and look at the clouds, etc.
Participation	Involve the cadets by asking questions. Ensure cadets participate early in a skill lesson. Use speed and/or ability competitions or games to reinforce learning.

COMPREHENSION

Comprehension or understanding relates to the cadet’s ability to understand the material taught. The cadets’ readiness to learn new material is influenced by what has previously been taught; new content should not exceed the knowledge level of the cadets. If the cadets do not understand, they are unable to learn.

- **Principle.** People learn when instruction starts at their level of understanding and proceeds at the rate of their comprehension.
- **Action.** Instructors must determine the cadet’s level of knowledge and only progress with new material when the cadets have full understanding of the material previously taught.

Ensure Comprehension	Technique
Research	Examine the Qualification Standard and Plan (QSP) to determine what material the cadets have already been taught.
Plan	Organize lesson material in a logical order. Proceed from the known to the unknown. Move from simple material to the more difficult.
Question	Ask review questions at the start of the lesson to determine the level of understanding. Continue to ask questions throughout the lesson to ensure understanding. Assure cadets early in the lesson that questions are welcome.
Observe	Watch for expressions of body language that may indicate difficulty with parts of the lesson. Observe cadets when they practice a skill and correct error as they occur.

EMPHASIS

During a period of instruction there will be some information, which may be of particular importance. The instructor can emphasize this important information through the use of voice control, training aids and in-class activities.

- **Principle.** People retain more important information when the instructor uses repetition and emphasis.
- **Action.** Instructors must stress essential points.

Ensure Emphasis	Technique
Process	Teach the material step by step. Re-cap each area (stress key points). Have the cadets take notes.
In-Class Review	Review the key points from the past lesson. Repeat the key points during the lesson.
Reinforcement	For a knowledge lesson, ask questions on the key points. For a skill lesson, allow sufficient practice time for the cadets to ask questions and receive corrective action. Do not over demonstrate. Try saying “This is important, remember it.” Use verbal support by giving examples, to include: • comparisons, • reasons, • restatement and repetition, • examples, • statistics, and • testimonials. Use training aids.
Post Lesson	Distribute handouts covering key points.

PARTICIPATION

Cadets are more likely to retain information if they are both mentally and physically involved in learning. The instructor should conduct activities that contain action, activity and excitement. Cadets learn by doing.

- **Principle.** People learn best when they have an opportunity to participate actively in the learning process. People learn by doing.
- **Action.** The instructor creates class participation in the form of a physical or mental activity.

Ensure Participation in a Knowledge Lesson	Technique
Involvement	Ask open-ended questions that will encourage individual thought and generate a discussion.
Group Work	Select teaching methods that allow the cadets to share ideas and knowledge.
Learning Activity	Organize teaching points to contain such things as: • puzzles, • crosswords, • trivia games, • board games, • word searches, • discussions, • case studies, • competitions, • experiments, or • problem solving.
Application	Allow the cadets to apply the knowledge through case studies and problem-based learning.

Ensure Participation in a Skill Lesson	Technique
Involvement	Ensure early involvement by cadets. Have as many cadets as possible working on the skills at the same time.
Practice	Ensure ample practice time. Maintain close supervision during practice

Ensure Participation in a Skill Lesson	Technique
Detection and Correction	Be aware of commonly made errors while practicing a new skill. Observe cadets closely when they practice a skill. Correct errors as they occur. Correct one error at a time.
Competition	Allow the cadets to practice new skills by conducting friendly competitions and contests.

ACCOMPLISHMENT

The lesson must impart a sense of accomplishment to each cadet. The cadets should leave the class with the satisfaction that they were able to achieve something in the lesson.

- **Principle.** People learn most effectively when their performance results in a sense of accomplishment.
- **Action.** The instructor must tell the cadets what they are doing well and what needs improvement. The objective is to offer feedback that will reinforce desired performance and correct undesired performance.

Ensure Accomplishment	Technique
Expectations	Inform cadets of the lesson objectives. Ensure the cadets understand what will be expected of them at the end of the lesson.
Learner Satisfaction	Explain lessons clearly using simple words. The cadets will learn easily creating fulfillment.
Learner Responsibility	Keep cadets informed of their progress. Just by saying “Now that you have all correctly created a lean-to, let’s practice erecting a tent” will indicate the cadets’ progress.
Encouragement	Reassure cadets that they will be successful. Compliment cadets on work that is well done.
Perseverance	Encourage cadets who may be having difficulty. Allow cadets to practice skills they have difficulty with. Offer extra help if necessary.

CONFIRMATION

Confirmation is an essential part of learning and instructing. It gives both the instructor and the cadet the opportunity to see how well the information is understood.

- **Principle.** Confirm that learning has occurred and knowledge has been retained.
- **Action.** Instructors must confirm that the cadets' learning meets established standards and ensure that the skills can be performed safely and competently.

Ensure Confirmation	Technique
Practice	Observe as the cadets practice the skills.
Exercise	Have the cadets perform the skill. If you are teaching cadets how to use the phonetic alphabet, listen to each cadet perform the letters. Anyone who cannot do it may need extra instruction. Provide exercises or guide discussions that stress the key points of the lesson.
Questions	Ask questions at the end of the lesson to assess how well the cadets are learning. Listen carefully to the cadets' answers. You may be able to identify weak areas that may need to be re-taught.
Assignments	Review assignments completed outside class to determine the extent of learning.
Tests	Conduct confirmation for teaching points and enabling checks. This will also reinforce learning.
Observations	Note and provide feedback on cadet behaviour.

PRINCIPLES OF INSTRUCTION WORKSHEETS

PRINCIPLES OF INSTRUCTION Worksheet

NAME OF PRINCIPLE: Interest.

TOPIC: How to eat an apple.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

PRINCIPLES OF INSTRUCTION
Worksheet

NAME OF PRINCIPLE: Comprehension.

TOPIC: How to tie a shoe.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

PRINCIPLES OF INSTRUCTION
Worksheet

NAME OF PRINCIPLE: Emphasis.

TOPIC: How to cross the street.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

PRINCIPLES OF INSTRUCTION Worksheet

NAME OF PRINCIPLE: Participation.

TOPIC: How to walk down the stairs.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

PRINCIPLES OF INSTRUCTION Worksheet

NAME OF PRINCIPLE: Accomplishment.

TOPIC: How to work a zipper.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

PRINCIPLES OF INSTRUCTION
Worksheet

NAME OF PRINCIPLE: Confirmation.

TOPIC: How to throw a ball.

TECHNIQUES FOR APPLYING THE PRINCIPLE TO THIS TOPIC:

METHODS OF INSTRUCTION

INTERACTIVE LECTURE

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
Interactive lecture is an instructor-driven method, which combines both lecture and interaction to meet lesson objectives. The lecture portions of the lesson are offset with relevant activities such as videos with discussion, games, learning stations, brainstorming, debating, group work or the completion of handouts.	Use attention-getters such as interesting facts, statistics or rhetorical questions to begin the lecture or to introduce new teaching points. Prepare participatory questions to encourage cadet participation. Prepare evaluative questions for confirmation of teaching points. Obtain or develop training aids to clarify main points. Prepare an in-class activity to avoid lecturing too long. Practice delivering the material.	Interactive lectures can be used with different sizes of groups to: • introduce a subject; • present background information; • review previously taught material; • give instructions on procedures; • illustrate the application of rules, principles or concepts; or • introduce a demonstration, discussion or performance.	Begin the lesson and each new TP with an attention-getter. Use presentation aids such as: • flip chart, • whiteboard, and/or • electronic media. Pay attention to signals of alertness, such as: • cadets' facial expressions, and • cadets' body language. Deal with alertness problems by: • asking for questions; and • posing questions to the group. Use visual training aids at opportune moments. Integrate interesting facts with lesson material to maintain interest. Use participatory questions or a short activity to avoid lecturing too long. Use questions to confirm each teaching point. Confirm the lesson using questions or an activity.

DEMONSTRATION AND PERFORMANCE

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
Demonstration and Performance During demonstration and performance the cadets observe the instructor performing the task in a demonstration, and rehearse it under the supervision of the instructor. **Demonstration Method** A method of instruction where the instructor, by actually performing an operation or doing a job, shows the cadet what to do, how to do it and explains why, where and when it is done. **Performance Method** A method in which the cadet is required to perform, under controlled conditions, the operations, skill or movement being taught.	The instructor must be skilled in the task. Gather all materials necessary to instruct the lesson. Break the task down into smaller sequential steps. Practice the lesson to ensure that steps are accurate and clear. Prepare a handout outlining the steps, if necessary. Organize the training area so that all cadets can: • see the demonstration, and • perform the task.	**Demonstration Method** Demonstration can be used to: • teach hands-on operations or procedures; • teach troubleshooting; • illustrate principles; • teach operation or functioning of equipment; • set standards of workmanship; • explain a theory or concept; or • teach safety procedures. **Performance Method** Performance can be used to: • teach hands-on operations or procedures; • teach operation or functioning of equipment; • teach team skills; or • teach safety procedures.	Introduce the lesson by demonstrating what the cadets will be able to do at the end. Explain where the skill can be applied and why it is important. Provide a handout outlining the steps if the process is complex. Explain and demonstrate each step in a sequential manner. Allow cadets maximum time to practice the steps as soon as possible. Positively reinforce everything the cadets do correctly. Supervise the cadets as they practice, providing assistance or re-demonstrations when necessary. Have cadets perform the skill as confirmation. Encourage the cadets to practice beyond class time.

IN-CLASS ACTIVITY

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
In-class activities encompass a wide variety of activity-based learning opportunities that can be used to reinforce and practice instructional topics or to introduce cadets to new experiences. In-class activities should stimulate interest among cadets and encourage their participation, while maintaining relevance to the performance objectives. Examples of in-class activities include learning stations, videos, brainstorming, debating, and group work.	Create an activity that involves all cadets, which can be conducted within the time allocated. Clearly specify the objective of the activity. Obtain all materials necessary to complete the activity. Write out specific instructions describing what participants are supposed to do. Write out specific directions for conducting the activity. Arrange for assisting staff, if necessary, to help conduct the activity. Prepare handouts for cadets containing background information. Organize the training area into work/learning stations.	An in-class activity can be used for both knowledge and skill lessons to: • reinforce instructional objectives; • introduce a subject and generate interest; • present background information; • give direction on procedures; • introduce a demonstration, discussion or performance; • illustrate the application of rules, principles or concepts; • to create interactivity during a lecture; or • to review, clarify or summarize information.	Introduce the activity to the whole group. Brief participants on what will be expected of them. Stress timings. Ensure all resources are available. Begin the activity. Supervise and assist the groups as required. Conclude the activity. Confirm the TP or lesson. Debrief the cadets.

PRACTICAL ACTIVITY

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
Practical activities encompass a wide variety of activity-based learning opportunities that can be used to reinforce and practice instructional topics or to introduce cadets to new experiences. Practical activities should stimulate interest among cadets and encourage their participation, while maintaining relevance to the performance objective.	The instructor must be skilled in the task. Gather all materials necessary to instruct the lesson. Organize the training area so that all cadets will have space to perform the task safely. Ensure there is enough time to conduct the complete activity or breakdown the task into smaller stages. Prepare a handout outlining the steps, if necessary. Arrange for assisting staff, if necessary. Divide cadets into small groups.	The objective of the practical activity method is to reinforce and practice instructional topics or to introduce the cadets to new experiences. If it is used to teach new material it must be combined with other methods to ensure cadets have the necessary background information to complete the activity. The practical activity method can be used to: • carry out an application; • demonstrate a process; • verify an explanation; • produce a product; • introduce a subject; • teach manipulative operations; • teach procedures; • teach troubleshooting; • illustrate principles; • teach equipment operation; or • teach safety.	Review background information. Distribute the handout, if necessary. Introduce the activity to the group. Stress safety. Brief the cadets on what they will be expected to do. Brief assisting staff on what they will be expected to do. Begin the activity. Supervise the cadets and provide assistance, if necessary. Watch for safety infractions and stop the activity, if necessary. Conclude the activity. Debrief the cadets.

GAME

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
Games are used with one or more participants to practice skills, apply strategies and enhance teams. It is critical that the game supports learning through a challenging activity that allows for skill practice or knowledge confirmation.	Develop a simple game with the following characteristics: • fast to play, • easy and quick to organize, • has few rules, • uses minimal equipment, and • involves maximum participation. If possible use variations of games cadets know from childhood or television. Determine the following when developing the rules of the game: • individual or team play, • how to change leaders, • what the leader will do, • what the followers will do, • timings for the game, • how to signal the start and stop of the game, • how to ensure safety. Obtain the resources needed to play the game. Organize the training area to play the game.	Games create variety and arouse interest but must also support learning. Games can be used to: • introduce a topic; • discover concepts and principles; • learn terminology; • recall terms; • recognize equipment parts; • develop strategies and tactics; • carry out an application; • demonstrate a process; • practice interpersonal skills; and/or • confirm learning	Brief the cadets on the following: • the objective of the game, and • rules of the game. Play the game. • Supervise closely to : • ensure that the game is played in the manner expected; • ensure that the game is played safely; and • ensure maximum participation. End the game. Debrief the cadets.

FIELD TRIP

Description	Pre-Lesson Preparation	Typical Applications	Lesson Development
Theoretical knowledge is reinforced through participation in an activity in a real-life setting. Prior planning helps to ensure all pre-training and safety standards are met. Field trip activities are planned and carried out to achieve clear instructional objectives that are understood by the cadets. Examples include trips to areas of local interest, flying/gliding, hiking and/or sailing.	Specify the objective(s) of the field trip. Determine the time and location of the field trip. Obtain necessary authorizations. Determine the timings. Determine the activities or demonstrations needed to achieve the objectives. Determine if trained personnel will be available to assist. Arrange the following, if necessary: • transportation, • supervision, and • meals. Determine if the cadets will be allowed to use equipment or participate in a training activity. Determine if all cadets can take part at once or if they need to be rotated through. Divide the cadets into groups, if necessary. Ensure safety.	The field trip is used to: • introduce/illustrate and confirm topics; • reinforce and clarify classroom learning; • inject variety into the training situation; or • allow cadets to view operations or equipment that cannot easily be shown in the classroom.	Inform cadets as soon as possible of the following: • time of the field trip, • location of the field trip, and • timings for departure. Brief cadets on the following prior to departure: • objectives of the field trip, • timings and groupings for activities and demonstrations, and • how they will participate during the field trip. During the field trip ensure the following: • the safety of all cadets, • maximum participation, and • the objectives are met. After the field trip: • debrief the cadets; and • confirm that objectives have been met. Express appreciation to the facilitators of the field trip.

SELECT A METHOD OF INSTRUCTION

Lesson Topic	Method of Instruction	Explanation
Participate in a Discussion on Hygienic Practices During Physical Activity		
Identify the Parts and the Characteristics of the Daisy 853C Air Rifle		
Apply Basic Marksmanship Techniques		
Participate in a Discussion on Proficiency Level One Training		
Wear the Air Cadet Uniform		
Participate in a Discussion of Year One Summer Training Opportunities		
Construct a Lean-to-Style Shelter		
Operate a Hand Held Radio		
Invent a Space Technology Item		
Discuss Aircraft Flown in WWI and WWII		
Discuss Leadership Within a Peer Setting		
Identify Year Two CSTC Training Opportunities		
Fly a Paper Colditz Glider		
Explain Aspects of Air Traffic Control		
Identify the Rank Structure of the Royal Canadian Sea, Army and Air Cadets		

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POSING QUESTIONS SEQUENCE

Question Sequence	Action
Pose the question	The instructor must ensure that they have the full attention of the class and ask a question that is clearly heard by all.
Pause	The instructor must allow cadets time to think of a response. Do not waste time, but avoid answering the question for the cadets just to break the silence.
Pounce	When using a direct question the instructor must indicate which cadet will answer.
Ponder	The instructor must allow the cadets time to answer fully, listen carefully to the response, confirm the correct response and explain why it is correct. If an answer is incomplete, the instructor must emphasize what is correct and ask a follow-up question to complete the response or simply provide additional information. If an answer is incorrect the instructor must point that out as well, in a manner that does not embarrass the cadet and explain why the answer is incorrect. There may be a need to reword the question to get a better response.
Praise	The instructor must praise all cadets for participating and confirm/ summarize all correct responses so as to avoid confusion regarding which responses were correct or incorrect.

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QUESTIONS HANDOUT

Read the short passage to the group and ask them to remember the children's story "Goldilocks and the Three Bears."

Once upon a time there was a little girl named Goldilocks. She went for a walk in the forest. Pretty soon, she came upon a house. She knocked and, when no one answered, she walked right in.

Use the questions below to have each cadet use the question posing sequence at least once.

Q. Who do you think lived in the house in the forest?

A. The three bears.

Q. What did Goldilocks first do when she entered the house?

A. She tasted the porridge.

Q. Whose chair did Goldilocks break?

A. Little bear's chair.

Q. Why did Goldilocks go upstairs to the bedroom?

A. She felt tired.

Q. Did Goldilocks ever return to the house in the forest?

A. No.

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POSING QUESTIONS RUBRIC

STANDARD

Effective Questioner: Follows posing questions sequence when asking questions.

PERFORMANCE TASK

Ask a recall question to the group about the children's story, "Goldilocks and the Three Bears" using the posing questions sequence.

Performance Element	Met the Standard (Level 3)	Met the Standard With Difficulty (Level 2)	Did Not Meet the Standard (Level 1)
Pose the question	Had the attention of the group. Asked the question clearly.	Had the attention of the group. Did not ask the question clearly.	Did not get the attention of the group. Did not ask the question carefully.
Pause	Allowed cadets ample time to think of a response. Did not waste time. Did not answer the question for the cadets.	Unsure of how much time to allow for a response.	Allowed too much/too little time for a response. Answered the question for the cadet.
Pounce	Pointed to a cadet.	Had to be told to point to a cadet.	Allowed anyone to answer.
Ponder	Allowed cadet to answer fully. Confirmed correct response. Explained incorrect answer.	Allowed cadet to answer fully. Confirmed correct response after being prompted. Explained incorrect response after being prompted.	Did not allow cadet to answer fully. Did not confirm correct response after being prompted. Did not explain incorrect response after being prompted.
Praise	Ensured all cadets participated. Praised correct response appropriately. Clarified any confusion regarding responses.	Ensured all cadets participated. Had to be prompted to praise correct response. Had to be prompted to clarify confusion regarding responses.	Did not ensure all cadets participated. Failed to praise correct responses. Did not clarify lingering confusion regarding responses.

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POSING QUESTIONS CHECKLIST

Place a check mark in the appropriate box.

Name	Pose the Question			Pause			Pounce			Ponder			Praise		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3

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COMMON INSTRUCTIONAL AIDS

HOW INSTRUCTIONAL AIDS WORK

During the communication process, the brain filters the important pieces of information from the less significant pieces. What is considered to be the most important information is passed to the short-term memory for possible storage into the long-term memory. Instructional aids support learning by highlighting and emphasizing the most important pieces of information for the brain to store in memory.

Instructional aids also:

- attract and hold the cadets' attention;
- involve the two most important senses – sight and sound; and
- help instructors teach more in less time.

CHARACTERISTICS OF INSTRUCTIONAL AIDS

Instructional aids should:

- support the lesson by emphasizing and clarifying important information;
- keep the cadets' attention on the topic;
- contain quality pictures, graphs or text;
- be simple and easy to use; and
- be large enough to be seen and loud enough to be heard.

GUIDELINES FOR USING INSTRUCTIONAL AIDS

During the lesson planning stage the following process can be used to determine if and where instructional aids are necessary:

- clearly establish the lesson objective – the information to be communicated or the task to be accomplished;
- research supporting material to achieve the lesson objective;
- organize the material into a lesson plan; and
- select the important points to be supported by instructional aids.

> Instructional aids should be used only if they support learning and should not be made visible until the appropriate time during a lesson so as not to become a distraction.

VERBAL SUPPORT

Almost all ideas need some sort of clarification, explanation or proof to be understood. If cadets are learning something new, they want proof to support what is being said. The lesson topic, the instructional method, the cadets' background knowledge and the size of the group are factors that determine how much learning support is required.

Verbal support is one type of support instructors use to clarify, prove, illustrate, emphasize or to add variety and interest to information during a lesson. Types of verbal support include:

- **COMPARISONS**

A comparison is a bridge built by the instructor between the known and the unknown. New information can be clarified by pointing out its similarity to a familiar topic, idea or situation. A factual comparison clarifies by highlighting how two or more related things are similar. For example, a factual comparison is used when the **similarities** between two or more different types of uniforms are highlighted. A contrast clarifies by highlighting how two or more things are different. A contrast is used when the **differences** between two or more types of uniforms are highlighted. Figurative comparisons use similes and metaphors to add variety and gain attention. A figurative comparison is used when expressions such as the "ship cut through the water like a knife" or "the ship knifed through the water" are used to indicate the ship's speed.

- **REASONS**

Reasons are logical explanations that satisfy the question "why". Explaining the reason for something often makes it easier for the cadets to accept what is being explained. When instructors cite "safety concerns" as the reason why a task must be completed a certain way, they are using reasons as verbal support.

- **RESTATEMENT AND REPETITION**

Instructors can emphasize main ideas or key points by repeating them. One way to repeat something is to restate it in a different way. Skillful repetition can also persuasively help cadets accept an idea or point of view. Sometimes directions or instructions need to be repeated many times without change for clarity.

- **EXAMPLES**

An example is a specific instance of a general idea used to clarify or simplify information. It should be short and specific and in the cadets' background knowledge so that the cadets can associate new information with something already known.

- **STATISTICS**

Statistics are a summary of numerical information about an event or thing. If properly used, statistics help instructors prove or emphasize main points and create interest in the information. Do not assume, however, that verbal support is being used every time a number or figure is quoted. For example, saying "last year's national budget for cadets was approximately $180 million" is a statement of fact but saying "last year's cadet budget was approximately $3 000.00 for every cadet in Canada" is using statistics to emphasize the point that the cadet budget is large.

- **TESTIMONY**

Testimony is simply using the experiences, words and thoughts of others to emphasize or prove points. Testimonials are believable because they are offered by experts or people with first-hand knowledge. For example, simply saying, “the cadet organization offers many advantages to youth” is not as powerful as quoting or hearing from cadets who have gone through the program and realized its benefits.

> The acronym **CRREST** can be used to remember the different types of verbal support.

AUDIOVISUAL AIDS

Instructional aids appeal to all five senses. Audiovisual aids are particularly effective because individuals learn and retain over 50 percent of what they both see and hear.

MODELS

A model is a copy of a real object and can be an enlargement, a reduction or the same size as the original. Two types of models are:

- the scale model which is an exact reproduction of the original, and
- the simplified model, which does not represent reality in all details.

> As instructional aids, models are usually more practical than the real object because they are lightweight and easy to manipulate.

Mock-Ups

A mock-up is a three dimensional or specialized type of working model and is used for study, training or testing in place of the real object, which may be too costly, too dangerous or impossible to obtain. The advantage of the mock-up over the real thing is that the mock-up may emphasize the essential elements to be learned by distinguishing them from non-essential elements.

Cut-Aways

Some models are solid and show only the outline of the object while others can be manipulated or operated. Specialized models, called cut-aways, are built in sections and can be taken apart to reveal an internal structure. Whenever possible, the various parts should be labelled and coloured to clarify relationships.

> Production and equipment costs are limiting factors in developing and using models, mock-ups and cut-aways. If a two-dimensional representation will satisfy the instructor's needs it should be used.

THE REAL OBJECT AND REALISTIC IMAGES

The real object is often the most effective visual aid. To be effectively used the real object should be safe and big enough for everyone to see or small enough and available enough for each cadet to have one. Realistic images, including quality photographs or drawings of the real object, are suitable replacements if the real object cannot be obtained or effectively used.

> Realistic images and objects are most effective when they are used after a teaching point has been introduced.

GRAPHICS

Graphics, which include charts, graphs, maps, diagrams, drawings and cartoons, can be used to clarify relationships between concepts or effectively explain a concept that would otherwise require a lengthy description.

Graphics catch the cadets' attention and stimulate thinking by:

- presenting one idea;
- avoiding too many details; and
- using colours, which contrast with the background to emphasize main points.

PROJECTED MATERIAL

Projected material includes videotapes, DVDs and slides projected by an overhead projector or computer. Short, high-quality video presentations have become one of the most popular instructional aids.

Passive video, which includes VHS, DVDs and slides, provides motion, colour, sound and in some cases special advanced graphic and animation techniques. The availability, low cost and user-friendly characteristics are important advantages of passive video but instructors should be aware it is often difficult for instructional video to compete with the action-packed entertainment videos and is often considered less exciting and stimulating by cadets. This, in addition to the cadets' often passive viewing style for entertainment videos, can diminish the instructional value of the video.

To increase the value of passive video for instructional purposes, instructors should follow these basic guidelines:

- preview the video to determine the important points and concepts;
- prepare the cadets for viewing the video by stressing what is important to watch; and
- summarize the presentation and answer any questions the cadets may have.

Video presentations are not designed to replace the instructor.

Videotapes and DVDs are generally purchased but slides can easily be developed by hand or by using a computer.

Guidelines for developing slides are:

- illustrate key points;
- use key words or phrases as headers for each slide;
- include a maximum of six words per line and six lines per slide; and
- use lettering large enough to be clearly read from the back of the classroom.

Use of projected materials requires planning and practice. Instructors should set up and adjust the equipment and lighting beforehand and always preview the presentation.

Interactive video refers to software that responds to choices and commands by the user. A typical system consists of a combination of a compact disk and computer with video presentation capability. The software may include image banks of colour photos and graphics as well as questions or directions, which are programmed to create interactivity for students as they progress through the course.

Interactive video solves one of the main problems of passive video in that it increases the cadets' involvement in the learning process. Each cadet receives a customized learning experience.

SIMULATORS

Simulators are mechanical or electronic devices that act like the actual equipment or systems and provide the cadets with realistic practice in a safe and controlled environment. They may have various capabilities such as jump, freeze, record and replay which can capture and playback information for instructional feedback. Simulators replicate the real thing at a fraction of the cost.

Some concerns include:

- the need for the provision of background information,
- the requirement for hardware and software maintenance,
- the need for expertise to run the simulator, and
- the need for specialized facilities.

Some of the more commonly recognized simulators include flight simulators, driver training simulators and marine simulators, which simulate normal and emergency situations, which would otherwise be encountered in real life.

TRAINING EQUIPMENT

Training equipment refers to the use of actual equipment such as boats, air rifles, or gliders for training purposes. The main advantage of this type of aid is that it is the actual piece of equipment or system that the cadet will be expected to use. Despite the benefits of simulators, training is not complete without intensive training in or with the real thing.

Some concerns include:

- the need for subject matter experts,
- the high maintenance costs,
- the need for modifications for instructional purposes, and
- scheduling difficulties caused by external factors such as weather and the availability of the resources.

In short, cadets will only learn to sail, fly or complete an expedition by using a sailboat or glider or travelling to the field.

SELECT AN INSTRUCTIONAL AID

GUIDELINES FOR SELECTING INSTRUCTIONAL AIDS

During the lesson planning stage the following process can be used to determine if and where instructional aids are necessary:

- clearly establish the lesson objective – the information to be communicated or the task to be accomplished;
- research supporting material to achieve the lesson objective;
- organize the material into a lesson plan; and
- select the important points to be supported by instructional aids. Instructional aids are appropriate when:
  - long segments of technical description are necessary;
  - a point is complex and difficult to put into words;
  - instructors find themselves forming visual images; and
  - students are puzzled by an explanation or description.

The selection of instructional aids depends on several factors, which include:

- **Availability.** Which ready-made aids are available? What resources are available to make instructional aids?
- **Facilities.** Does the training area or equipment available allow the instructor to use certain instructional aids?
- **Cost.** Are the instructional aids too expensive to purchase or produce?
- **Class size.** Does the number of people in the class make the use of the instructional aid practical? Does the instructional aid encourage cadet participation?

> Instructional aids should be used only if they support learning and should not be a distraction.

INSTRUCTIONAL AID WORKSHEETS

INSTRUCTIONAL AIDS
Worksheet

1. How do instructional aids support learning?

2. In your opinion, what is the most important characteristic of instructional aids?

3. When should instructional aids be used during a lesson?

VERBAL SUPPORT Worksheet

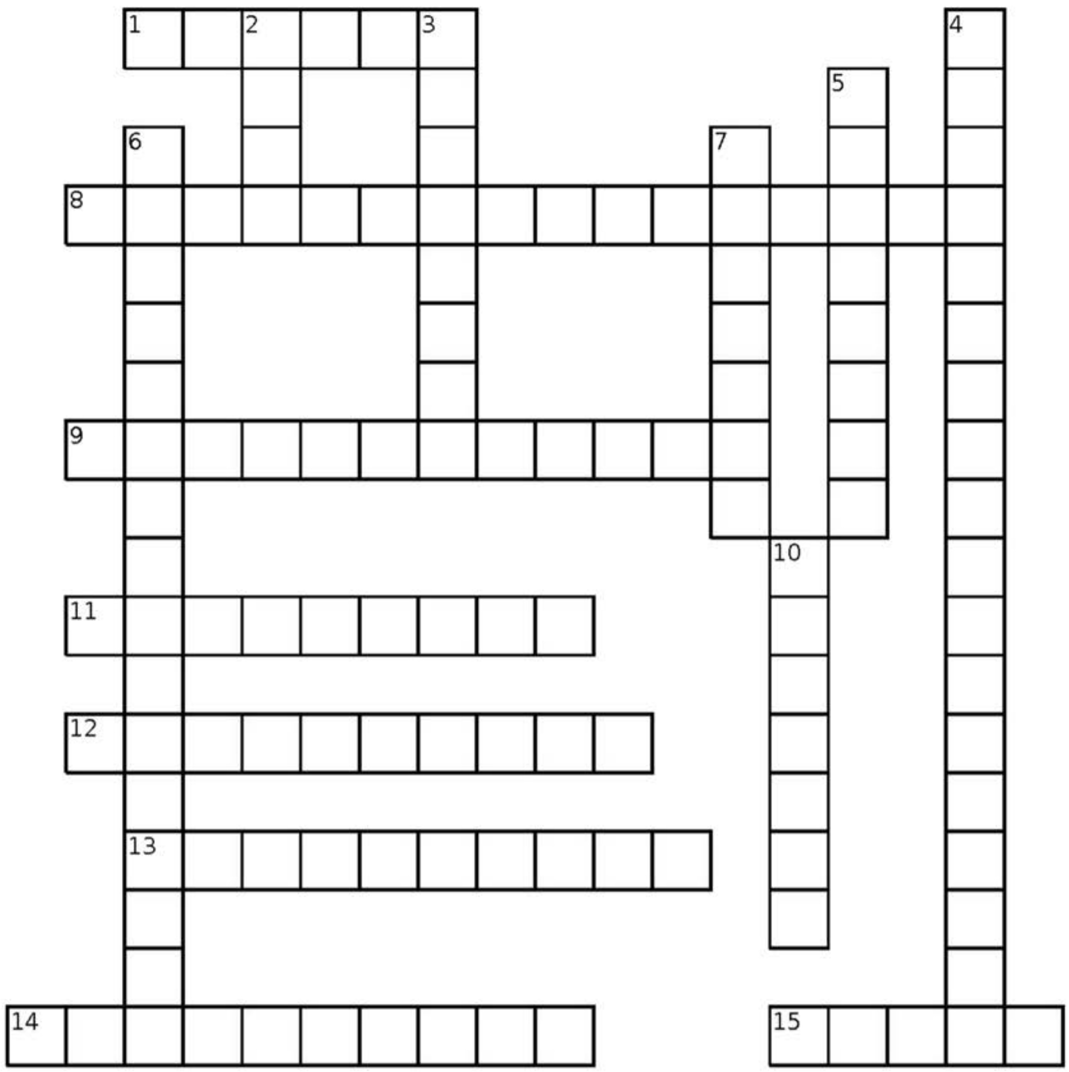
Match Column A with Column B by placing the correct number from Column B opposite the correct phrase from Column A.

Column A		Column B
a. a bridge between the known and unknown	______	1. testimony
b. numerical information about an event or thing	______	2. reasons
c. can be used to persuade the cadets to accept an idea	______	3. comparison
d. a specific instance of a general idea	______	4. statistics
e. logical explanations that satisfy the question “why”	______	5. repetition
f. using the words of others to prove a point	______	6. example
g. highlighting how two or more things are different	______	7. contrast

AUDIOVISUAL AIDS

Worksheet

COMPLETE THE CROSSWORD PUZZLE



CROSSWORD PUZZLE CLUES

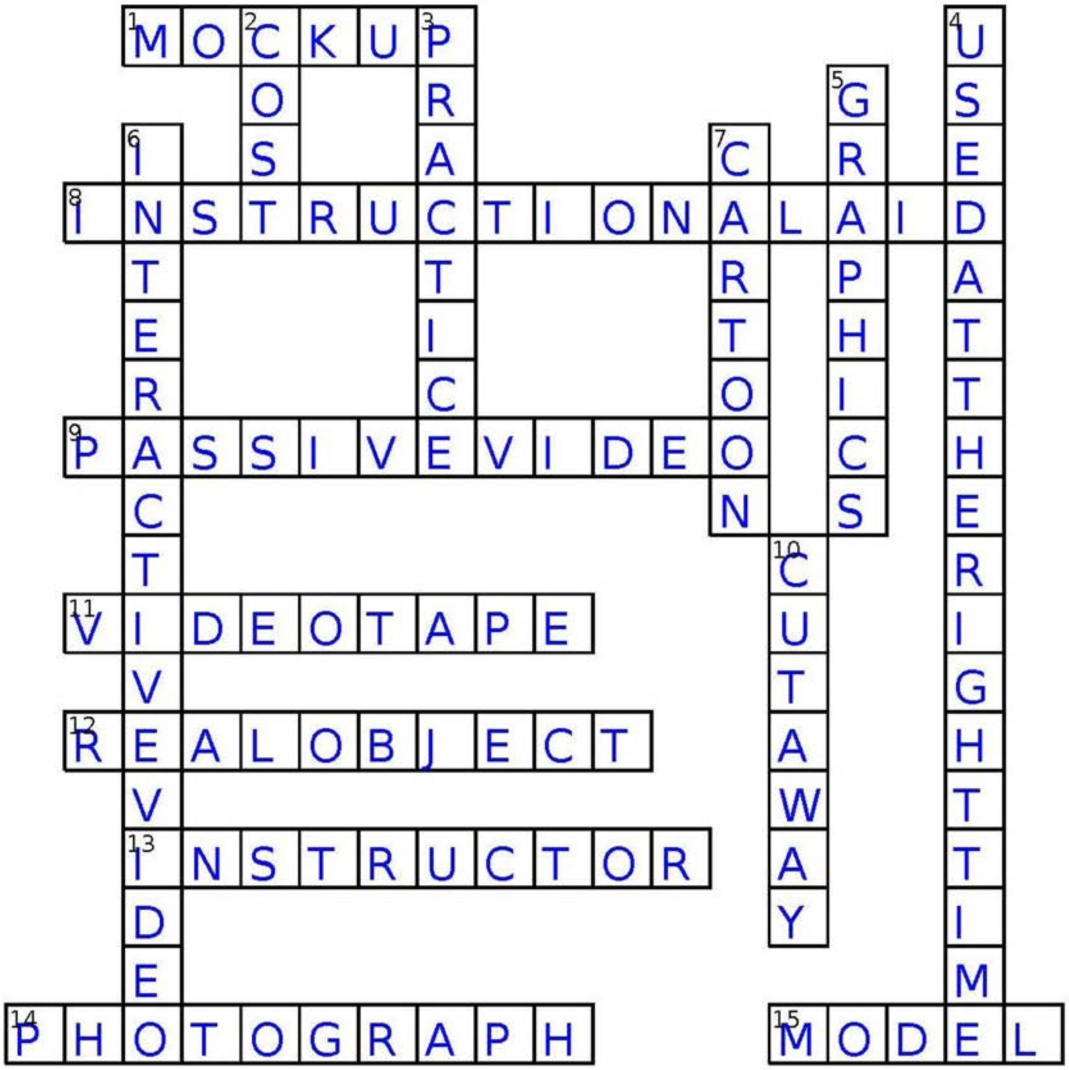
Across

1. a specialized type of working model (2 words)
8. appeals to all five senses (2 words)
9. video, which lacks cadet involvement (2 words)
11. one type of projected material (2 words)
12. the most effective visual aid (2 words)
13. video presentations should not replace the ...
14. an example of a realistic image
15. copy of the real object

Down

2. a limiting factor in developing models
3. use of projected material requires planning and ...
4. instructional aids are most effective when they are ... (5 words)
5. can effectively replace a lengthy explanation
6. software that responds quickly to commands (2 words)
7. an example of a graphic instructional aid
10. a model that can be taken apart (2 words)

ANSWER KEY


1 MOCKUP
2 COST
3 PRACTICE
4 USEDATTHERIGHTTIME
5 GRAPHICS
6 INTERACTIVEVIDEO
7 CARTOON
8 INSTRUCTIONALAID
9 PASSIVEVIDEO
10 CUTAWAY
11 VIDEOTAPE
12 REALOBJECT
13 INSTRUCTOR
14 PHOTOGRAPH
15 MODEL

SIMULATORS AND TRAINING EQUIPMENT

Worksheet

1. What do simulators provide the cadets?

2. List four concerns about simulators.

3. What is the main advantage of training equipment as an instructional aid?

4. List four concerns about training equipment.

SELECT AN INSTRUCTIONAL AID
Worksheet

Using the "Select an Instructional Aid" information sheet, select an instructional aid you would consider appropriate for each of the topics listed below.

Lesson Topic	Type of Instructional Aid
Participate in a Discussion on Hygienic Practices During Physical Activity	
Identify the Parts and the Characteristics of the Daisy 853C Air Rifle	
Apply Basic Marksmanship Techniques	
Participate in a Discussion on Phase One Training	
Wear the Air Cadet Uniform	
Participate in a Discussion of Year One Summer Training Opportunities	
Construct a Lean-to-Style Shelter	
Operate a Hand Held Radio	
Invent a Space Technology Item	
Discuss Aircraft Flown in WWI and WWII	
Discuss Leadership Within a Peer Setting	
Identify Year Two CSTC Training Opportunities	
Fly a Paper Colditz Glider	
Explain Aspects of Air Traffic Control	
Identify the Rank Structure of the Royal Canadian Sea, Army and Air Cadets	

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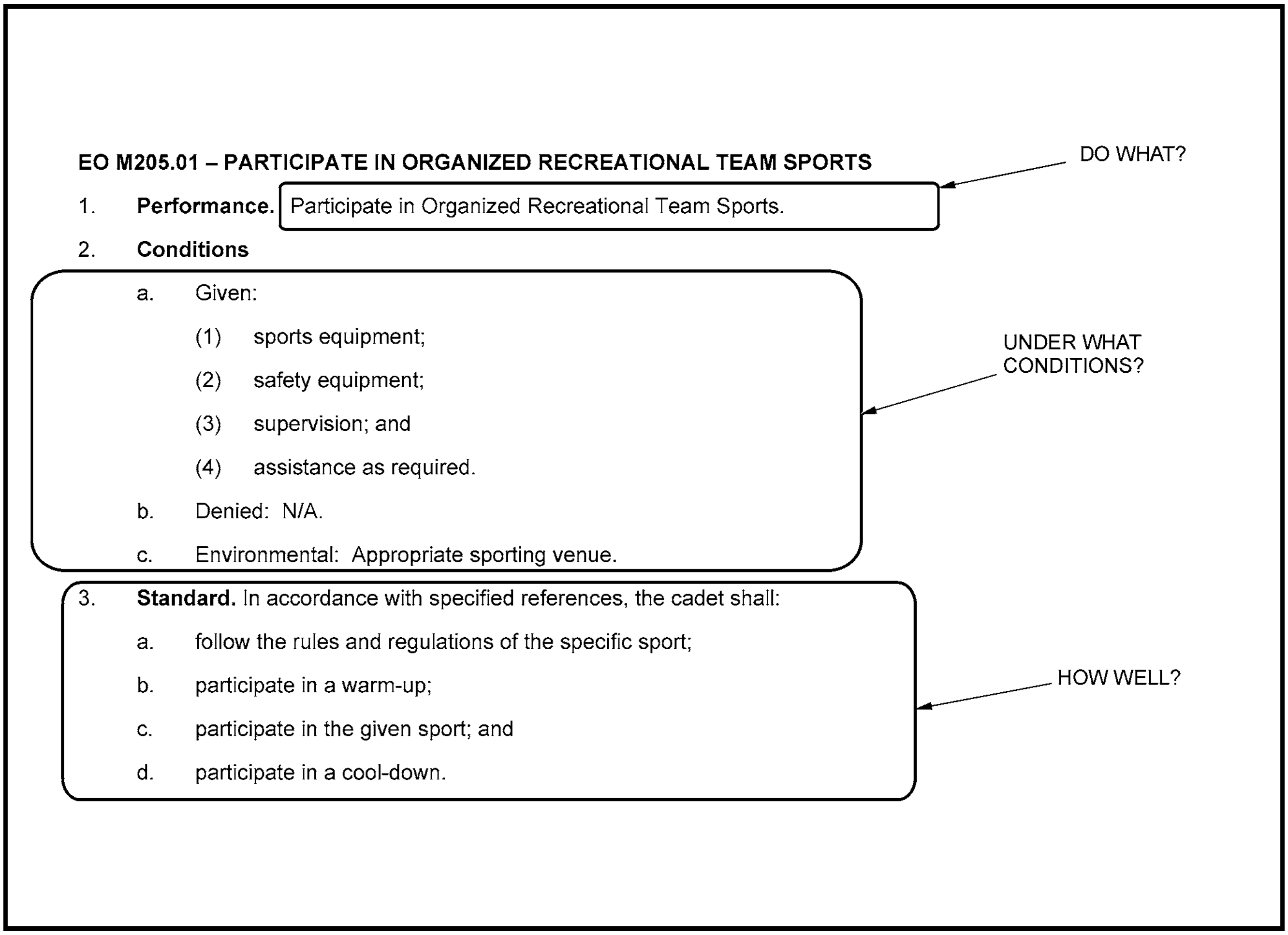
LESSON SPECIFICATION AND INSTRUCTIONAL GUIDE HANDOUT

ENABLING OBJECTIVE AND LESSON SPECIFICATION

Performance objectives are broken down into a series of enabling objectives and lesson specifications. The enabling objective consists of Paragraphs 1. to 3. (as illustrated in Figure 9K-1). The information in these paragraphs will answer three questions:

1. What will the cadet be expected to be able to do by the end of this lesson?
2. Under what conditions will the cadet be expected to carry out the performance?
3. How well or to what standard will the cadet be expected to perform?



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 9K-1 Enabling Objective

Paragraphs 4. to 11. are known as the lesson specification. The lesson specification provides information about the content to be taught, teaching methods, time, references, training aids, learning aids, test details and remarks.

In Paragraph 4., the TPs are usually described in a table where information is provided on the content taught in each TP, the suggested teaching method, the time for each TP and references (as illustrated in Figure 9K-2).

CONTENT TO BE TAUGHT

LENGTH OF TP

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Introduce cadets to a specific sport's rules and regulations, to include: a. an overview of how to play the sport; and b. rules and regulations of the sport.	Interactive Lecture	10 min	C0-001
TP2	Conduct a warm-up session, composed of light cardiovascular exercises, meant to: a. stretch the muscles; b. gradually increase respiratory action and heart rate; c. expand the muscles' capillaries to accommodate the increase in blood circulation; and d. raise muscle temperature to facilitate reactions in muscle tissue.	Practical Activity	10 min	C0-002 (pp. 109 to 113) C0-089
TP3	Supervise the cadets' participation in a given sports activity.	Practical Activity	50 min	

REFERENCE NUMBER

SUGGESTED TEACHING METHOD

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Figure 9K-2 Teaching Points

Paragraph 5. outlines how much time is spent on the introduction/conclusion and the different teaching methods. Paragraph 6. offers substantiation or reasons why certain teaching methods were recommended for each TP. Paragraph 7. provides a list of references used to compile the content in Paragraph 4. (as illustrated in Figure 9K-3).

5. **Time**

    a. Introduction/Conclusion: 10 min
    b. Interactive Lecture: 10 min
    c. Practical Activity: 70 min
    d. Subtotal: 90 min
    e. Total (three sessions): 270 min

6. **Substantiation**

    a. An interactive lecture was chosen for TP1 to illustrate the application of rules, principles, or concepts of the specific sport to be played.

    b. A practical activity was chosen for TP2–4 as it allows cadets to participate in sports activities in a safe and controlled environment. This activity contributes to the development of sports skills in a fun and challenging setting.

7. **References**

    a. C0-001 (ISBN 0-88011-807-5) Hanlon, T. (1998). *The Sports Rules Book: Essential Rules for 54 Sports*. USA: Human Kinetics Publishers, Inc.

    b. C0-002 (ISBN 0-88962-630-8) LeBlanc, J., and Dickson, L. (1997). *Straight Talk About Children and Sport: Advice for Parents, Coaches, And teachers.* Oakville, ON and Buffalo, NY: Mosaic Press.

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Figure 9K-3 Paragraphs 5–7

Paragraphs 8. and 9. list the training aids and learning aids required for the lesson. Training aids are the materials that are required by the instructor to instruct the lesson and learning aids are the materials that will be required by the cadet to participate in the lesson (as illustrated in Figure 9K-4).

8. **Training Aids**

    a. Sports/safety equipment appropriate for the activity;

    b. First aid kit;

    c. Whistles; and

    d. Stopwatch.

9. **Learning Aids.** Sports equipment.

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Figure 9K-4 Training Aids and Learning Aids

Paragraph 10. is test details, which is information about the evaluation to be conducted. Paragraph 11. is remarks, which describe any other information that may be useful to the Training Officer or instructor (as illustrated in Figure 9K-5).

10. **Test Details.** N/A.

11. **Remarks**

    a. The CCO list of approved sports is located at A-CR-CCP-802/PF-001, Annex A.

    b. Recreational sports can be carried out as nine periods during a supported day or over three sessions of three periods each.

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 9K-5 Test Details and Remarks

INSTRUCTIONAL GUIDE

The IG is used in conjunction with the QSP and other resources to conduct training. IGs should be reviewed in conjunction with lesson specifications so that the instructor can adequately plan and prepare their lesson. IGs do not replace lesson plans but offer written content, supporting figures and suggestions on how to instruct a lesson. The following are the six sections of an IG:

1. preparation,
2. introduction,
3. body,
4. conclusion,
5. references, and
6. annexes.

Preparation

The preparation section provides information about where to find the lesson specification and any instructions to the instructor such as reviewing lesson content, photocopying handouts, pre-lesson assignments and the approach and substantiation as to why certain teaching methods were recommended for each TP.

Introduction

The introduction section provides information to the instructor about review that may be necessary, what the cadet will be expected to do by the end of the lesson and why the knowledge/skills are important.

The Body

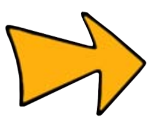
The body of the IG contains all of the TPs and content listed in Paragraph 4. of the lesson specification in greater detail. The body provides suggested teaching methods, note boxes with special instructions or information (as illustrated in Figure 9K-6), lesson content, figures, activities and confirmation questions.

Note Boxes:

Special note to the instructor.

Key information to pass along to the cadets.

Refer to the following CF regulations and policies.



Points of interest or special instructions should pass along to the cadets.

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Figure 9K-6 Note Boxes

The Conclusion

The conclusion section states any homework/reading/practice that may be required of the cadet and the method of evaluation as stated in the lesson specification. The conclusion section also provides a closing statement to be spoken aloud to the cadets and any additional instructor notes/remarks.

References

The reference section lists the references used to create the lesson specification and instructional guide. In some cases, an IG may direct the instructor to a specific reference to be used during a lesson. In most cases this section is only used to identify where the content of the lesson has been drawn from.

Annexes

The annex section contains information that may range from pre-made training aids, learning aids such as handouts and additional information for activities.

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LESSON PLAN

<table>
<tr><td colspan="2">EO #:</td><td colspan="1">Title of the EO:</td></tr>
<tr><td colspan="2">Instructor: Location:</td><td>Total Time: min</td></tr>
<tr><td>TIME</td><td>REVIEW</td><td>NOTES</td></tr>
<tr><td></td><td>EO#:
ENABLING OBJECTIVE:</td><td></td></tr>
<tr><td>TIME</td><td>INTRODUCTION</td><td>NOTES</td></tr>
<tr><td></td><td>What:
Where:
Why:</td><td></td></tr>
<tr><td>TIME</td><td>BODY</td><td>NOTES</td></tr>
<tr><td></td><td>Teaching Method:
TP 1:

TP 1 Confirmation:</td><td></td></tr>
</table>

	Teaching Method: **TP 2:** **TP 2 Confirmation:**	
TIME	**END OF LESSON CONFIRMATION**	NOTES
TIME	**CONCLUSION**	NOTES
	Summary: In this lesson you have learned **Re-Motivation:** Your next lesson will be	

PLAN A LESSON CHECKLIST

PREPARATION	NOTES
Have you:	
❑ Selected an appropriate lesson location?	
❑ Selected an appropriate method of instruction?	
❑ Provided for a review of previous lesson materials?	
INTRODUCTION	
Does your introduction:	
❑ State what the cadets will learn?	
❑ Describe why the information is important to learn?	
❑ Describe where and when the information / skill can be used?	
BODY	
Does the body of your lesson:	
❑ Include the different principles of instruction?	
❑ Include questions?	
❑ Provide for the use of instructional aids?	
❑ Used explanation and demonstration? (skill lesson only)	
❑ Confirm each TP?	
END OF LESSON CONFIRMATION	
❑ Did you conduct an end of lesson confirmation by using questions or by conducting an activity?	
CONCLUSION	
Does your conclusion:	
❑ Summarize the lesson?	
❑ Re-motivate the cadets by:	
❑ commenting on their progress; and	
❑ re-stating why the information learned is important?	
❑ Describe the next lesson?	

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LIST OF APPROVED 15-MINUTE TOPICS

TP 1 of M104.01 (Identify Activities That Will Help Achieve a Healthy Active Lifestyle, A-CR-CCP-801/PG-001, Chapter 4, Section 4 and A-CR-CCP-801/PF-001, Chapter 4, Section 1)

TP 1 of M106.01 (Identify the Parts and the Characteristics of the Daisy 853C Air Rifle, A-CR-CCP-801/PG-001, Chapter 4, Section 6 and A-CR-CCP-801/PF-001, Chapter 6, Section 1)

TP 4 of M106.03 (Apply Basic Marksmanship Techniques, A-CR-CCP-801/PG-001, Chapter 4, Section 6 and A-CR-CCP-801/PF-001, Chapter 6, Section 3)

TP 1 of M203.01 (Discuss Leadership Within a Peer Setting, A-CR-CCP-802/PG-001, Chapter 4, Section 3 and A-CR-CCP-802/PF-001, Chapter 3, Section 1)

TPs 1 and 2 of M129.01 (Recite the Phonetic Alphabet, A-CR-CCP-801/PG-001, Chapter 4, Section 11 and A-CR-CCP-801/PF-001, Chapter 11)

TP 3 of M129.01 (Recite the Phonetic Alphabet, A-CR-CCP-801/PG-001, Chapter 4, Section 11 and A-CR-CCP-801/PF-001, Chapter 11)

TP 1 of M130.02 (Describe the Main Components of an Aircraft, A-CR-CCP-801/PG-001, Chapter 4, Section 12 and A-CR-CCP-801/PF-001, Chapter 12, Section 2)

TP 1 of M160.01 (Identify Major Aerodrome Components, A-CR-CCP-801/PG-001, Chapter 4, Section 14 and A-CR-CCP-801/PF-001, Chapter 14, Section 1)

TPs 1 and 2 of M160.02 (Identify Features of a Runway, A-CR-CCP-801/PG-001, Chapter 4, Section 14 and A-CR-CCP-801/PF-001, Chapter 14, Section 2)

TPs 4 and 5 of M230.01 (Discuss Aircraft Flown During WWII, A-CR-CCP-802/PG-001, Chapter 4, Section 10 and A-CR-CCP-802/PF-001, Chapter 10, Section 1)

TP 3 of M231.02 (Describe the Production of Lift by an Aircraft Wing, A-CR-CCP-802/PG-001, Chapter 4, Section 11 and A-CR-CCP-802/PF-001, Chapter 11, Section 2)

TPs 1 and 2 of M231.04 (Describe the Axial Movements of an Aircraft, A-CR-CCP-802/PG-001, Chapter 4, Section 11 and A-CR-CCP-802/PF-001, Chapter 11, Section 4)

TP 1 of M232.01 (Identify Types of Aircraft Engines, A-CR-CCP-802/PG-001, Chapter 4, Section 12 and A-CR-CCP-802/PF-001, Chapter 12, Section 1)

TP 2 of C232.03 (Identify the Characteristics of Helicopter Engines, A-CR-CCP-802/PG-001, Chapter 4, Section 12 and A-CR-CCP-802/PF-001, Chapter 12, Section 7)

TP 2 of C240.03 (Identify Parts of a Rocket, A-CR-CCP-802/PG-001, Chapter 4, Section 13 and A-CR-CCP-802/PF-001, Chapter 13, Section 6)

Note:	The TPs in this list were selected because they best fit into the 15-minute format. The selected EOs are a variety of knowledge and skill-based lessons.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M104.01

A-CR-CCP-801/PG-001

EO M104.01 – IDENTIFY ACTIVITIES THAT WILL HELP ACHIEVE A HEALTHY ACTIVE LIFESTYLE

1. **Performance.** Identify Activities That Will Help Achieve a Healthy Active Lifestyle.

2. **Conditions**

   a. Given:

      (1) a copy of *Canada's Physical Activity Guide to Healthy Active Living*;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities/training area large enough to accommodate entire group.

3. **Standard.** In accordance with *Canada's Physical Activity Guide to Healthy Active Living*, the cadet shall identify activities that will help achieve a healthy and active lifestyle.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Introduce cadets to *Canada's Physical Activity Guide to Healthy Active Living*, to include: a. page 4 – Check Out What You Are Doing Now; b. page 5 – Benefits of Physical Activity; c. page 6 – What Are You Into; d. page 8 – Let's Get Active; and e. page 10 – Crank Up Your Activity.	Interactive Lecture	10 min	C0-020 (pp. 4 to 10)

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	Interactive Lecture:	10 min
c.	Total:	15 min

6. **Substantiation.** For TP1, the interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

7. **References.** C0-020 (ISBN 0-662-32899) Minister of Health. (2002). *Canada's Physical Activity Guide to Healthy Active Living* [Brochure].

8. **Training Aids**

   a. Presentation aids (i.e. whiteboard/flipchart/OHP) appropriate for classroom/training area; and

   b. *Canada's Physical Activity Guide to Healthy Active Living.*

9. **Learning Aids.** *Canada's Physical Activity Guide to Healthy Active Living.*
10. **Test Details.** N/A.
11. **Remarks.** N/A.

A-CR-CCP-801/PF-001

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

CADETS CANADA

SECTION 1

EO M104.01 – IDENTIFY ACTIVITIES THAT WILL HELP ACHIEVE A HEALTHY ACTIVE LIFESTYLE

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

The instructor shall review the lesson content and become familiar with the material prior to the instruction of the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

For TP1, the interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify activities that will help them achieve a healthy and active lifestyle.

IMPORTANCE

Physical fitness is one of the three aims of the cadet program. Teaching the cadets what activities contribute to an active lifestyle will help them achieve physical fitness.

Teaching Point 1	Introduce Cadets to *Canada's Physical Activity Guide to Healthy Active Living*
Time: 10 min	Method: Interactive Lecture

CANADA'S PHYSICAL ACTIVITY GUIDE TO HEALTHY ACTIVE LIVING

Hand out *Canada's Physical Activity Guide to Healthy Active Living*, highlighting the following pages and information detailed there:

- **Page 4 – Check Out What You Are Doing Now.** Is your exercise time more than 90 minutes per day? Less than 90 minutes but more than 60? Less than 60 but more than 30? Have each cadet write down their activities from yesterday and two days ago to add up their total time.
- **Page 5 – Benefits of Physical Activity.** Meet new friends, improve physical self-esteem, achieve a healthy weight, build strong bones and strengthen muscles, maintain flexibility, promote good posture and balance, improve fitness, strengthen the heart, increase relaxation and promote healthy growth and development.
- **Page 6 – What Are You Into.** Walking, running, hiking, cycling, swimming, jogging, gymnastics, ice-skating, skiing, basketball, volleyball, tobogganing, soccer, football, tennis, baseball, softball, dancing, yoga, climbing, bowling, hockey, skateboarding, badminton, etc. Have the cadets brainstorm all the activities they can think of that they may be interested in.
- **Page 8 – Let's Get Active.** Increase the time currently spent on physical activity and reduce non-active time.
- **Page 10 – Crank Up Your Activity.** Walking instead of taking the bus, playing ball at breaks, walking the dog, raking leaves, shovelling snow, carrying groceries, etc. Brainstorm ideas that will help increase current physical activity.

The purpose of highlighting these pages is to fuel the discussion for the next teaching point. The cadets may take home the guides and explore them further afterwards.

END OF LESSON CONFIRMATION

The confirmation of this lesson will occur in EO M104.02 (Section 2) as the cadets develop a personal activity plan.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

There is no formal assessment of this EO.

CLOSING STATEMENT

As physical fitness is one of the aims of the cadet program, it is important that cadets learn what activities contribute to an active lifestyle to help them achieve physical fitness.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C1-011 (ISBN 0-662-32899) Minister of Health (2002). *Canada's Physical Activity Guide to Healthy Active Living* [Brochure].

C3-024 (ISBN 0-7627-0476-4) Roberts, H. (1989). *Basic Essentials Backpacking*. Guildford, CT: The Globe Pequot Press.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M106.01

A-CR-CCP-801/PG-001

EO M106.01 – IDENTIFY THE PARTS AND CHARACTERISTICS OF THE DAISY 853C AIR RIFLE

1. **Performance.** Identify the Parts and Characteristics of the Daisy 853C Air Rifle.

2. **Conditions**

   a. Given:

      (1) Daisy 853C air rifle;

      (2) assistance as required; and

      (3) supervision.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facility and/or air rifle range constructed IAW A-CR-CCP-177/PT-001, Chapter 1, sect 8.

3. **Standard.** In accordance with A-CR-CCP-177/PT-001, the cadet shall identify the parts and list the characteristics of the Daisy 853C air rifle.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Identify the parts of the Daisy 853C air rifle, to include: a. butt plate; b. spacers; c. small of the butt; d. stock; e. fore end; f. sling bracket; g. trigger; h. trigger guard; i. safety catch; j. bolt; k. pump handle; l. front sight; m. rear sight; n. muzzle; o. barrel with barrel weight; p. bore; q. feed track; r. chamber; s. sling; t. single shot adapter; and	Interactive Lecture	10 min	A0-027 (p. 2-5, Diagram)

TP	Description	Method	Time	Ref
	u. five-shot clip. **Note:** The instructor shall ensure that the cadet can identify the parts of the cadet air rifle by physically pointing to the proper part on the rifle or on an unlabeled diagram.			

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Interactive Lecture: 10 min

   c. Total: 15 min

6. **Substantiation.** The interactive lecture method was chosen as it best allows the instructor to make a semi-formal presentation of the material allowing the cadets to participate by asking or responding to questions, commenting on the material, or participating in short activities. This method appeals to auditory learners, with the potential for active participation in activities that appeal to tactile/kinaesthetic learners.

7. **References.** A0-027 A-CR-CCP-177/PT-001 D Cdts 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Programme Reference Manual*. Ottawa, ON: Department of National Defence.

8. **Training Aids**

   a. Daisy 853C air rifle; and

   b. Presentation aids (i.e. whiteboard/flipchart/OHP) appropriate for classroom/training area.

9. **Learning Aids.** Daisy 853C air rifle.

10. **Test Details.** Assessment of this EO shall be carried out during the end of lesson check. While there is no formal assessment of this EO, every cadet is required to successfully complete the Cadet Air Rifle Handling Test provided at Chapter 3, Annex C.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 1

EO M106.01 – IDENTIFY THE PARTS AND THE CHARACTERISTICS OF THE DAISY 853C AIR RIFLE

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material;
- carry out a safety precaution check on all rifles to be used during this lesson; and
- state to cadets that the rifles have been inspected and are safe to handle.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the interactive lecture method. The interactive lecture method was chosen as it best allows the instructor to make a semi-formal presentation of the material allowing the cadets to participate by asking or responding to questions, commenting on the material, or participating in short activities. This method appeals to auditory learners, with the potential for active participation in activities that appeal to tactile/kinaesthetic learners.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify the parts, and list the characteristics of the cadet air rifle.

IMPORTANCE

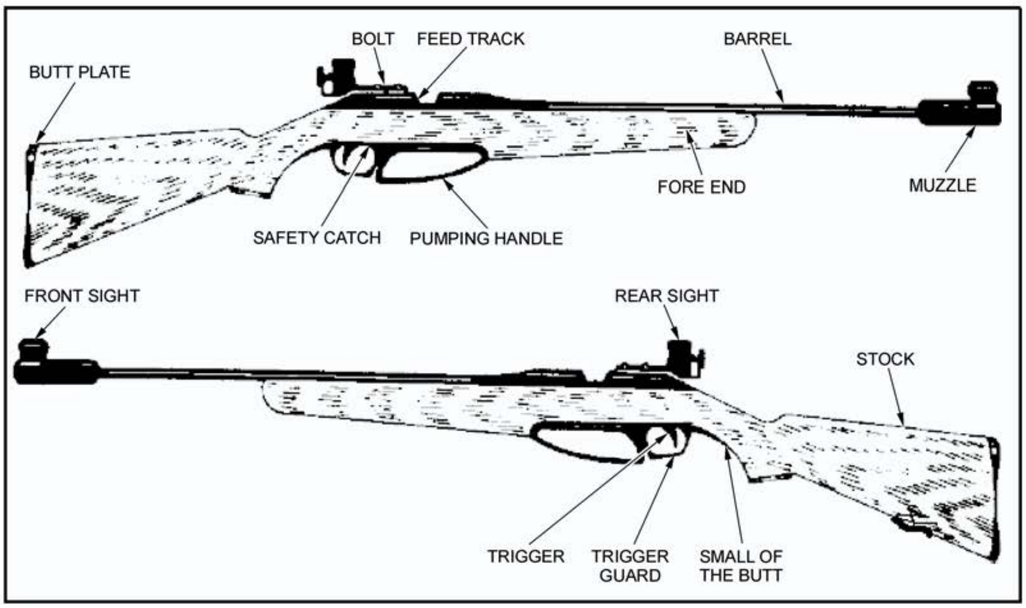
Cadets must have a basic knowledge of the cadet air rifle in order to understand how the rifle works and to safely follow directions given on the range.

Teaching Point 1 — **Identify the Parts of the Daisy 853C Air Rifle**

Time: 10 min — Method: Interactive Lecture

PARTS

- Depending on the number of rifles available, distribute them with an optimum ratio of one rifle for every two cadets.
- When possible, have a second instructor in the room to assist.
- **For safety purposes, maintain strict class control at all times.**



A-CR-CCP-177/PT-001

Figure 6-1-1 Parts of the Cadet Air Rifle

Butt Plate (End of the Butt). It is the part of the rifle directly in contact with the marksman's shoulder. When fitted properly, the butt plate aids in achieving a snug fit, and a consistent placement of the rifle into the shoulder. The addition of butt spacers allows for this adjustment in length.

Spacers. Plastic inserts that can be added or removed from the butt plate to vary its length. To add or take away butt spacers, use a Phillips screwdriver to loosen the butt plate and slide in/out the amount of spacers desired.

Small of the Butt (Pistol Grip). Curved area directly behind the trigger guard where the hand controlling the trigger grips the rifle.

Stock. Complete wooden portion of the rifle (from the butt plate end forward).

Fore End (of the Stock). Wooden portion of the stock from the trigger guard forward, in which the barrel and the rifle mechanism are encased.

Sling. It is a web sling made of nylon. Links the rifle to the marksman's arm to support most of the weight of the rifle. One end attaches to the sling bracket and the other to the upper arm.

Sling Bracket (Hand Stop). Adjustable metal clasp attached to the fore stock used to affix the sling to the rifle. It also acts as a hand stop, used to rest the left hand to prevent it from moving.

Trigger. Movable device that releases a spring and releases the rifle mechanism. This rifle has a single stage trigger that cannot be adjusted for weight.

Trigger Guard. Metal band that surrounds and protects the trigger.

Safety Catch. This is a mechanism that, once engaged, prevents the rifle from firing by locking the trigger in place. It is a cross bolt type device located on the trigger guard. The black side indicates that the rifle is unable to fire; the red side indicates the rifle is ready to fire. It should be ON (no red) at all times, unless firing.

Bolt. Metal lever used for opening or closing the rifle mechanism. It must be in the closed position in order to fire. For maximum safety when the rifle is uncased and not firing, the bolt should be kept open.

Pump Handle. Metal lever used to compress the air required to fire the pellet. Whenever the rifle is in a "safe rifle status", the pump lever should be left partially open.

Front Sight. Global front sight that uses aperture inserts.

Rear Sight. Micrometer sight adjustable for windage and elevation. It is easily attached to a metal rail located above the action. This rail allows for adjustment of the sight forward or backward, in order to maintain proper eye relief. The sight is attached using a small flat-blade screwdriver.

Muzzle. Front end of the barrel equipped with attachable barrel weight.

Barrel With Barrel Weight. Steel tube through which the pellet travels, extending from the muzzle to the chamber. The barrel weight ensures that the rifle's weight is evenly distributed and that the rifle's balance is maintained.

Bore. Interior of the barrel has spiral grooves cut into it. The lands are the ridges of metal between the grooves. Together, the grooves and lands are called rifling.

Feed Track. Delicate area where the pellet is inserted manually onto a single pellet adapter, or with a five-shot clip.

Single Shot Adapter. Plastic clip that aids in placing a pellet in the chamber.

Five-shot Clip. Plastic clip that holds a maximum of five pellets and used to place the pellets in the chamber.

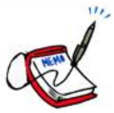
Chamber. Location where the pellet is held before firing.

CONFIRMATION OF TEACHING POINT 1

The instructor shall ensure that the cadet can identify the parts of the cadet air rifle by physically pointing to the parts, and having the cadets properly name the part.

END OF LESSON CONFIRMATION

This EO may be confirmed with the handout found at Annex A. Allow cadets a few minutes to complete the annex, then have cadets switch sheets for correcting.



Correctly labelled diagram is located at page 6A-2.

CONCLUSION

HOMEWORK/READING/PRACTICE

Cadets are to take home the corrected handout to study the parts of the cadet air rifle.

METHOD OF EVALUATION

The instructor will confirm cadets' ability to identify the parts and characteristics of the cadet air rifle by asking questions during the end of lesson confirmation, and with the handout found at Annex A.

CLOSING STATEMENT

Knowing the parts and characteristics of the cadet air rifle is important in understanding how the rifle works. This allows the cadet to be able to follow directions given on the range, and properly perform a handling test whenever an air rifle is to be used.

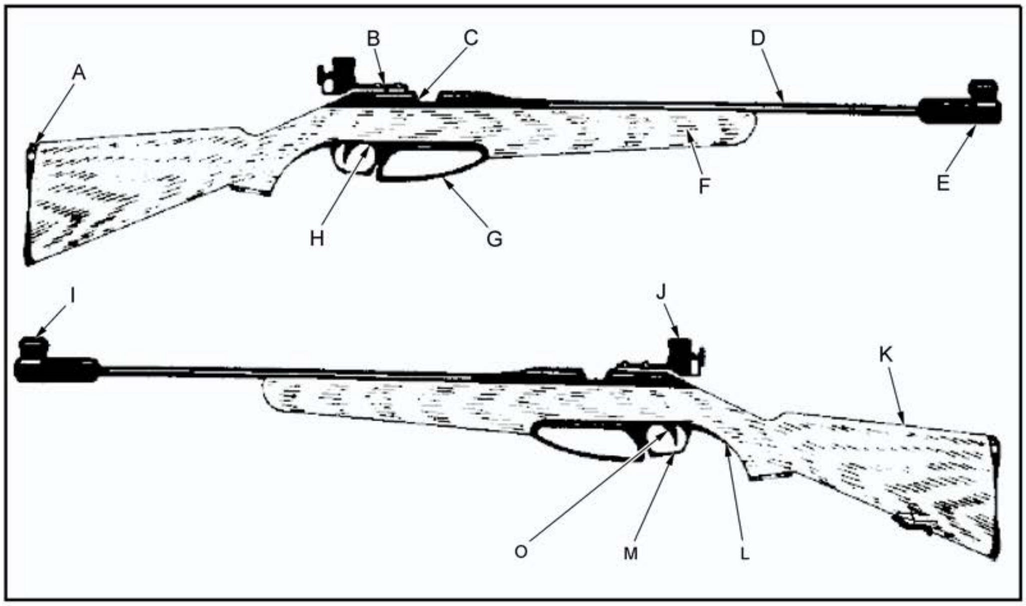
INSTRUCTOR NOTES/REMARKS

Emphasis must be placed on the safety aspect of this lesson.

REFERENCES

A0-027 A-CR-CCP-177/PT-001 D Cdts 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Programme Reference Manual*. Ottawa, ON: Department of National Defence.

PARTS AND CHARACTERISTICS OF THE CADET AIR RIFLE

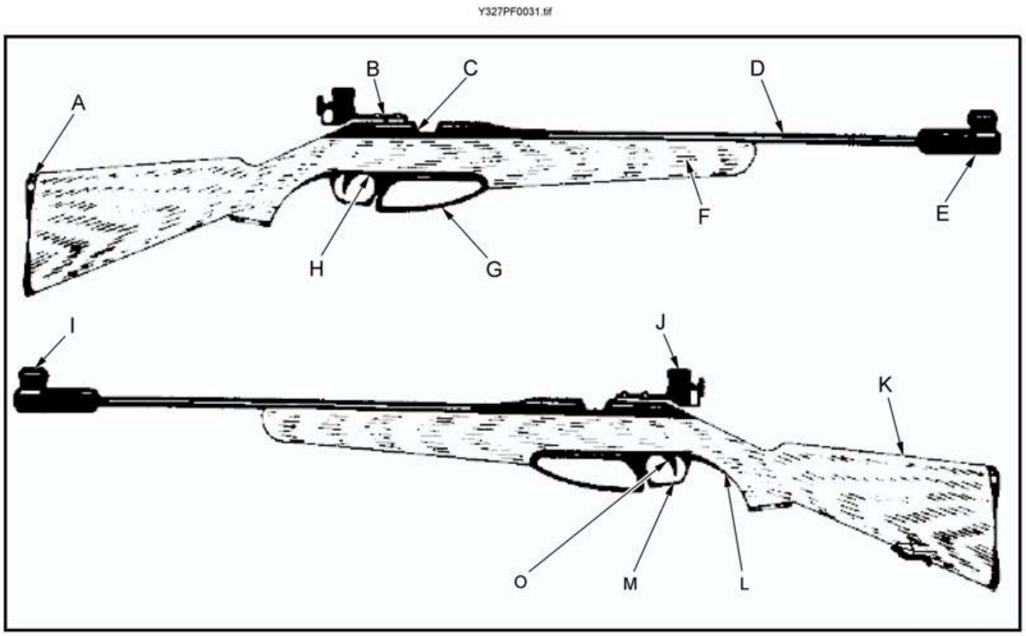


Put the letter next to the matching name of the part of the cadet air rifle.

1.	Feed Track	________	8.	Safety Catch	________
2.	Small of the Butt	________	9.	Muzzle	________
3.	Barrel	________	10.	Pump Lever	________
4.	Fore End	________	11.	Front Sight	________
5.	Rear Sight	________	12.	Trigger Guard	________
6.	Trigger	________	13.	Butt Plate	________
7.	Bolt	________	14.	Stock	________

A-CR-CCP-801/PF-001
Chapter 6, Annex A

ANSWER KEY



Put the letter next to the matching name of the part of the cadet air rifle.

1.	Feed Track	C	8.	Safety Catch	H
2.	Small of the Butt	L	9.	Muzzle	E
3.	Barrel	D	10.	Pump Lever	G
4.	Fore End	F	11.	Front Sight	I
5.	Rear Sight	J	12.	Trigger Guard	M
6.	Trigger	O	13.	Butt Plate	A
7.	Bolt	B	14.	Stock	K

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 4 OF EO M106.03

A-CR-CCP-801/PG-001

EO M106.03 – APPLY BASIC MARKSMANSHIP TECHNIQUES

1. **Performance.** Apply Basic Marksmanship Techniques.

2. **Conditions**

   a. Given:

      (1) cadet air rifle;

      (2) single pellet adaptor

      (3) assistance as required; and

      (4) supervision.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facility and/or air rifle range constructed IAW A-CR-CCP-177/PT-001, Chapter 1, sect 8.

3. **Standard.** In accordance with A-CR-CCP-177/PT-001, the cadet shall apply basic marksmanship techniques, to include:

   a. loading;

   b. unloading; and

   c. preparing for inspection.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP4	Explain, demonstrate, and have the cadets load, unload, and prepare for inspection the cadet air rifle, as follows: a. loading the cadet air rifle, to include: (1) picking up the rifle with the left hand; (2) ensuring safety catch is in the ON position; (3) pumping the air rifle, pausing for three seconds; (4) bringing pump handle back to closed position; (5) loading a pellet; and (6) closing the bolt; b. unloading the cadet air rifle, to include: (1) opening the bolt (do not insert a pellet); (2) pumping the air rifle, pausing for three seconds; (3) closing the bolt (do not insert a pellet);	Demonstration and Performance	10 min	A0-027 (p. 2-16)

TP	Description	Method	Time	Ref
	(4) placing the safety catch in the OFF position; (5) aiming the rifle at the target; (6) squeezing the trigger; (7) placing the safety catch in the ON position; and c. preparing for inspection, to include: (1) opening the bolt; (2) opening the pump handle slightly; (3) placing the rifle on the shoulder, muzzle pointed down range; (4) waiting to be cleared by the RSO; and (5) laying the rifle down. **Note:** Cadets will be required to perform these skills during their air rifle handling test. The pellet guide shall be used for training, although cadets may be introduced to the five-round clip prior to actual firing.			

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-027 A-CR-CCP-177/PT-001 D Cdts 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Programme Reference Manual*. Ottawa, ON: Department of National Defence.

8. **Training Aids**

   a. Presentation aids (i.e. whiteboard/flipchart/OHP) appropriate for classroom/training area; and

   b. Cadet air rifle.

9. **Learning Aids.** Cadet air rifle.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 3

EO M106.03 – APPLY BASIC MARKSMANSHIP TECHNIQUES

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> This lesson may be better presented using a round robin format for those squadrons with large first year groups.

INTRODUCTION

REVIEW

The pertinent review for this lesson, from EO M106.02 (Section 2), will include:

QUESTIONS

Q1. Why are the individual safety precautions performed?

Q2. What is the purpose of the "safety catch"?

ANTICIPATED ANSWERS

A1. To confirm a rifle is safe.

A2. It prevents a rifle from firing by locking its trigger into place.

OBJECTIVES

By the end of this lesson the cadet shall be expected to apply basic marksmanship techniques to include:

- prone position;
- basic holding;
- basic aiming;
- loading;
- firing; and
- unloading.

Cadets will apply the knowledge gained during this lesson when they participate in any range practice.

IMPORTANCE

These techniques must all be applied in harmony. Improving one while not working on another will not produce the best results in the long run. Perfecting these techniques takes time and concentration. Cadets should remember – PRACTICE MAKES PERFECT!

Teaching Point 4	**Explain and Demonstrate How To Load and Unload the Cadet Air Rifle**
Time: 10 min	Method: Demonstration and Performance

LOADING THE AIR RIFLE

The instructor shall provide an EXPLANATION and DEMONSTRATION of the complete skill.

The instructor shall also provide an EXPLANATION and DEMONSTRATION of each step required to effectively complete the skill.

This will be conducted as a DRY FIRE EXERCISE ONLY.

Loading procedure:

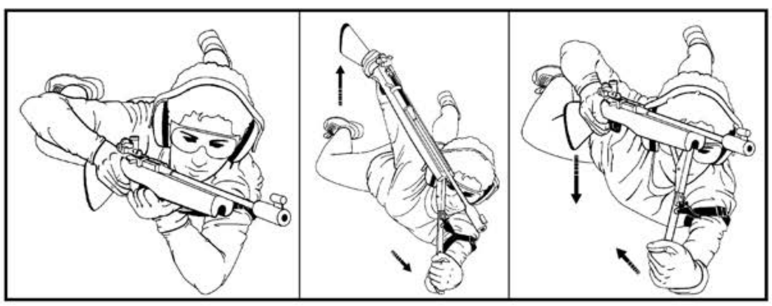
1. Pick up the rifle with the left hand.
2. Ensure the safety catch is in the ON position.
3. Pump the air rifle, pausing for 3 seconds.
4. Bring the pump handle back to closed position.
5. Simulate loading a pellet, or load an auto indexing five-pellet clip into the feed track.

6. Close the bolt.

Cadets will IMITATE the demonstration provided by the instructor for each step within the skill. The instructor(s) will SUPERVISE the cadets during this imitation.

The following methods may be used when pumping the air rifle:

- **Option 1.** Grasp the pistol grip with the right hand. Grasp the pump handle with the left hand. Push downward with the left hand until the pump handle is fully extended. Wait for a few seconds. Using the left hand, bring the pump handle back to the stock of the rifle. The rifle should remain stationary during the pumping process and always point towards the targets.
- **Option 2.** Grasp the pistol grip with the right hand. Grasp the pump handle with the left hand. Place the butt of the rifle under the right arm or shoulder for support. Push downward with the left hand until the pump handle is fully extended. Wait for a few seconds. Using the left hand, bring the pump handle back to the stock of the rifle allowing the underarm and shoulder to help hold the rifle steady when closing the pump handle. Remember that the rifle must always point towards the targets.
- **Option 3 – Coach Assistance.** Point the rifle is a safe direction and request the assistance from a coach. The coach should move in and pump the rifle using both hands. This should be used as last resorts as any cadet can easily do the above two options.



Cadet Marksmanship Program Reference Manual

Figure 6-3-7 Pumping the Air Rifle

Do not pump the rifle more than once per shot. This air rifle is designed to withstand the pressure based on a single pump stroke.

The instructor shall provide an EXPLANATION and DEMONSTRATION of the complete skill.

The instructor shall also provide an EXPLANATION and DEMONSTRATION of each step required to effectively complete the skill.

A-CR-CCP-801/PF-001

UNLOADING THE CADET AIR RIFLE

Follow the unloading sequence of the cadet air rifle, to include:

UNLOAD

1. Pick up the air rifle.
2. Remove five-pellet clip (if used).
3. Open the bolt (do not insert a pellet).
4. Pump the air rifle, pausing for 3 seconds.
5. Close the bolt (do not insert a pellet).
6. Place the safety catch in the OFF position.
7. Aim the rifle at the target.
8. Squeeze the trigger.
9. Place the safety catch in the ON position.

PREPARE FOR INSPECTION

1. Open the bolt.
2. Open the pump handle slightly.
3. Place the rifle on shoulder, muzzle pointed down range.
4. Wait to be cleared by the RSO.
5. Lay the rifle down.

Cadets will IMITATE the demonstration provided by the instructor for each step within the skill. The instructor(s) will SUPERVISE the cadets during this imitation.

CONFIRMATION OF TEACHING POINT 4

The instructor will divide the group into two, or by the number of air rifles available. The instructor shall have one group imitate the actions of the sequence as demonstrated, while the remainder observe. Have them trade places, and repeat.

END OF LESSON CONFIRMATION

The instructor will divide the group into two, or by the number of air rifles available. The instructor shall have one group imitate the actions of the sequence for all teaching points as demonstrated, while the remainder observe, and then have them trade places, and repeat.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The first principle of marksmanship is to find a comfortable shooting position. A comfortable shooting position will enable cadets to shoot safely and with much better results. The prone position is the most stable shooting position to use.

INSTRUCTOR NOTES/REMARKS

1. Emphasis must be placed on the safety aspects of this lesson.
2. Ensure thorough confirmation by stages.

REFERENCES

A0-027 A-CR-CCP-177/PT-001 D Cdts 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Programme Reference Manual.* Ottawa, ON: Department of National Defence.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M203.01

A-CR-CCP-802/PG-001

EO M203.01 – DISCUSS LEADERSHIP WITHIN A PEER SETTING

1. **Performance.** Discuss Leadership Within a Peer Setting.

2. **Conditions**

   a. Given:

      (1) supervision; and

      (2) assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.

3. **Standard.** The cadet shall discuss leadership within a peer setting.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain leadership within a peer setting, to include: a. responsibilities of a Proficiency Level Two cadet, to include: (1) following the chain of command; (2) setting the example; (3) being firm, fair and friendly; (4) being respectful to superiors and subordinates; (5) being aware of safety hazards; (6) displaying initiative; and (7) setting goals; and b. squadron specific Proficiency Level Two cadet responsibilities.	Interactive Lecture	10 min	C0-134

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Interactive Lecture: 10 min

   c. Total: 15 min

6. **Substantiation.** An interactive lecture was chosen for TP1 to orient the cadets to junior leadership, to generate interest and present basic material.

7. **References.** C0-134 (ISBN 0-7852-7440-5) Maxwell, J. (1999). *The 21 Indispensable Qualities of a Leader: Becoming the Person Others Will Want to Follow*. Nashville, TN: Thomas Nelson Publishers.

8. **Training Aids.** Presentation aids (e.g. whiteboard/flipchart/OHP) appropriate for the classroom/training area.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** The list of responsibilities in TP1 is not exhaustive. For each squadron Proficiency Level Two cadet responsibilities may vary.

COMMON TRAINING

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 1

EO M203.01 – DISCUSS LEADERSHIP WITHIN A PEER SETTING

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

The list of responsibilities of Proficiency Level Two cadets will vary for each corps. Information about the specific responsibilities should be available in the corps Standing Orders or by speaking to the corps Commanding Officer/Training Officer.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to orient the cadets to leadership within a peer setting, to generate interest and to present basic material.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to discuss leadership within a peer setting.

IMPORTANCE

It is important for cadets to learn about leadership within a peer setting because there are responsibilities for second year cadets. Being aware of the responsibilities Proficiency Level Two cadets perform will assist them in setting achievable goals and adapting to their new role as leaders in the corps.

Teaching Point 1	**Explain Leadership Within a Peer Setting**
Time: 10 min	Method: Interactive Lecture

Within junior leadership, there are responsibilities for a Proficiency Level Two cadet at the squadron. To make the second year of cadets a fun, challenging and dynamic experience, second year cadets should know their responsibilities.

Have cadets brainstorm a list of what they think the responsibilities of a Proficiency Level Two cadet are. As you teach each of the following points, try to match them to the cadet generated list.

There are some responsibilities common to every Proficiency Level Two cadet in the corps. They are:

- **Following the Chain of Command.** Following the chain of command ensures that all information that must be passed up and down the chain is delivered. Following the chain of command prevents gaps in the information flow.
- **Setting the Example.** A Proficiency Level Two cadet must set a personal example in dress and deportment. A good leader will never ask more of their followers and teammates than they are willing to give themselves.
- **Being Firm, Fair and Friendly With Everyone, Especially New Recruits.** No one is impressed with a Proficiency Level Two cadet who yells, least of all new cadets. A highly influential and respected Proficiency Level Two cadet is one who is consistent in their approach to people and each situation. Being approachable at all times should enable the cadet to fulfill all duties and responsibilities in an effective manner.
- **Being Respectful to Superiors and Subordinates.** Using a proper tone of voice, looking people in the eyes when they speak and standing up straight is a physical way to show respect. If the Proficiency Level Two cadet wishes to be treated with respect, they must display respect toward others.
- **Being Aware of Safety Hazards.**
- **Displaying Initiative.** Undertaking small matters, like cleaning up, before being told to do so is an example of using initiative. Superiors notice when small tasks are completed without any request to do so.
- **Setting Goals.** Every leader needs to set goals. Goals allow people the opportunity to turn ideas into results. A goal is a glimpse of the future. Setting goals like improving their drill, dress and deportment, gives Proficiency Level Two cadets something to strive for. By setting goals, and working towards them, a Proficiency Level Two cadet will show commitment.

If the corps has no specific duties for Proficiency Level Two cadets, do not teach the following point.

There are specific responsibilities of a Proficiency Level Two cadet in this corps.

Explain the corps specific Proficiency Level Two cadet responsibilities.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. List the responsibilities of Proficiency Level Two cadets in the corps.

Q2. Why is setting goals important for a Proficiency Level Two cadet?

Q3. List the specific Proficiency Level Two cadet duties and responsibilities for your squadron.

ANTICIPATED ANSWERS

A1. The responsibilities of every Proficiency Level Two cadet in the squadron are:

- following the chain of command;
- setting the example;
- being firm, fair and friendly with everyone, especially new recruits;
- being respectful towards your superiors and subordinates;
- being aware of safety hazards;
- displaying initiative; and
- setting goals.

A2. By setting goals and working towards them, the Proficiency Level Two cadet will show commitment.

A3. Answers will vary.

END OF LESSON CONFIRMATION

The cadets' participation in TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

A-CR-CCP-802/PF-001

CLOSING STATEMENT

In order for a cadet to be successful in the role of a Proficiency Level Two, they must know their responsibilities. By setting personal short and long term goals, cadets have something to work toward and may be more motivated to complete the tasks ahead.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C0-134 (ISBN 0-7852-7440-5) Maxwell, J. (1999). *The 21 Indispensable Qualities of a Leader: Becoming the Person Others Will Want to Follow*. Nashville, TN: Thomas Nelson Publishers.

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TPS 1 AND 2 OF EO M129.01

A-CR-CCP-801/PG-001

EO M129.01 – RECITE THE PHONETIC ALPHABET

1. **Performance.** Recite the Phonetic Alphabet.
2. **Conditions**
   a. Given:
      (1) supervision; and
      (2) assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities to accommodate the entire group.
3. **Standard.** The cadet shall recite the phonetic alphabet and numbers.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Describe the phonetic alphabet from A to Z. Each letter is associated with a word that can be more easily understood over the radio.	Interactive Lecture	5 min	A3-001 (p. 205)
TP2	Identify the phonetic numbers from zero to nine. Explain that: a. numbers are always spoken as single digits, except for whole thousands; and b. symbols are spoken out as words over the radio, for example, the word "decimal" is used where there is a number with a decimal point.	Interactive Lecture	5 min	A3-001 (p. 205)

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. Interactive Lecture: 10 min
   c. Total: 15 min
6. **Substantiation.** The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.
7. **References.** A3-001 A-CR-CCP-263/PT-001 *From the Ground Up: Millennium Edition.* (2000). Ottawa, ON: Aviation Publishers Co. Limited.
8. **Training Aids.** Presentation aids (i.e. whiteboard/flipchart/OHP/multimedia projector) appropriate for classroom/training area.
9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

EO M129.01 – RECITE THE PHONETIC ALPHABET

Total Time: 15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching points for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have recited the phonetic alphabet.

IMPORTANCE

It is important to know how to properly say the alphabet and numbers while communicating over a radio. This knowledge will help avoid confusion through the pronunciation of letters and numbers and the misinterpretation of messages. Cadets can use this information during flying and aircrew survival training.

A-CR-CCP-801/PF-001

Teaching Point 1 | **Describe the Phonetic Alphabet**

Time: 5 min | Method: Interactive Lecture

PHONETIC ALPHABET

The phonetic alphabet is used because letters that sound similar might be confused when said over a radio. An example of similar sounding letters is "**M**" and "**N**". Therefore, each letter of the alphabet is associated with a word that is easily understood over the radio.

The phonetic alphabet is as follows:

- A – Alpha
- B – Bravo
- C – Charlie
- D – Delta
- E – Echo
- F – Foxtrot
- G – Golf
- H – Hotel
- I – India
- J – Juliet
- K – Kilo
- L – Lima
- M – Mike
- N – November
- O – Oscar
- P – Papa
- Q – Quebec
- R – Romeo
- S – Sierra
- T – Tango
- U – Uniform
- V – Victor
- W – Whiskey
- X – X-ray

- Y – Yankee
- Z – Zulu

Use of the phonetic alphabet can be heard on a familiarization flight when the pilot communicates the aircraft's call letters to the tower.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why is the phonetic alphabet used?

Q2. How is "Y" pronounced using the phonetic alphabet?

Q3. How is "H" pronounced using the phonetic alphabet?

ANTICIPATED ANSWERS

A1. To avoid confusion between letters that sound alike.

A2. Yankee.

A3. Hotel.

Teaching Point 2	**Identify the Phonetic Numbers**
Time: 5 min	Method: Interactive Lecture

PHONETIC NUMBERS

Phonetic numbers are used to avoid misunderstandings when using radio communication. Numbers are enunciated in the following manner:

- 0 – Zee-ro
- 1 – Wun
- 2 – Too
- 3 – Tree
- 4 – Fow-er
- 5 – Fife
- 6 – Six
- 7 – Seven
- 8 – Ait
- 9 – Nin-er

Numbers are always spoken as single digits, except for whole thousands. For example, 5280 would be spoken "fife too ait zee-ro" and 5000 would be spoken "fife tou-sand."

Symbols are spoken out as words over the radio; e.g. the word decimal, pronounced "day-see-mal", is used where there is a number with a decimal point.

A-CR-CCP-801/PF-001

Air traffic controllers use phonetic numbers to communicate to pilots what runway to use when taking off and landing.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How is the number one pronounced?

Q2. How is the number four pronounced?

Q3. How is 1289 pronounced?

ANTICIPATED ANSWERS

A1. Wun.

A2. Fow-er.

A3. Wun too ait nin-er.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. How is the letter N pronounced?

Q2. How is the letter U pronounced?

Q3. How is the number four pronounced?

Q4. How is 629.03 pronounced?

ANTICIPATED ANSWERS

A1. November.

A2. Uniform.

A3. Fow-er.

A4. Six too nin-er day-see-mal zee-ro tree.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowledge of the proper way to use the alphabet and numbers is essential to ensure radio messages are transmitted and understood properly. This knowledge ensures the proper use of voice procedures during flying training and aircrew survival training.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT001, *From the Ground Up: Millennium Edition* (2000). Ottawa, ON: Aviation Publishers.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 3 OF EO M129.01

A-CR-CCP-801/PG-001

EO M129.01 – RECITE THE PHONETIC ALPHABET

1. **Performance.** Recite the Phonetic Alphabet.
2. **Conditions**
   a. Given:
      (1) supervision; and
      (2) assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities to accommodate the entire group.
3. **Standard.** The cadet shall recite the phonetic alphabet and numbers.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Conduct an activity where the cadets are required to spell their name phonetically.	In-class Activity	10 min	A3-001 (p. 205)

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	In-class Activity:	10 min
c.	Total:	15 min

6. **Substantiation.** The in-class activity was selected to allow for maximum participation in the learning process. It is an interactive way to illustrate and substantiate the lesson material in a concrete manner.
7. **References.** A3-001 A-CR-CCP-263/PT-001 *From the Ground Up: Millennium Edition*. (2000). Ottawa, ON: Aviation Publishers Co. Limited.
8. **Training Aids.** Presentation aids (i.e. whiteboard/flipchart/OHP/multimedia projector) appropriate for classroom/training area.
9. **Learning Aids.** N/A.
10. **Test Details.** N/A.
11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

EO M129.01 – RECITE THE PHONETIC ALPHABET

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in Chapter 4 of the QSP. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The in-class activity was selected to allow for maximum participation in the learning process. It is an interactive way to illustrate and substantiate the lesson material in a concrete manner.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall recited the phonetic alphabet.

IMPORTANCE

It is important to know how to properly say the alphabet and numbers while communicating over a radio. This knowledge will help avoid confusion through the pronunciation of letters and numbers and the misinterpretation of messages. Cadets can use this information during flying and aircrew survival training.

Teaching Point 1 | **Conduct an Activity Where the Cadets are Required to Spell Their Name Phonetically**

Time: 10 min | Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for cadets to spell out their name using the phonetic alphabet.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the class into two teams.
2. Have a cadet spell their first name using the phonetic alphabet.
3. Each cadet that spells their name correctly receives one point for their team.
4. Alternate between teams.
5. Repeat step 2 and 3.
6. Once every cadet has gone, have each cadet spell their last name using the phonetic alphabet.
7. Have each cadet a number to pronounce as well.
8. The team with the most points wins the game.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the in-class activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the in-class activity will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowledge of the proper way to use the alphabet and numbers is essential to ensure radio messages are transmitted and understood properly. This knowledge ensures the proper use of voice procedures during flying training and aircrew survival training.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT001, *From the Ground Up: Millennium Edition* (2000). Ottawa, ON: Aviation Publishers.

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M130.02

A-CR-CCP-801/PG-001

EO M130.02 – DESCRIBE THE MAIN COMPONENTS OF AN AIRPLANE

1. **Performance.** Describe the Main Components of an Airplane.
2. **Conditions**
   a. Given:
      (1) supervision; and
      (2) assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities/training facilities to accommodate the entire group.
3. **Standard.** The cadets shall identify and describe the five major components of an airplane, to include:
   a. fuselage;
   b. wings;
   c. empennage;
   d. landing gear; and
   e. propulsion system.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Identify and explain the components of an airplane, to include: a. fuselage; b. wings; c. empannage; d. landing gear; and e. propulsion system.	Interactive Lecture	10 min	A3-001 (p. 9-13)

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. Interactive Lecture: 10 min
   c. Total: 15 min
6. **Substantiation.** The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.
7. **References.** A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition.* (2000). Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids.** Presentation aids (i.e. whiteboards/flipcharts/OHP/multimedia projector) appropriate for classroom/training area.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 2

EO M130.02 – DESCRIBE THE MAIN COMPONENTS OF AN AIRCRAFT

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in Chapter 4 of the QSP. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

Photocopy the handout Figure 12A-1 Components of an Airplane for each cadet, located at the end of this document.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to describe the main components of an airplane.

IMPORTANCE

A basic understanding of the components of an airplane will provide a foundation for further aviation topics. It will create a familiarity with airplanes that will contribute to the cadets' appreciation of the familiarization of flying and aviation tour experiences.

Teaching Point 1	**Identify and Explain the Main Components of an Airplane**
Time: 10 min	Method: Interactive Lecture

MAIN COMPONENTS OF AN AIRPLANE

There are five main components of an airplane.

Fuselage. The body of the aircraft, designed to accommodate the crew, passengers and cargo. The cockpit or crew flight deck is the part of the fuselage where the pilot and flight crew operate the aircraft. The fuselage is the structural body to which the wings, the tail section, landing gear and (in most small aircraft) the engine are attached.

Wings. Fitted to the fuselage on both sides. The primary purpose of the wings is to support the aircraft in flight by producing lift. The wing root is where the wing meets the fuselage. The wing tip is the part farthest from the fuselage. The leading edge is the front edge of the wing running from wing root to wing tip. The trailing edge is the back edge of the wing running from wing root to wing tip.

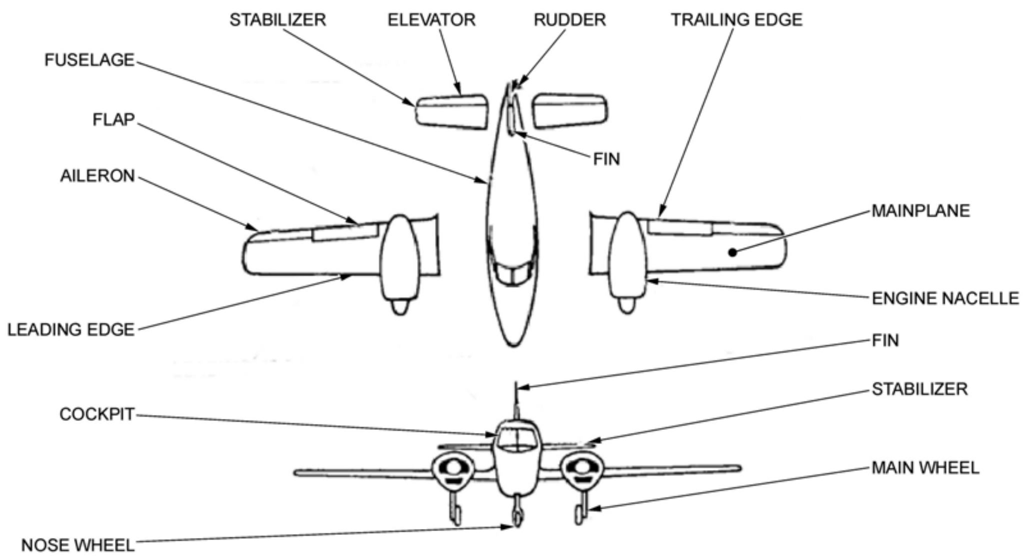
Empennage. Refers to the whole tail section of a plane. It includes the horizontal stabilizer, elevator, vertical stabilizer, and rudder. The horizontal stabilizer is at the back of the aircraft, and helps keep the aircraft stable as it flies through the air. The elevator is hinged to the horizontal stabilizer and is operated by moving the control column forward and backward controlling pitch. The vertical stabilizer, also called the fin, is an upright surface on the empennage. The rudder is hinged to the fin and is operated by the rudder pedals in the cockpit. The rudder controls yaw.

Landing gear. Supports the aircraft when it is on the ground and absorbs the shock of landing. All aircraft have their landing gear under the main part of the fuselage or wings. Landing gear can be fixed or retractable. Fixed gear is attached to the airplane in a permanent position. Retractable gear can fold up into the wings or the fuselage.

Propulsion. Produced by an internal combustion engine with a two or three bladed propeller or a gas turbine (jet) engine. A jet can be used to power a propeller – this is called a turboprop engine.

The cowling (also called the nacelle) encloses the engine and streamlines the airplane to reduce drag. The cowling provides cooling of the engine by ducting cool air around the engine.

Distribute the handout of Figure 12A-1 Components of an Airplane, located at the end of this document.



Level 1 Royal Canadian Air Cadet Handbook – A-CR-CCP-266/PT-001

Figure 12-2-1 Airplane Components

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the fuselage?

Q2. What is the primary purpose of the wings?

Q3. Name the five main components of an airplane.

ANTICIPATED ANSWERS

A1. The body of the aircraft, designed to accommodate the crew, passengers and cargo.

A2. To support the aircraft in flight by producing lift.

A3. Fuselage, wings, empennage, landing gear and propulsion system.

END OF LESSON CONFIRMATION

The questions for TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to describe the main components of an airplane will give cadets the knowledge needed to appreciate and successfully participate in further aviation topics.

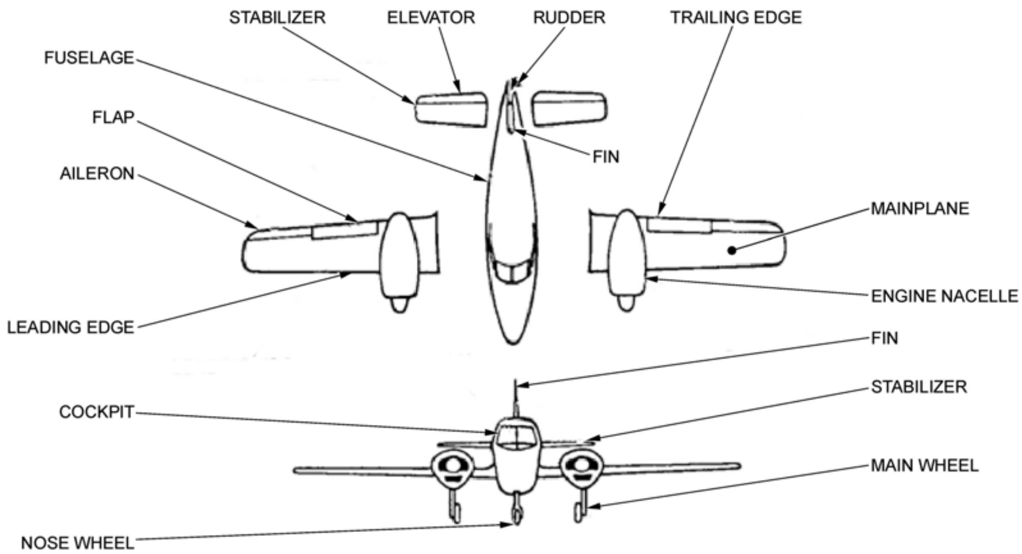
INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT-001 *From the Ground Up: Millennium Edition (28th Edition)*. (2000). Ottawa, ON: Aviation Publishers.

COMPONENTS OF AN AIRPLANE



Level 1 Royal Canadian Air Cadet Handbook – A-CR-CCP-266/PT-001

Figure 12A-1 Components of an Airplane

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M160.01

A-CR-CCP-801/PG-001

EO M160.01 – IDENTIFY MAJOR AERODROME COMPONENTS

1. **Performance.** Identify Major Aerodrome Components.
2. **Conditions**
   a. Given:
      (1) supervision; and
      (2) assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom/training facilities to accommodate the entire group.
3. **Standard.** The cadets shall identify the major components of an aerodrome, to include:
   a. runway;
   b. taxiway;
   c. hangars;
   d. ramp areas;
   e. control towers;
   f. terminal buildings;
   g. wind socks; and
   h. flying schools.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Identify and explain the components of an aerodrome, to include: a. runway, b. taxiway, c. ramp area, d. hangar, e. control tower, f. terminal building, g. wind sock, and h. flying school.	Interactive Lecture	10 min	A3-001 (pp. 91-93 and 213) C2-002

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. Interactive Lecture: 10 min
   c. Total: 15 min

A-CR-CCP-801/PG-001

6. **Substantiation.** The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

7. **References.** A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition.* (2000). Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids.** Presentation aids (i.e. whiteboard/flipcharts/OHP/multimedia projector) appropriate for classroom/training area.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 1

EO M160.01 – IDENTIFY MAJOR AERODROME COMPONENTS

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in Chapter 4 of the QSP. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify major aerodrome components.

IMPORTANCE

It is important for cadets to know the various components of an aerodrome. This information will assist them in identifying the components during aerodrome tours and familiarization flights.

Teaching Point 1	**Identify and Explain the Components of an Aerodrome**
Time: 10 min	Method: Interactive Lecture

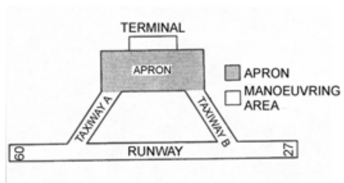
COMPONENTS OF AN AERODROME

There are nine main components of an aerodrome.

Runway. The area where aircraft take off and land. A runway may be made of pavement, grass, gravel, dirt or snow among other materials. Runways are identified by numbers and by the white lights that run along each side.

Taxiway. The area used by an aircraft to manoeuvre around the aerodrome between aprons and runways. Letters normally designates taxiways. At aerodromes with lighting, taxiways are defined by blue lights along each side.

Ramp Area. The part of an aerodrome intended to accommodate the loading and unloading of passengers and cargo. It is also the area used for refuelling, servicing and parking of aircraft. The ramp area is also known as the tarmac or apron.



Royal Canadian Air Cadet Manual, Proficiency Level One Handbook, Cadets Canada, 1998

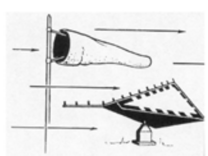
Figure 14-1-1 Aerodrome Movement Areas

Hangar. An aerodrome building that is used for storage, protection and maintenance of aircraft.

Control tower. Ensures the safe and efficient movement of aircraft. The air traffic controllers in the control tower are responsible for a number of procedures. These include take off / landing procedures, circuit procedures and ground manoeuvring of aircraft. Not all aerodromes have the service of a control tower.

Terminal building. Used for passengers arriving and departing. They are also used for baggage and cargo handling. Terminal buildings are normally located on the apron.

Windsock. Used by pilots to determine wind direction and speed. The approximate wind speed is indicated by the amount the windsock is extended. Every aerodromes have at least one windsock or wind-t. The wind-t is designed like an arrow whose small end points into the wind. They are found on the airfield, normally beside the runway.



From the Ground Up : Millennium Edition, A.F. MacDonald, 2000

Figure 14-1-2 Windsock and Wind T

Flying School. Used as training facilities for current pilots and those that wish to pursue a career in aviation.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the purpose of a taxiway?

Q2. What is the purpose of a hangar?

Q3. What is the purpose of a windsock?

ANTICIPATED ANSWERS

A1. To manoeuvre around the aerodrome between aprons and runways.

A2. An aerodrome building that is used for storage, protection and maintenance of aircraft.

A3. Used by pilots to determine wind direction and speed.

END OF LESSON CONFIRMATION

The questions from TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The various areas of an aerodrome serve different purposes. As cadets, knowing the various components of an aerodrome will assist in identifying the components during tours and familiarization flights.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition* (2000). Ottawa, ON: Aviation Publishers Co. Limited.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TPS 1 AND 2 OF EO M160.02

A-CR-CCP-801/PG-001

EO M160.02 – IDENTIFY FEATURES OF A RUNWAY

1. **Performance.** Identify Features of a Runway.

2. **Conditions**

   a. Given:

      (1) supervision; and

      (2) assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities to accommodate the entire group.

3. **Standard.** The cadet shall identify features of a runway, to include:

   a. runway lights; and

   b. runway numbering.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Identify and explain runway lights, to include that different coloured lights identify different parts of the runway.	Interactive Lecture	5 min	A3-001 (p. 93)
TP2	Identify and explain runway numbering.	Interactive Lecture	5 min	A3-001 (p. 91)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Interactive Lecture: 10 min

   c. Total: 15 min

6. **Substantiation.** The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature.

7. **References.** A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition.* (2000). Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids.** Presentation aids (i.e. whiteboard/flipchart/OHP/multimedia projector) appropriate for classroom/training area.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 2

EO M160.02 – IDENTIFY FEATURES OF A RUNWAY

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in Chapter 4 of the QSP. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content, and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The interactive lecture method was chosen as it allows the instructor to make a semi-formal presentation of the material where the cadets can participate by asking or responding to questions and commenting on the material. For this lesson, this method is most effective as it matches well the taxonomic level of the material and is age-appropriate by virtue of its participatory nature

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify features of a runway.

IMPORTANCE

It is important for cadets to understand the features of a runway as it will be helpful during tours and familiarization flights. The various features of runways will be referred to in future aviation lessons at the squadron and the CSTC. In the aviation industry, pilots and air traffic controllers require this information to perform their jobs.

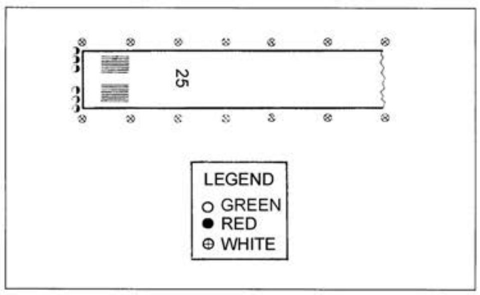
Teaching Point 1 — **Identify and Explain Runway Lights**

Time: 5 min — Method: Interactive Lecture

Create a large runway on the floor, whiteboard or flipchart.

RUNWAY LIGHTS

Runways are lined down both sides by white lights. These lights are used to define the overall area of the runway on each side. Runways also contain red/green lights at the ends. These lights are double sided with red on one side and green on the other. As seen for the pilot's perspective, the red side of the lights faces toward the runway and indicates the end of the runway. The green side faces away from the runway and shows the beginning of the runway to aircraft that are landing.



Royal Canadian Air Cadet Manual, Proficiency Level One Handbook, Cadets Canada, 1998

Figure 14-2-1 Runway Lights

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What colour lights define the runway on each side?

Q2. What is the importance of the red lights?

Q3. What is the importance of the green lights?

ANTICIPATED ANSWERS

A1. White lights.

A2. Red lights indicate the end of the runway.

A3. Green lights indicate the beginning of the runway.

Teaching Point 2	**Identify and Explain Runway Numbering**
Time: 5 min	Method: Interactive Lecture

RUNWAY NUMBERING

The runway number is always indicated in large print as a two-digit number at the end of the runway. Runways are numbered according to their magnetic direction and are rounded off to the nearest ten degrees. Once rounded, the hundreds and tens digits are used to number the runway. For example, a runway that points in the direction of 266 degrees magnetic would be numbered 27. Therefore, the highest runway number possible is 36 (360 degrees).

When runways run parallel, they are designated left or right (e.g. 27L and 27R). The runway number is displayed at the approach end of each runway. A single runway would, therefore, have different numbers at each of its two ends. These numbers would be 180 degrees apart. For example, runway 09 would be numbered 27 at the other end.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. On what basis are runways numbered?

Q2. If a runway points in the direction of 176 degrees magnetic, how would it be numbered?

Q3. If a runway points in the direction of 43 degrees magnetic, how would it be numbered?

ANTICIPATED ANSWERS

A1. Their magnetic direction.

A2. 18 (Round 176 to 180, and use only the hundreds and tens digits).

A3. 04 (Round 43 to 40, and use only the hundreds and tens digits).

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What colour lights define the runway on each side?

Q2. If a runway points in the direction of 241 degrees magnetic, how would it be numbered?

Q3. If a runway points in the direction of 358 degrees magnetic, how would it be numbered?

ANTICIPATED ANSWERS

A1. White lights.

A2. 24 (Round 241 to 240, and use only the hundreds and tens digits).

A3. 36 (Round 358 to 360, and use only the hundreds and tens digits).

A-CR-CCP-801/PF-001

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being familiar with the various features of runways can assist cadets in a number of areas of their training. Understanding the features of a runway enhances cadet knowledge of aerodrome components and gives further insight into the runways' role with respect to take-off and landing procedures of aircraft.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition* (2000). Ottawa, ON: Aviation Publishers Co. Limited.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TPS 4 AND 5 OF EO M230.01

A-CR-CCP-802/PG-001

EO M230.01 – DISCUSS AIRCRAFT FLOWN WWII

1. **Performance.** Discuss Aircraft Flown During WWII.
2. **Conditions**
   a. Given:
      (1) Supervision; and
      (2) Assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities/training facilities large enough to accommodate the entire group.
3. **Standard.** The cadet shall discuss aircraft flown during the Battle of Britain.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Discuss the importance of the Battle of Britain, to include: a. the duration of the battle fought from August 8, 1940–October 31, 1940; and b. the battle between the Allied Forces and Axis powers.	Interactive Lecture	5 min	C3-078
TP2	Discuss the aircraft flown during the Battle of Britain, to include: a. the Hawker Hurricane Mark 1; and b. the Spitfire Mark 1.	Interactive Lecture	5 min	C3-078

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. Interactive Lecture: 10 min
   c. Total: 15 min
6. **Substantiation.** An interactive lecture was chosen for this lesson to present background material to the cadets and promote an interest in aircraft flown during WWII.
7. **References.** C3-078 Canadian War Museum. (2004). *The Invasion Threat to Britain and the Battle of Britain, 1940.* Retrieved 16 February 2007, from http://www.warmuseum.ca/cwm/newspapers/operations/Britain_e.html.
8. **Training Aids.** Presentation aids (e.g. whiteboard/flipchart/OHP/multimedia projector) appropriate for the classroom/training area.
9. **Learning Aids.** N/A.

10. **Test Details.** N/A.
11. **Remarks.** N/A.

A-CR-CCP-802/PF-001

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 1

EO M230.01 – DISCUSS AIRCRAFT FLOWN DURING WWII

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts at Figure 10A-5 The Hawker Mark 1 Hurricane and Figure 10A-6 The Spitfire for each cadet, located at the end of this document.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to present background material to the cadets and to promote an interest in aircraft flown during WWII.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to discuss aircraft flown during WWII.

IMPORTANCE

It is important for cadets to know about the aircraft flown in WWII so that they can better understand Canada's role during these conflicts and to commemorate the fallen men and women who gave their lives during these conflicts.

A-CR-CCP-802/PF-001

Teaching Point 1	Discuss the Importance of the Battle of Britain
Time: 5 min	Method: Interactive Lecture

THE BATTLE OF BRITAIN

The Battle of Britain was fought from August 8, 1940 until October 31, 1940.

The Battle of Britain was the first major battle to be fought wholly in the air, with both sides having roughly the same number of fighter aircraft.

It was the largest and most sustained bombing campaign yet attempted and the first real test of the strategic bombing theories that had emerged since the previous World War.

Duration of the Battle of Britain

The battle can be roughly divided into four phases:

- July 10–August 11: Kanalkampf, the Channel battles,
- August 8–August 23: Adlerangriff, the early assault against the coastal airfields,
- August 24–September 6: the Luftwaffe targets the airfields – the critical phase of the battle;
- September 7 onward: the day attacks switch to British towns and cities.

The Battle of Britain marked the first time that the Nazis were stopped and that air superiority became clearly seen as the key to the war. Though the battle was small in the number of combatants and casualties, had the Germans won, the war would have taken a very different path.

The British victory marked the first failure of Hitler's war machine.

The Royal Air Force lost 375 pilots and 358 pilots were wounded.

ALLIED FORCES AND AXIS POWERS

The Battle of Britain was between the United Kingdom and Germany and Italy.

The Battle of Britain is the name commonly given to the attempt by the German Luftwaffe, as part of German Blitzkrieg tactics, to gain air superiority over the Royal Air Force (RAF), before a planned sea and airborne invasion of Britain (Operation Sealion).

Neither Hitler nor the German Wehrmacht believed it possible to carry out a successful amphibious assault on the British Isles until the RAF had been neutralized.

Secondary objectives were to destroy aircraft production and ground infrastructure, to attack areas of political significance, and to terrorize the British people with the intent of intimidating them into seeking an armistice or surrender.

The RAF roll of honour for the Battle of Britain recognizes 510 overseas pilots as flying at least one authorized operational mission with an eligible unit of the Royal Air Force or Fleet Air Arm between July 10 and October 31, 1940. This included pilots from Poland, New Zealand, Canada, Czechoslovakia, Belgium, Australia, South Africa, France, Ireland, the United States of America, Jamaica, Palestine and Southern Rhodesia (Zimbabwe).

The highest scoring unit during the Battle of Britain is remarkably the No. 303 Polish Fighter Squadron.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What were the dates of the Battle of Britain?

Q2. Who was the battle between?

Q3. What were two of the other countries involved in the Battle of Britain?

ANTICIPATED ANSWERS

A1. The Battle of Britain was fought from August 8, 1940 until October 31, 1940.

A2. The Battle of Britain was between the Allied Forces and Axis powers.

A3. Poland, New Zealand, Canada, Czechoslovakia, Belgium, Australia, South Africa, France, Ireland, the United States of America, Jamaica, Palestine and Southern Rhodesia (Zimbabwe).

Teaching Point 2	**Discuss the Aircraft Flown During the Battle of Britain**
Time: 5 min	Method: Interactive Lecture

Distribute handouts to the cadets of Figure 10A-5 The Hawker Mark 1 Hurricane, located at the end of this document.

HAWKER HURRICANE MARK I

- The Hawker Hurricane Mark I was a single-seater fighter with a Rolls-Royce Merlin engine.
- It was a low-wing all-metal cantilever monoplane armed with eight Browning machine-guns – four in each wing set to fire forward outside the airscrew disc.
- The maximum speed was 539 km/h.
- The Hurricane was regarded as less 'twitchy' than the Spitfire and provided a more stable gun platform.
- The RAF's preferred tactic was, if possible, to deploy the Hurricane's awesome fire power against formations of less-agile bombers and to set up the Spitfires against fighter escorts waiting to pounce from a higher altitude.

Distribute handouts to the cadets of Figure 10A-6 The Spitfire, located at the end of this document.

THE SPITFIRE MARK 1

- The Spitfire Mark 1 was a similar single-seater fighter with a Rolls-Royce Merlin engine.
- It was a low-wing all-metal cantilever monoplane armed with eight Browning machine-guns – four in each wing set to fire forward outside the airscrew disc.

A-CR-CCP-802/PF-001

The Spitfire's one-piece sliding moulded canopy gave the best visibility, the pilot having a better chance of spotting an enemy.

The maximum speed was 589 km/h.

QUALITIES OF BOTH AIRCRAFTS

In both these aircrafts the armour in the front and back protected the pilot.

The Spitfire and Hurricane would out-turn the Bf-109E or Emil (German Aircraft) because the Bf-109 pilots were afraid to push the plane to its limits due to the fact that the Bf-109 did not give the pilot any warning that it was going to stall, unlike the Spitfire and Hurricane, which gave the pilot plenty of warning that the plane was about to stall by shaking violently.

Both the Spitfire and Hurricane were slower in a power dive and had the drawback of being equipped with a float-type carburetor, which cut out under negative g-forces.

Both the RAF fighters were easy to fly and forgiving with both rough handling and novice pilots.

The Hurricane was a superbly steady gun platform and the closely clustered .303 machine guns in each wing proved very destructive.

A drawback to the Hurricane was the presence of a fuel tank just behind the cockpit firewall, which could catch fire and within a few seconds severely burn the pilot before he managed to bail out.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What was the maximum speed of the Hawker Hurricane?

Q2. What was the maximum speed of the Spitfire Mark 1?

Q3. What was a drawback to the Hurricane?

ANTICIPATED ANSWERS

A1. The maximum speed of the Hawker Hurricane was 539 km/h.

A2. The maximum speed of the Spitfire Mark 1 was 589 km/h.

A3. A drawback to the Hurricane was the presence of a fuel tank just behind the cockpit firewall, which could catch fire and within a few seconds severely burn the pilot before he managed to bail out.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What were the dates of the Battle of Britain?

Q2. Who was the battle between?

Q3. Name two Allied aircraft flown during the Battle of Britain.

ANTICIPATED ANSWERS

A1. The Battle of Britain was fought from August 8, 1940 until October 31, 1940.

A2. The Battle of Britain was between the Allied Forces and Axis powers.

A3. Hawker Hurricane and Spitfire Mark 1.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for cadets to know about the aircraft flown in WWII so that they can better understand Canada's role during these conflicts. Learning about Canada's aviation history may assist the cadets in understanding the meaning of the parades used to commemorate the fallen men and women who gave their lives during these conflicts.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-078 Canadian War Museum. (2004). *The Invasion Threat to Britain and the Battle of Britain, 1940.* Retrieved 16 February 2007, from http://www.warmuseum.ca/cwm/newspapers/operations/Britain_e.html.

AIRCRAFT FLOWN DURING WWII

Department of National Defence. (2006). Canadian Forces Aircraft. Retrieved 20 March 2007, from http://www.airforce.forces.gc.ca/equip/grfx/equip_gallery/historic_gallery/wallpaper/harvarda9.jpg

Figure 10A-5 The Hawker Mark 1 Hurricane

Department of National Defence. (2006). Canadian Forces Aircraft. Retrieved 20 March 2007, from http://www.airforce.forces.gc.ca/equip/historical/spitfirelst_e.asp

Figure 10A-6 The Spitfire

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 3 OF EO M231.02

A-CR-CCP-802/PG-001

EO M231.02 – DESCRIBE THE PRODUCTION OF LIFT BY AN AIRCRAFT WING

1. **Performance.** Describe the Production of Lift by an Aircraft Wing.
2. **Conditions**
   a. Given:
      (1) Supervision; and
      (2) Assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.
3. **Standard.** The cadet shall describe the production of lift by an aircraft wing, to include:
   a. the airfoil camber; and
   b. angle of attack.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain that air acts like a fluid insofar as it has: a. speed; and b. pressure. Have the cadets explore Bernoulli's Principle by blowing over a curved sheet of paper.	In-class Activity	10 min	C3-017 (p. 18) C3-116 (p. 21, p. 26)

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. In-class Activity: 10 min
   c. Total: 15 min
6. **Substantiation.** An in-class activity was chosen for TP1 as it is an interactive way to provoke thought and stimulate interest among cadets.
7. **References**
   a. C3-017 (ISBN 1-895569-23-0) Schmidt, N. (1998). *Fabulous Paper Gliders.* New York, NY: Sterling Publishing.
   b. C3-116 A-CR-CCP-263/PT-001 (ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.
8. **Training Aids**
   a. Presentation aids (e.g. whiteboard/flipchart/OHP/multimedia projector) appropriate for the classroom/training area;
   b. 8.5 x 11 in paper.

9. **Learning Aids.** 8.5 x 11 in paper.
10. **Test Details.** N/A.
11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 2

EO M231.02 – DESCRIBE THE PRODUCTION OF LIFT BY AN AIRCRAFT WING

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handout for each cadet of Figure 11D-2 Creating Lift, located at the end of this document.

Gather resources needed for the in-class activity in TP1.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP1 as it is an interactive way to provoke thought and stimulate interest among cadets.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to describe the production of lift by an aircraft wing.

IMPORTANCE

It is important for cadets to learn about the production of lift by an aircraft wing so that they can develop an understanding of subsequent and related principles of flight.

Teaching Point 1	**Explain That Air Acts Like a Fluid**
Time: 10 min	Method: In-Class Activity

AIR ACTS LIKE A FLUID

Air behaves like a fluid since it has pressure and speed. As airspeed increases, its pressure drops. A wing uses principle to deflect air, which causes an equal and opposite reaction.

The pressure of moving air can be examined by blowing gently over a small piece of curved paper. The air does not push the paper down as might be intuitively assumed. Instead, the paper behind the curve rises toward the moving air. This happens because the air pressure drops over the paper due to the air's increased speed—this would seem to match the description of speed/pressure relationship. The curvature in the paper enhances the effect of the lowered air pressure.

Distribute handout of Figure 11D-2 – Creating Lift located at the end of this document.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets reduce the air pressure over a sheet of paper and observe the results.

RESOURCES

- Paper 8 1/2 x 11, and
- Pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Tear a sheet of paper 8 1/2 x 11 vertically, into two pieces.
2. Curve one end of the sheet gently over a pencil as shown in Figure 11D-2.
3. Blow gently over the paper as shown in Figure 11D-2.
4. Observe that the paper rises into the moving air.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why does air behave like a fluid?

Q2. Why does the paper airfoil rise when a cadet blows over it?

Q3. Why was the paper deliberately curved before blowing over it?

ANTICIPATED ANSWERS

A1. It has speed and pressure.

A2. Air pressure over the paper drops as the air moves, so the still air below the paper pushes it up.

A3. The curvature in the paper enhances the effect of the lowered air pressure.

END OF LESSON CONFIRMATION

The cadet's participation in the in-class activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

There are other methods of producing lift, such as rocketry, but airfoils are by far the most common, not just because of their elegance, but because they are best suited to prolonged horizontal flight.

INSTRUCTOR NOTES/REMARKS

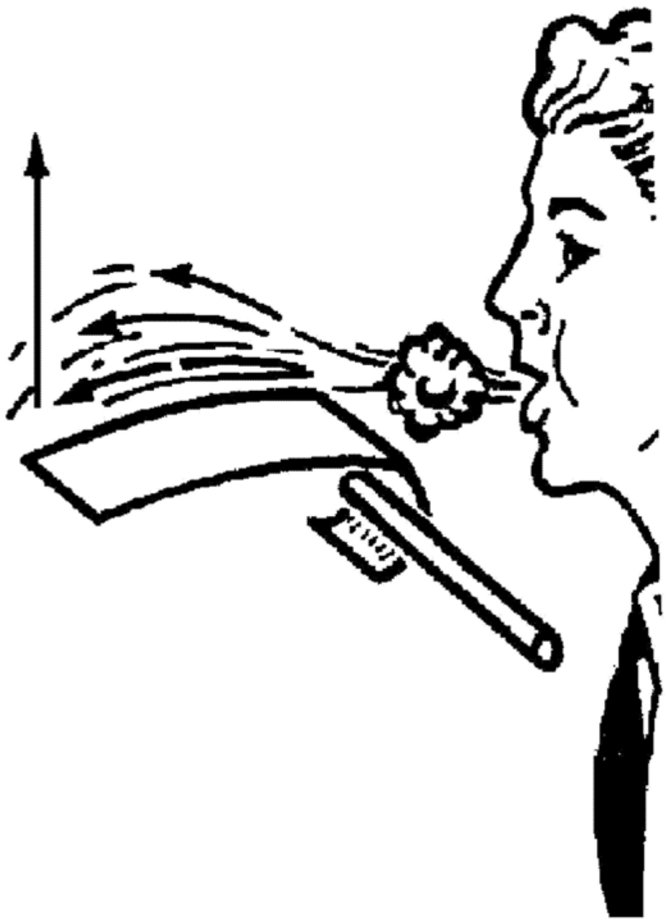
N/A.

REFERENCES

C3-017 (ISBN 1-895569-23-0) Schmidt, N. (1998). *Fabulous Paper Gliders.* New York, NY: Sterling Publishing.

C3-116 A-CR-CCP-263/PT-001/(ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

CREATING LIFT



Cadets Canada: RCSU Pacific, 2007, Air Cadet Master Lesson Plans. Retrieved 7 March 2007, from http://www.regions.cadets.ca/pac/aircad/resources/mlp_air_e.asp

Figure 11D-2 Creating Lift

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TPS 1 AND 2 OF EO M231.04

A-CR-CCP-802/PG-001

EO M231.04 – DESCRIBE THE AXIAL MOVEMENTS OF AN AIRCRAFT

1. **Performance.** Describe the Axial Movements of an Aircraft.

2. **Conditions**

   a. Given:

      (1) Supervision; and

      (2) Assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.

3. **Standard.** In accordance with specified references, the cadet shall describe the axial movements of an aircraft, to include:

   a. the three axes of an aircraft; and

   b. the three corresponding axial movements.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain that aircraft operate in a three-dimensional space. Identify the three axes of aircraft movement, to include: a. the longitudinal axis; b. the lateral axis; and c. the vertical axis.	Interactive Lecture	5 min	C3-116 (p. 30)
TP2	Using a model aircraft, describe the three movements that aircraft make around their three axes, to include: a. roll about the longitudinal axis; b. pitch about the lateral axis; and c. yaw about the vertical axis.	Interactive Lecture	10 min	C3-116 (p. 30) C3-017 (p. 22)

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	Interactive Lecture:	10 min
c.	Total:	15 min

6. **Substantiation.** An interactive lecture was chosen for this lesson to introduce the subject of axial movement of an aircraft and give an overview of it.

7. **References**

   a. C3-017 (ISBN 1-895569-23-0) Schmidt, N. (1998). *Fabulous Paper Gliders*. New York, NY: Sterling Publishing.

   b. C3-116 A-CR-CCP-263/PT-001 (ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids**

   a. Presentation aids (e.g. whiteboard/flipchart/OHP/multimedia projector) appropriate for the classroom/training area; and

   b. Model of a light fixed-wing aircraft with wing struts, fixed gear and control surface detail.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 4

EO M231.04 – DESCRIBE THE AXIAL MOVEMENTS OF AN AIRCRAFT

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handouts of Figure 11K-1 Axes of an Aircraft for each cadet, located at the end of this document.

Obtain a model of a light fixed-wing aircraft with wing struts, fixed gear and control surface detail.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the subject of axial movement and give an overview of it.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify the three axes of an aircraft and describe an aircraft's movement about them.

IMPORTANCE

It is important for cadets to learn about aircraft axes and axial movement so that they can understand subsequent and related principles of flight.

Teaching Point 1	**Identify the Three Axes of Aircraft Movement**
Time: 5 min	Method: Interactive Lecture

Aircraft operate in a three-dimensional space so there are three corresponding ways they can turn. Each of the three possibilities has an associated axis of motion:

- the longitudinal axis,
- the lateral axis, and
- the vertical axis.

> Distribute handouts of aircraft axes in Figure 11K-1 Axes of an Aircraft, located at the end of this document.

When an aircraft is airborne, it can move in almost any direction. All movement of the aircraft takes place around the centre of gravity. This is the aircraft's balance point, or point through which all weight acts downwards.

> The centre of gravity is the point where the three axes intersect.

To clarify the ways that aircraft can move in flight, the aircraft is said to move around an axis. This is an imaginary line running through the centre of gravity of the aircraft and around which the aircraft rotates.

There are three such axes and the aircraft may rotate around one, two or all three axes at the same time. They are the longitudinal axis, the lateral axis, and the vertical axis:

- The longitudinal axis runs lengthwise through the fuselage from the nose to the tail and passes through the centre of gravity.
- The lateral axis runs from wingtip to wingtip through the centre of gravity.
- The vertical axis runs vertically through the centre of gravity. It is situated at right angles to the other axes.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why does an aircraft have exactly three axes of motion?

Q2. Where is an aircraft's centre of gravity located?

Q3. What are the three axes of an aircraft called?

ANTICIPATED ANSWERS

A1. An aircraft operates in a three-dimensional space and needs an axis for each dimension.

A2. At the intersection of the three axes of motion.

A3. The three axes of an aircraft are the longitudinal axis, the lateral axis and the vertical axis.

Teaching Point 2	**Describe the Three Axial Movements That Aircraft Make**
Time: 5 min	Method: Interactive Lecture

Using a model aircraft, describe the three movements that aircraft make around their three axes, to include:

- roll about the longitudinal axis;
- pitch about the lateral axis; and
- yaw about the vertical axis.

Have cadets simulate the three movements of an aircraft using their hand. Spin the wrist right to left to simulate roll, bend the wrist up and down to simulate pitch, and twist the wrist left to right simulate yaw.

Rolling. Movement of an aircraft about the longitudinal axis is called roll.

Pitching. Movement of an aircraft about the lateral axis is called pitch.

Yawing. Movement of an aircraft about the vertical axis is called yaw.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is roll?

Q2. What is pitch?

Q3. What is yaw?

ANTICIPATED ANSWERS

A1. Roll is the movement of an aircraft about its longitudinal axis.

A2. Pitch is the movement of an aircraft about its lateral axis.

A3. Yaw is the movement of an aircraft about its vertical axis.

END OF LESSON CONFIRMATION

Have the cadets simulate the movements of an aircraft using their hand as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Movement through a three-dimensional space requires three axes of movement. The names of the axes and the names of the movements are borrowed from the sea, where ships have pitched, yawed and rolled for thousands of years.

INSTRUCTOR NOTES/REMARKS

N/A.

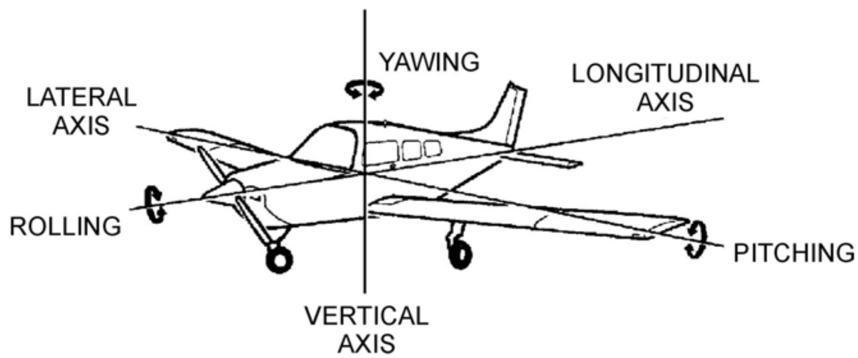
REFERENCES

C3-017 (ISBN 1-895569-23-0) Schmidt, N. (1998). *Fabulous Paper Gliders*. New York, NY: Sterling Publishing.

C3-116 A-CR-CCP-263/PT-001/(ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

AXES OF AN AIRCRAFT

AXIAL MOVEMENTS



Cadets Canada: RCSU Pacific, 2007, Air Cadet Master Lesson Plans. Retrieved 7 March 2007, from http://www.regions.cadets.ca/pac/aircad/resources/mlp_air_e.asp

Figure 11K-1 Axes of an Aircraft

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 1 OF EO M232.01

A-CR-CCP-802/PG-001

EO M232.01 – IDENTIFY TYPES OF AIRCRAFT ENGINES

1. **Performance.** Identify Types of Aircraft Engines.

2. **Conditions**

   a. Given:

      (1) Supervision; and

      (2) Assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.

3. **Standard.** In accordance with specified references, the cadet shall identify types of aircraft engines, to include:

   a. rocket engines;

   b. gas turbine engines; and

   c. piston-powered engines.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain that a powered aircraft needs a means of propulsion to overcome drag and allow the wings to generate lift. Identify common engine types used for propulsion, to include: a. rocket engines; b. gas turbine jet engines; and c. piston-powered engines.	Interactive Lecture	10 min	C3-116 (p. 51) C3-084 C3-086 C3-087 C3-088

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	Interactive Lecture:	10 min
c.	Total:	15 min

6. **Substantiation.** An interactive lecture was chosen for TP1 to introduce types of aircraft engines and give an overview of them.

7. **References**

   a. C3-084 NASA Glenn Research Center. *Engines 101.* Retrieved 21 February 2007, from http://www.ueet.nasa.gov/Engines101.html#Aeronautics.

   b. C3-086 NASA Glenn Research Center. *Engines 101.* Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/icengine.html.

c. C3-087 NASA Glenn Research Center. *Propulsion Index*. Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/shortp.html.

d. C3-088 NASA *Welcome to the Beginner's Guide to Rockets.* Retrieved 21 February 2007, from http://exploration.grc.nasa.gov/education/rocket/bgmr.html.

e. C3-116 A-CR-CCP-263/PT-001/(ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids.** Presentation aids (e.g. whiteboard/flipchart/OHP) appropriate for the classroom/training area.

9. **Learning Aids.** N/A.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 1

EO M232.01 – IDENTIFY TYPES OF AIRCRAFT ENGINES

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to introduce types of aircraft engines and give an overview of them.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify types of aircraft engines.

IMPORTANCE

Engines are one of the key systems in a powered aircraft. It is important for cadets to learn about types of aircraft engines so that they can understand subsequent and related aspects of aviation.

Teaching Point 1	**Explain That a Powered Aircraft Needs a Means of Propulsion**
Time: 10 min	Method: Interactive Lecture

A powered aircraft needs a means of propulsion to overcome drag and allow the wings to generate sufficient lift to overcome weight.

The propeller and jet engine are very closely related, providing thrust by the same means – the acceleration of a mass of air. The propeller generates thrust by acting on a large mass of air, giving it a relatively small acceleration. The jet engine does exactly the same thing by giving a larger acceleration to a smaller mass of air.

The most common engine types used for aviation propulsion employ internal combustion and they include:

- rocket engines,
- gas turbine jet engines, and
- reciprocating piston-powered engines.

> Show the cadets a slide or handout of rocket engine applications in Figures 12A-1 and 12A-2.

The earliest vehicle engines were rocket engines used to power ancient Chinese fire arrows. This method of propulsion proved so effective that, with many improvements, it is still commonly used today for many applications including space exploration. Self-contained with their own oxidizer, rockets have the great advantage of being able to function in a vacuum such as outer space.

> All propulsion systems are reactive, meaning that they all employ an equal and opposite reaction predicted by Newton's third law of motion.

Piston-powered internal combustion engines were developed in the late nineteenth century. They were available to Orville and Wilbur Wright, who designed their 1903 flyer with a four-cylinder piston-powered engine.

> Show the cadets a slide or handout of a Harvard piston-powered engine application in Figures 12A-3 and 12A-4 located at the end of this document.

Piston-powered engines are the most common vehicle engine of all and the one that Proficiency Level Two cadets will explore in most detail. In many ways, pistons are the most complicated system of converting the chemical energy of fuel into the energy of motion but they are found in many places, including aircraft, automobiles, boats and lawnmowers.

> Show the cadets a slide or handout of a gas turbine jet engine application in Figures 12A-5 and 12A-6 located at the end of this document. Point out the airflow path and combustion location in the schematic.

Gas turbine jet engines are improvements upon simple ramjets. The ramjet is a liquid-fuelled rocket-like engine, which uses atmospheric oxygen to burn fuel. One of the most limiting aspects of a ramjet is that it requires high velocity to work. Therefore it cannot start combustion until it is up to speed – it must be launched from a speeding vehicle. Air-launched missiles are one of the few applications of ramjet engines.

Any turbine converts the energy of moving liquid or gases, such as jet exhaust or wind, into rotary motion to turn a shaft. A windmill is a turbine which uses wind energy to turn a shaft. Among other advantages, adding a turbine to the simple ramjet allows a compressor to generate high-pressure air so that the gas turbine jet engine can be started from a resting, or static, position. This is the secret of the modern gas turbine jet engine, which still relies on the ejection of hot gases to produce thrust. Until the turbine and compressor are functioning and delivering high-pressure air to the engine, however, the engine cannot start. Even gas turbine jet engines, therefore, must be started with a starting motor.

Show the cadets a slide or handout of the CT-114 Tutor turbojet engine application Figures 12A-7 and 12A-8 located at the end of this document.

A gas turbine jet engine that provides thrust, with no rotating shaft output, is a TURBOJET engine.

Show the cadets a slide or handouts of the C-130 Hercules turboprop engine application Figures 12A-9 and 12A-10 located at the end of this document.

A gas turbine jet engine that provides thrust and also drives a propeller is a TURBOPROP engine.

Show the cadets a slide or handout of the CH-146 Griffon turboshaft engine application Figures 12A-11 and 12A-12 located at the end of this document.

A gas turbine engine that drives a helicopter rotor is usually a TURBOSHAFT engine. In a turboshaft helicopter engine, the output driveshaft is separate from the compressor turbine shaft so that engine speed is not tied to the helicopter's main rotor speed.

Show the cadets a slide or handout of the CC-150 Polaris (A310-300 Airbus) turbofan engine application Figures 12A-5 and 12A-6 located at the end of this document. Point out the fan location.

The most common variation of the gas turbine jet engine is the TURBOFAN, which is a hybrid of a turbojet and a turboprop. The turbofan has a fan that provides thrust with bypass air, in place of a propeller, adding to the reactive thrust of the ejected exhaust gases. This application allows the aircraft to go faster than normal propellers could go, while also reducing engine noise and allowing the aircraft to make efficient use of fuel. The noise reduction and fuel efficiency of turbofans make them very effective for commercial aviation.

All three of these engine types, rocket, gas turbine jet and piston-powered engines, use internal combustion to capture the energy of expanding hot gases in a closed container.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Which engine type was the first to be used for propulsion?

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Q2. Why are the rocket, gas-turbine and piston-powered engines all internal combustion engines?

Q3. Why does a gas turbine jet engine need to have a starting motor?

ANTICIPATED ANSWERS

A1. The rocket was the first to be used for propulsion.

A2. The rocket, gas-turbine and piston-powered engines all use internal combustion to capture the energy of hot expanding gases in a closed container.

A3. A gas turbine jet engine needs to have a starting motor because, until the turbine and compressor are running, there is no high-pressure air to operate the engine.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The topic of aircraft engines is very broad and ever-changing as new solutions are found and new products developed to push the performance envelope.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-084 NASA Glenn Research Center. *Engines 101.* Retrieved 21 February 2007, from http://www.ueet.nasa.gov/Engines101.html#Aeronautics.

C3-086 NASA Glenn Research Center. *Engines 101.* Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/icengine.html.

C3-087 NASA Glenn Research Center. *Propulsion Index.* Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/shortp.html.

C3-088 NASA. *Welcome to the Beginner's Guide to Rockets.* Retrieved 21 February 2007, from http://exploration.grc.nasa.gov/education/rocket/bgmr.html.

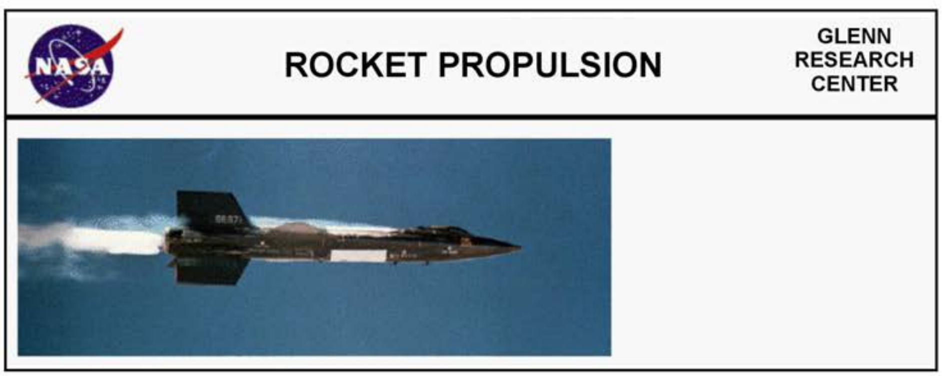
C3-116 A-CR-CCP-263/PT-001/(ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

IDENTIFYING TYPES OF AIRCRAFT ENGINES

Rocket Engines

National Aeronautics and Space Administration (NASA), "Missions" Space Shuttle System (2006). Retrieved 17 March 2007, from http://www.nasa.gov/returntoflight/system/system_SSME.html

Figure 12A-1 Rocket Engine Application



NASA Glenn Research Center. "Propulsion Index". Rocket Propulsion (2006). Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/shortp.html

Figure 12A-2 X-15 in Flight

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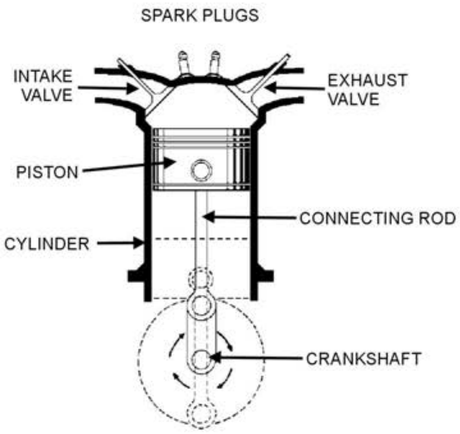
Chapter 12, Annex A

Piston-powered Engines

Canadian Forces. Aircraft. (2005). Retrieved 17 March 2007, from http://www.airforce.gc.ca/equip/equip1_e.asp

Figure 12A-3 Piston-powered Engine Application



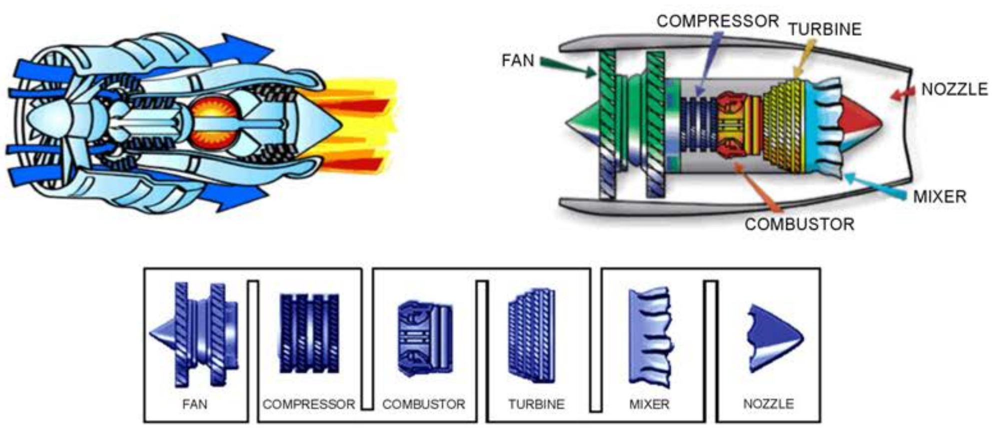
A-CR-CCP-263/PT-001 (p. 53)

Figure 12A-4 Piston-powered Engine Schematic

Jet Engine

Canadian Forces. Aircraft. (2005). Retrieved 17 March 2007, from http://www.airforce.gc.ca/equip/equip1_e.asp

Figure 12A-5 Gas Turbine Engine Application



*NASA "Engines 101". Ultra Efficient Engine Technology (UEET). (2001).
Retrieved 17 March 2007, from http://www.ueet.nasa.gov/Engines101.html*

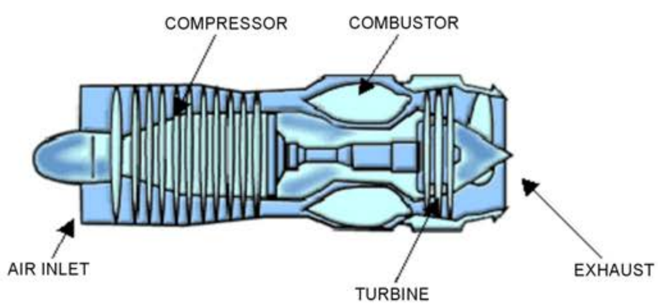
Figure 12A-6 Turbofan Parts

A-CR-CCP-802/PF-001
Chapter 12, Annex A

Turbojet Engines

Canadian Forces. Aircraft. (2005). Retrieved 17 March 2007, from http://www.airforce.gc.ca/equip/equip1_e.asp

Figure 12A-7 Turbojet Application



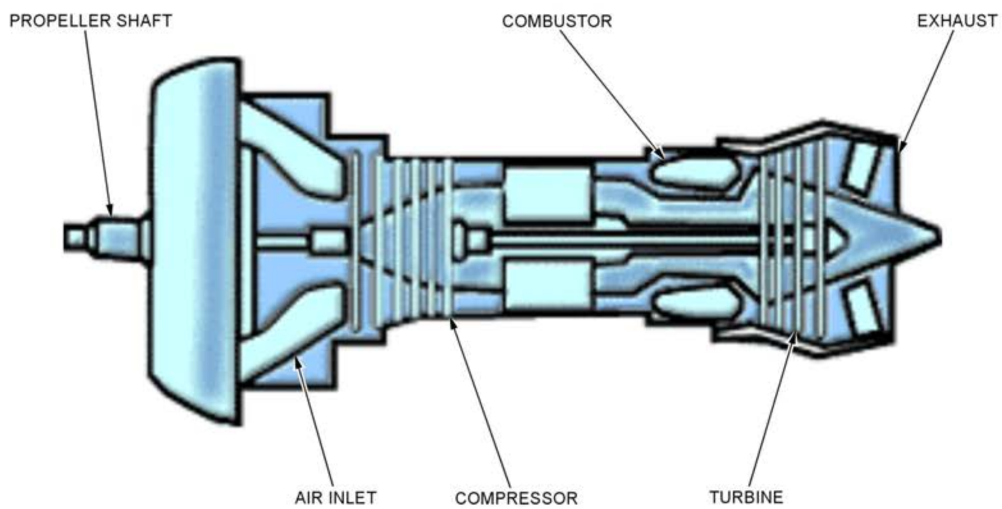
NASA Engines 101. Ultra Efficient Engine Technology (UEET). (2001). Retrieved 17 March 2007, from http://www.ueet.nasa.gov/Engines101.html

Figure 12A-8 Turbojet Schematic

Turboprop Engines

Canadian Forces. Aircraft. (2005). Retrieved 17 March 2007, from http://www.airforce.gc.ca/equip/equip1_e.asp

Figure 12A-9 Turboprop Application



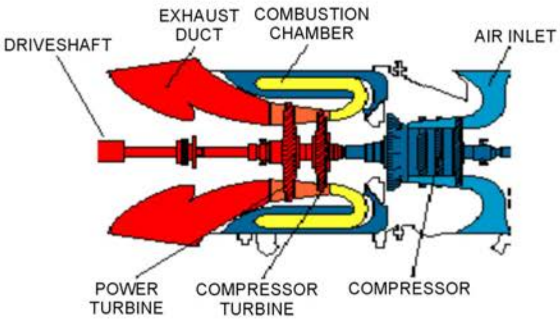
NASA Engines 101. Ultra Efficient Engine Technology (UEET). (2001). Retrieved 17 March 2007, from http://www.ueet.nasa.gov/Engines101.html

Figure 12A-10 Turboprop Engine Schematic

Turboshaft Engines

Canadian Forces. Aircraft. (2005). Retrieved 17 March 2007, from http://www.airforce.gc.ca/equip/equip1_e.asp

Figure 12A-11 Turboshaft Engine Application



Imagine the Power, Pratt & Whitney Canada. Retrieved 16 March 2007, from http://www.pwc.ca/en/3_0/3_0_3/3_0_3_3_1.asp

Figure 12A-12 Turboshaft Engine Schematic

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 2 OF EO C232.03

A-CR-CCP-802/PG-001

EO C232.03 – IDENTIFY THE CHARACTERISTICS OF HELICOPTER ENGINES

1. **Performance.** Identify the Characteristics of Helicopter Engines.

2. **Conditions**

   a. Given:

      (1) Supervision; and

      (2) Assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.

3. **Standard.** The cadet shall identify the characteristics of helicopter engines, to include:

   a. technical development of early helicopter engines;

   b. challenges of rotary-wing flight; and

   c. categories of engines in CF helicopters.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Have the cadets make and fly a paper helicopter.	In-Class Activity	10 min	C3-056

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	In-class Activity:	10 min
c.	Total:	15 min

6. **Substantiation.** An in-class activity was chosen for TP1 as it is an interactive way to provoke thought and stimulate interest among cadets.

7. **References.** C3-056 US Centennial of Flight Commission. *Helicopters.* (2003). Retrieved 12 October 2006, from http://www.centennialofflight.gov/essay/Dictionary/helicopter/DI27.htm.

8. **Training Aids**

   a. Presentation aids (e.g. whiteboard/flipchart/OHP/multimedia projector) appropriate for the classroom/training area;

   b. Completed paper helicopter for demonstration purposes;

9. **Learning Aids**

   a. Directions to construct and fold a paper helicopter (A-CR-CCP-802/PF-001, Annex D); and

   b. Materials required to construct a paper helicopter.

10. **Test Details.** N/A.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 7

EO C232.03 – IDENTIFY THE CHARACTERISTICS OF HELICOPTER ENGINES

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handouts of the paper helicopter construction templates and instructions shown in Figures 12T-2 and 12T-3 for each cadet.

Gather materials needed for the construction of the paper helicopter.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP1 as it is an interactive way to provoke thought and stimulate an interest among cadets.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall identify the characteristics of helicopter engines.

IMPORTANCE

It is important for cadets to know about the characteristics of helicopter engines because helicopters form a significant part of the Canadian Forces' lift, tactical manoeuvring and Search and Rescue capabilities.

Teaching Point 1 | **Make and Fly a Paper Helicopter**

Time: 10 min | Method: In-Class Activity

When a helicopter engine loses power under flight, the pilot can auto-rotate the aircraft to the ground.

Auto-rotation is the state of flight where the main rotor is being turned by the action of the wind passing up through the rotor disc instead of being turned by engine power.

ACTIVITY

Time: 15 min

OBJECTIVE

The objective of this activity is to have the cadets fold paper helicopters and then auto-rotate them to the ground to demonstrate that loss of engine power does not necessarily lead to a crash.

RESOURCES

Instructions and the template for folding a paper helicopter shown in Figures 12T-2 and 12T-3.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute the instructions and template for paper helicopter construction to each cadet.
2. Have the cadets cut out the paper helicopter and then fold it into shape.
3. Have the cadets stand and drop the helicopters.

> Give the paper helicopter a spin before releasing it. This will help establish effective rotor action because, as stated by Newton's first law of motion, every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Rotary wing aircraft present special challenges for aviation but they offer special capabilities as well, which enable them to make important contributions to the Canadian Forces' lift, tactical manoeuvring and Search and Rescue operations.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-056 US Centennial of Flight Commission. *Helicopters. (2003).* Retrieved 12 October 2006, from http://www.centennialofflight.gov/essay/Dictionary/helicopter/DI27.htm.

A-CR-CCP-802/PF-001
Chapter 12, Annex T

INSTRUCTIONS AND TEMPLATE FOR FOLDING A PAPER HELICOPTER

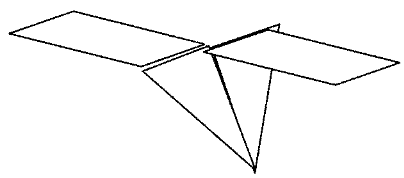
MAKE A HELICOPTER

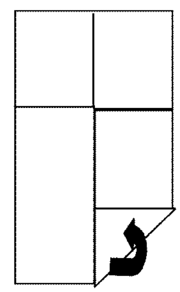
AIM: TO MAKE A TWIRLING HELICOPTER.

YOU WILL NEED: A HELICOPTER SHEET, SCISSORS, COLOURING PENCILS, PAPER CLIPS FOR WEIGHTS

WHAT TO DO:

1. COLOUR THE HELICOPTER SHEET.
2. CUT ALONG THE DOTTED LINES.
3. FOLD CORNERS A AND B TO MEET THE CENTRE LINE
4. FOLD E AND F IN THE OPPOSITE DIRECTIONS.





5. TEST YOUR HELICOPTER BY DROPPING IT FROM A HIGH PLACE (E.G. STANDING ON A RAISED PLATFORM).
6. DISCUSS WHAT HAPPENS.

THINGS TO TRY

DOES THE WAY THE FLAPS ARE BENT MAKE A DIFFERENCE TO THE HELICOPTER'S FALL?

ADD EXTRA WEIGHT TO YOUR HELICOPTER. DOES THIS MAKE A DIFFERENCE.

MAKE A NEW HELICOPTER WITH LONGER BLADES. HOW DOES IT WORK?

"Force and Movement" Making a Helicopter. Retrieved 11 October 2006, from http://www.teacherresourcesgalore.com/physics_files/helicopter.doc

Figure 12T-2 Instructions for Paper Helicopter Construction

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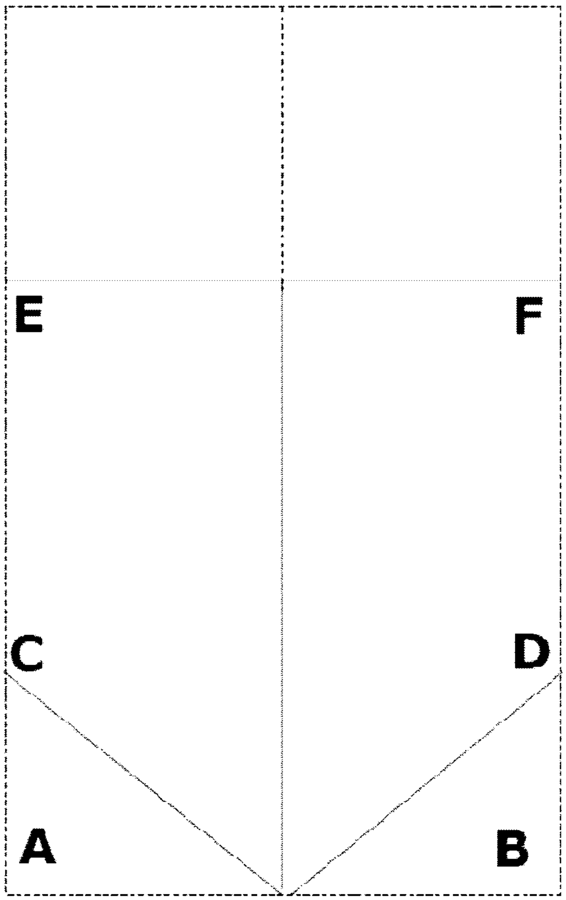
Chapter 12, Annex T

PAPER HELICOPTER TEMPLATE



"Force and Movement: Making a Helicopter". Retrieved 11 October 2006, from http://www.teacherresourcesgalore.com/physics_files/helicopter.doc

Figure 12T-3 Template for Paper Helicopter Construction

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 2 OF EO C240.03

A-CR-CCP-802/PG-001

EO C240.03 – IDENTIFY PARTS OF A ROCKET

1. **Performance.** Identify Parts of a Rocket.
2. **Conditions**
   a. Given:
      (1) Supervision; and
      (2) Assistance as required.
   b. Denied: N/A.
   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.
3. **Standard.** In accordance with *Rocket Parts,* the cadet shall identify parts of a rocket to become familiar with its components.
4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Conduct an activity naming the parts of a rocket.	In-class Activity	10 min	C3-106

5. **Time**
   a. Introduction/Conclusion: 5 min
   b. In-class Activity: 10 min
   c. Total: 15 min
6. **Substantiation.** An in-class activity was chosen for TP1 as it is an interactive way to confirm the cadet's comprehension of the material.
7. **References.** C3-106 NASA. (2006). *Rocket Parts.* Retrieved 22 February 2007, from http://exploration.grc.nasa.gov/education/rocket/rockpart.html#.
8. **Training Aids.** Presentation aids (e.g. whiteboard/flipchart/OHP/multimedia projector) appropriate for the classroom/training area.
9. **Learning Aids**
   a. Rocket parts puzzle; and
   b. Parts of a rocket handout.
10. **Test Details.** N/A.
11. **Remarks.** N/A.

A-CR-CCP-802/PF-001

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 6

EO C240.03 – IDENTIFY PARTS OF A ROCKET

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handout located at Figure 13F-1 for each cadet.

Photocopy and cut out the rocket puzzle pieces from Figure 13G-1 through Figure 13G-13 located at the end of this document.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP1 as it is an interactive way to confirm the cadet's comprehension of the material.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify parts of a rocket to become familiar with its components.

IMPORTANCE

It is important for cadets to know the parts of a rocket so that they can understand how they are constructed. Identifying the parts of a rocket may develop an interest in the components that make up a rocket, which may lead to future aerospace opportunities in the Air Cadet Program.

Teaching Point 1	**Conduct an Activity Naming the Parts of a Rocket**
Time: 10 min	Method: In-class Activity

The following activity is designed to be done as a class activity. The class will construct and label the puzzle together, one piece at time.

ACTIVITY

OBJECTIVE

The objective of this activity is to help cadets become familiar with the parts of a rocket.

RESOURCES

- The puzzle located at Figure 13G-1 through Figure 13G-13, and
- Tape.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Provide the cadets with the puzzle parts and shapes of a rocket.
2. Request a cadet to volunteer and select a shape and place it on the board in front of the class.
3. Repeat the steps until all the shapes are up on the board and the rocket is built. Then repeat the steps using the words and pictures to label the rocket.

Allow cadets to make corrections if the parts of the puzzle are in the wrong place.

4. Use the handout located at Annex F as a guide to confirm if the puzzle is correct.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the parts of a rocket activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

Distribute Figure 13F-1 Parts of a Rocket to each cadet.

The cadets' participation in identifying the parts of a rocket will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing the parts of a rocket will help cadets understand how rockets are constructed. Identifying the parts of a rocket will help cadets understand the components that make up the rocket, which may develop an interest in rocket technology that may lead to future aerospace opportunities in the Air Cadet Program.

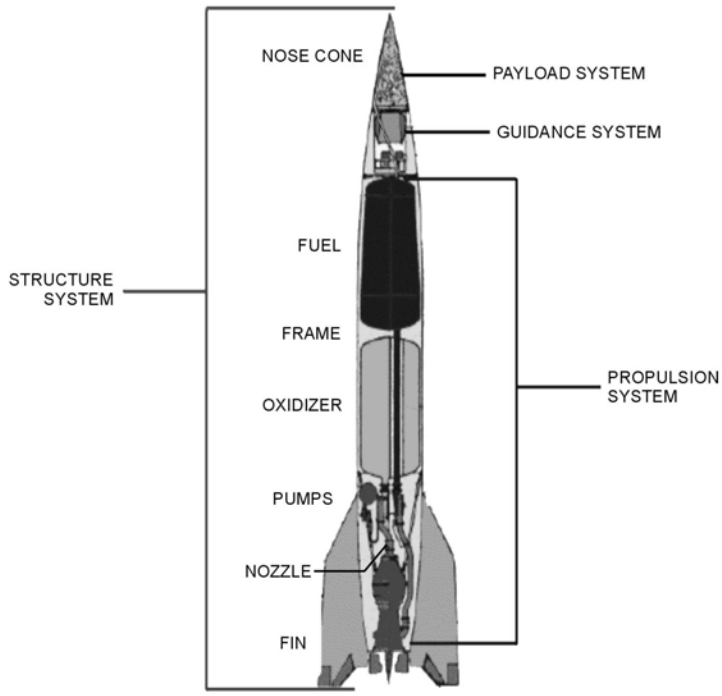
INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-106 NASA. (2006). *Rocket Parts.* Retrieved 22 February 2007, from http://exploration.grc.nasa.gov/education/rocket/rockpart.html#.

PARTS OF A ROCKET



"NASA", Parts of a Rocket. Retrieved 23 April 2007, from http://exploration.grc.nasa.gov/education/rocketpart.html#

Figure 13F-1 Parts of a Rocket

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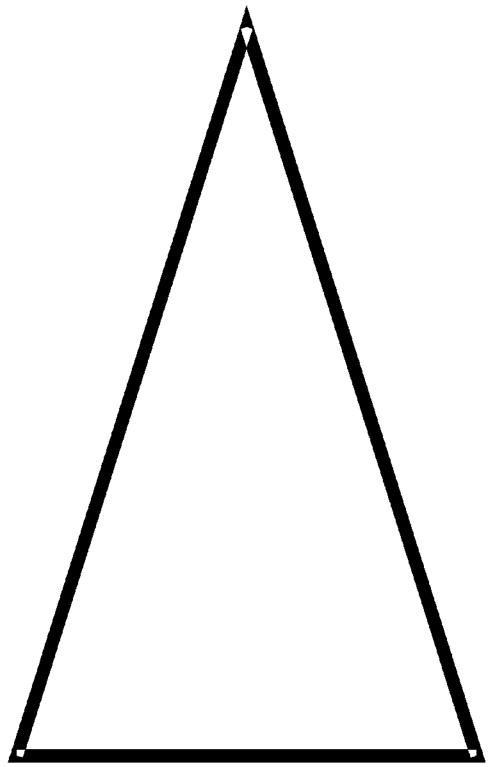
Chapter 13, Annex G

ROCKET PUZZLE PIECES



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-1 Nose Cone (Part A)

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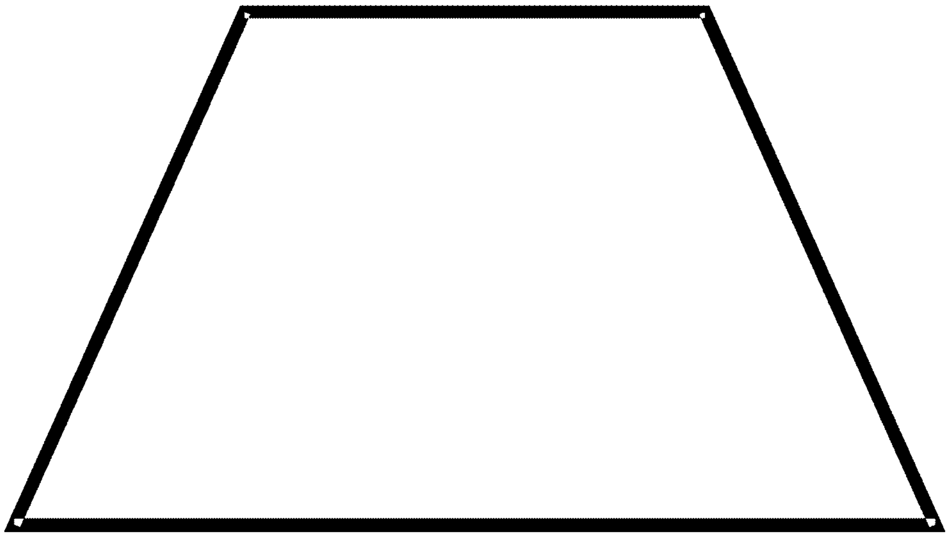
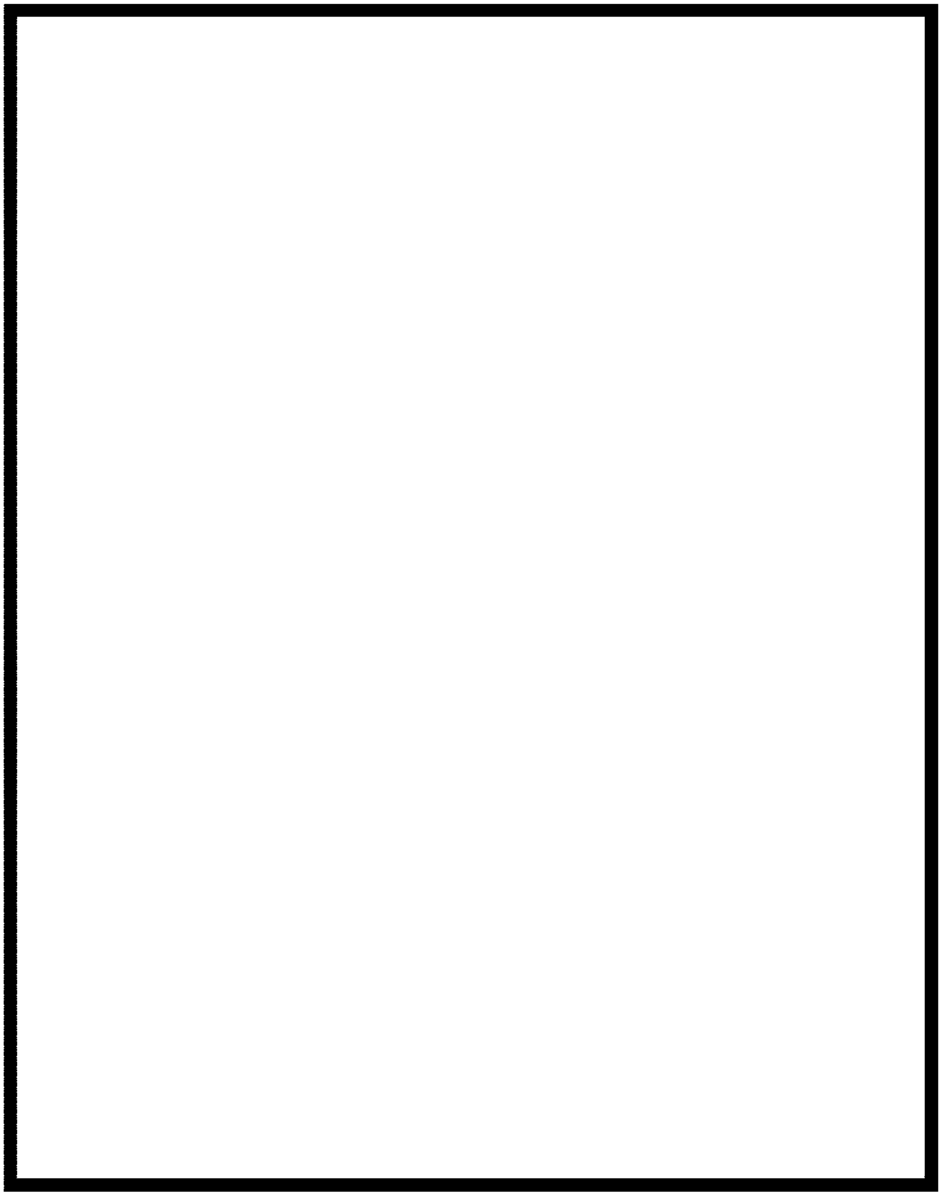
Chapter 13, Annex G



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

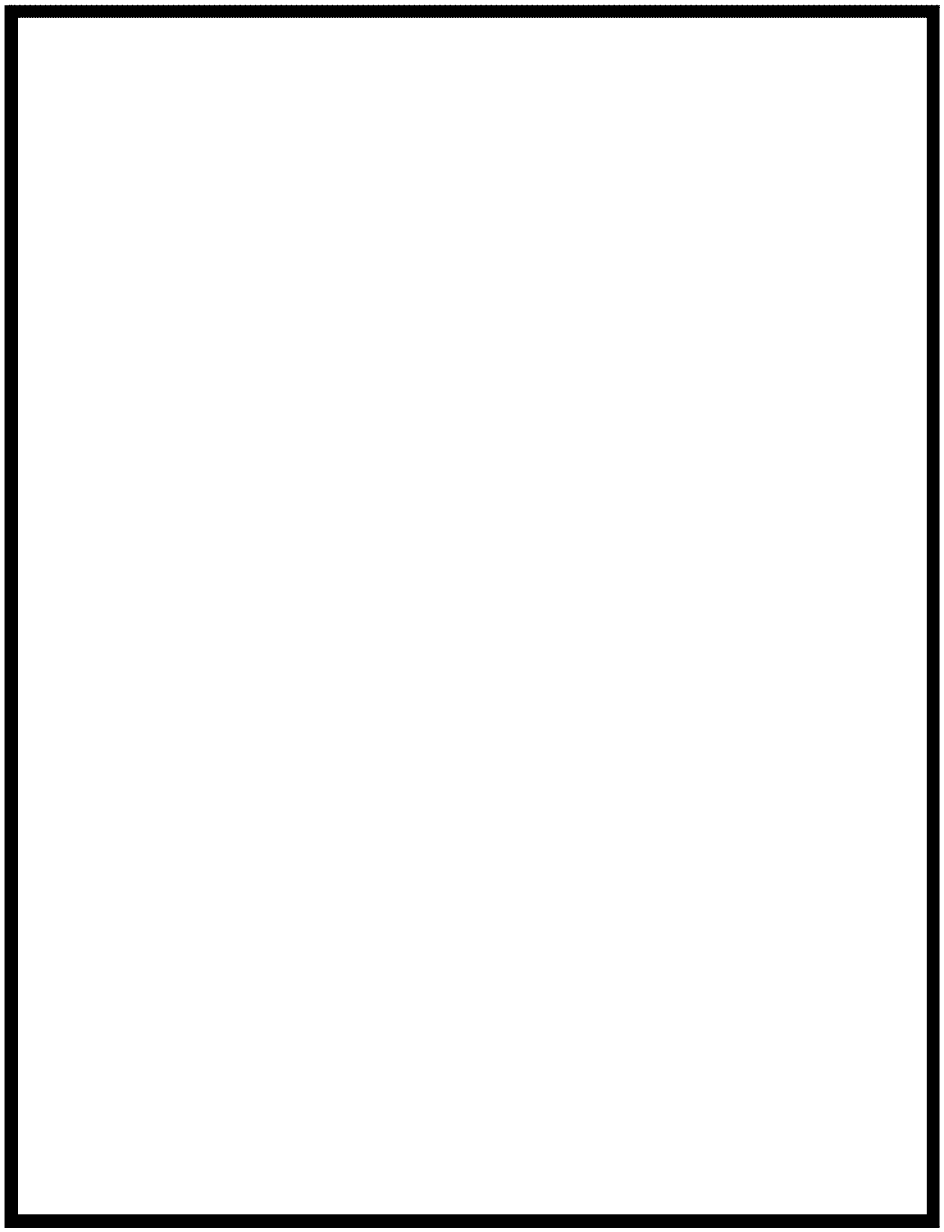
Figure 13G-2 Nose Cone (Part B)



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-3   Frame (Fuel Section)

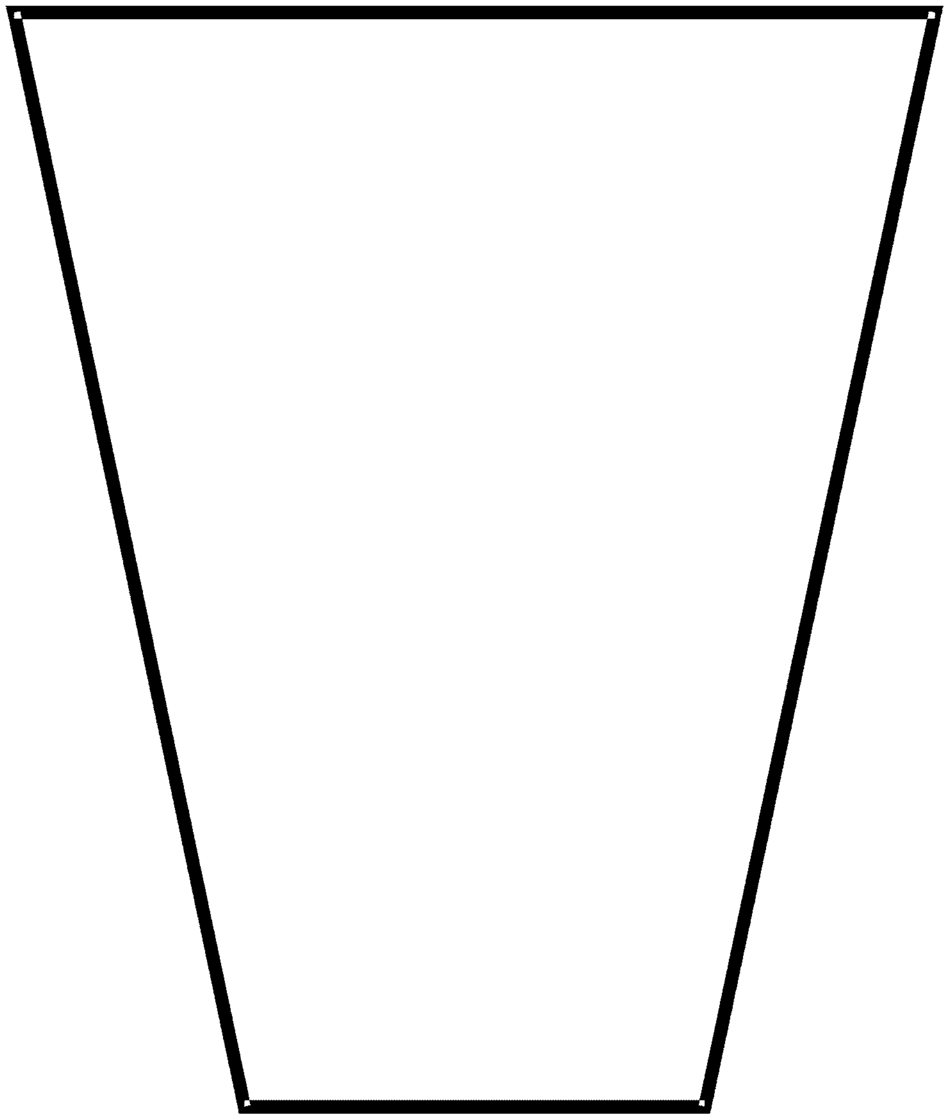
A-CR-CCP-802/PF-001
Chapter 13, Annex G



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-4 Frame (Oxidizer Section)

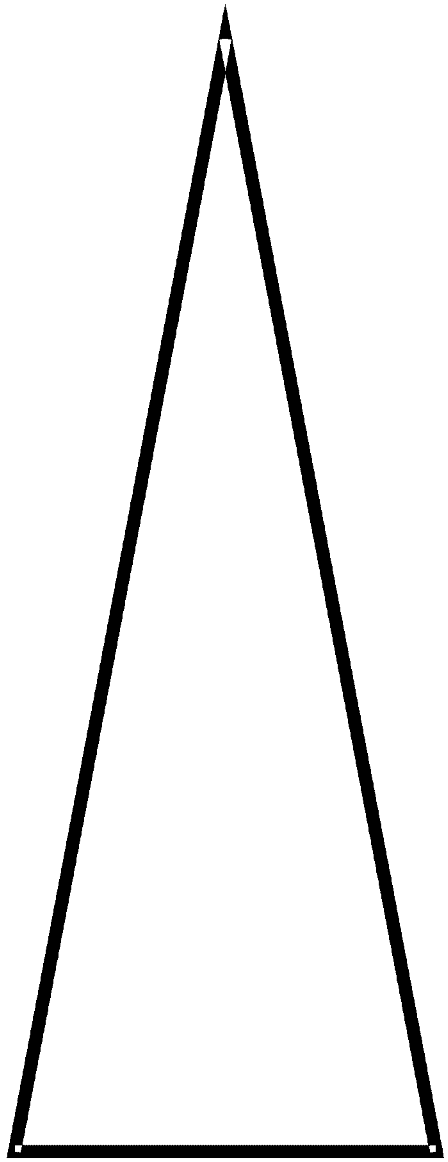
A-CR-CCP-802/PF-001
Chapter 13, Annex G



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

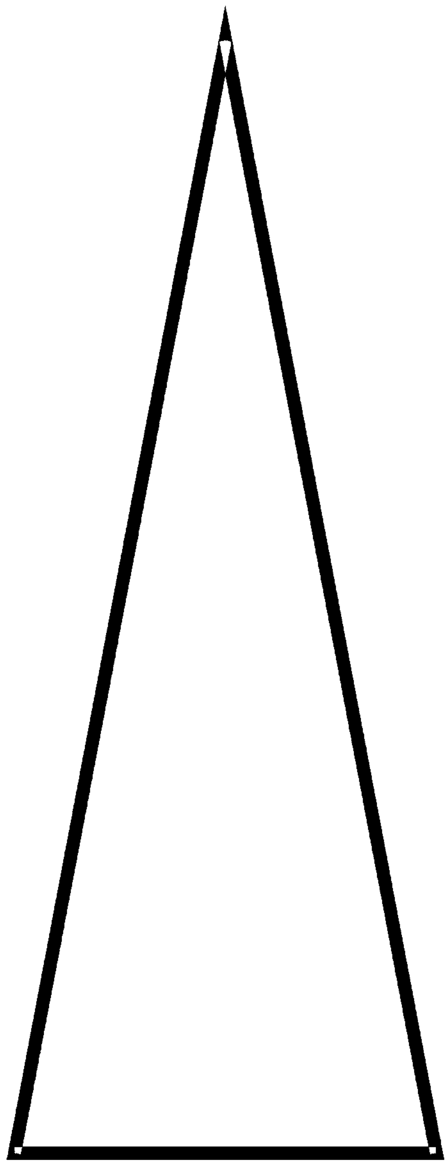
Figure 13G-5 Frame (Pumps and Nozzle Section 0)

A-CR-CCP-802/PF-001
Chapter 13, Annex G



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-6 Fin (Section 1)



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-7 Fin (Section 2)

A-CR-CCP-802/PF-001
Chapter 13, Annex G

PARTS OF A ROCKET: LABELS

Cut out the following boxes and figures to be used to label the rocket puzzle.

NOSE CONE	
FUEL	
FIN	FIN

Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 13G-8 Rocket Labels

GUIDANCE SYSTEM

"Clip Art", Microsoft Corporation, 2003 , Santa Rosa: CA: Impreza Systems, Copyright 2000, Impresa Systems

Figure 13G-9 Guidance System

PAYLOAD SYSTEM

"Clip Art", Microsoft Corporation, 2003 , Santa Rosa: CA: Impreza Systems, Copyright 2000, Impresa Systems

Figure 13G-10 Payload

A-CR-CCP-802/PF-001
Chapter 13, Annex G

FUEL PUMP

"Google Images", New Philadelphia, Ohio, Fuel Pump. Retrieved 18 April 2007, from http://www.neohiotravel.com/images/gaspump.gif

Figure 13G-11 Fuel Pump

OXIDIZER

"Google Images", California State University, Oxidizer Label. Retrieved 18 April 2007, from http://www.csudh.edu/oliver/chemdata/warnlabs/oxidizer.jpg

Figure 13G-12 Oxidizer

NOZZLE

"Google Images", Airwork Aviation Images, Engines. Retrieved 18 April 2007, from http://www.airwork-images.com/details.php?gid=278&sgid=&pid=456

Figure 13G-13 Nozzle

INSTRUCTIONAL TECHNIQUES – ASSESSMENT FORM

Cadet's Name: ______________________________ Flight: ______________________________

Lesson Topic: ______________________________

CRITERIA	COMMENTS	Incomplete	Completed With Difficulty	Completed Without Difficulty
PREPARATION				
Selected a lesson location.				
Set up the lesson location.				
Used a lesson plan.				
Selected an appropriate method(s) of instruction.				
Reviewed previous lesson material.				
INTRODUCTION				
Stated what the cadets will learn.				
Stated why it is important.				
Described where the knowledge/skill will be applied.				
BODY				
Applied the principles of instruction. (interest, comprehension, emphasis, participation, accomplishment and confirmation)				
Selected an appropriate instructional aid(s).				

CRITERIA	COMMENTS	Incomplete	Completed With Difficulty	Completed Without Difficulty
END OF LESSON CONFIRMATION				
Used questions/activity to confirm knowledge or skills.				
CONCLUSION				
Summarized the lesson.				
Re-motivated the cadets.				
Described the next lesson.				
EFFECTIVE-SPEAKING TECHNIQUES				
Applied the elements of voice control. (pitch, tone, volume, speed, pause and articulation)				
Used appropriate body language.				
Maintaining appropriate dress and deportment.				
QUESTIONING TECHNIQUES				
Choose appropriate types of questions.				
Applied the questioning sequence. (pose, pause, pounce, ponder and praise)				
FEEDBACK				

Assessor's Signature

Date

Cadet's Signature

LIST OF TOPICS

1. Your personal involvement within the cadet squadron.
2. One fun event in which you took part at a Cadet Summer Training Centre.
3. One subject or topic area you would like to see added to/expanded on in the current training program.
4. One goal you have set or attained while in cadets.
5. Where you see yourself within the squadron in the future.
6. One fun event in which you took part with the squadron.
7. Your first night as a cadet.
8. Your first trip with the squadron.
9. Your first visit to the gliding centre.
10. Why you joined cadets.

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VERBAL PRESENTATION – FEEDBACK FORM

Name: ______________________________ Date: ________________________

Length: 1 min **Start:** __________ **End:** ___________ **Total:** __________

Criteria	Comments	Yes	No
Introduction			
Body			
Conclusion			
Voice			
Body Language			
Dress & Deportment			
Presentation Aid(s)			
Comments:			
STRENGTHS	**AREAS FOR IMPROVEMENT**		

____________________________ Instructor's Signature

____________________________ Cadet's Signature

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THE LESSON PLAN

The lesson plan is a way for the instructor to organize the lesson and summarize information included in the lesson specification, the IG and their personal ideas. Lesson plans provide a set of detailed directions for delivering one or more periods of instruction.

Part	Purpose
1. Introduction	Builds the cadets' interest and motivation.
2. Body	Presents and explains each TP.
3. End of Lesson Confirmation	Confirms cadets' comprehension of the lesson.
4. Conclusion	Summarizes key points and identifies future lessons.

INTRODUCTION

The introduction is the instructor's first verbal interaction with the cadets. It should capture the cadets' interest. The following should be included in the introduction of a lesson plan:

- **What.** A description of what the cadets will be expected to accomplish at the end of the lesson.
- **Why.** A description of how and where the lesson fits into the Cadet Program.
- **Where.** A description of why it is important for the cadets to achieve the objectives.

Read the "Objective" and "Importance" paragraphs in the IG for help in writing the introduction of the lesson plan.

BODY

The body of the lesson plan is where the content is presented, explained and supported. Each TP directs the instructor and the cadets.

Each TP in the lesson includes:

- **Introduction.** Briefly introduce the content to be taught during the TP.
- **Teaching Method.** Identifies which teaching method has been chosen for the given TP.
- **Lesson Content.** Presents the lesson content in a clear and logical order, from easy to difficult or known to unknown.
- **Confirmation.** Confirmation of the TP may be oral questions, games, role-play or an in-class or practical activity. Instructional guides offer suggestions on how to confirm TPs. Instructors may choose to use those confirmation suggestions or develop their own.

END OF LESSON CONFIRMATION

The lesson plan should outline procedures to be used to confirm the learning of the TP. End of lesson confirmations are carried out to ensure that the cadets have understood the whole lesson and that any weaknesses in performance are identified so they may be corrected.

Confirmation activities are based on the lesson objectives. The end of lesson confirmation may be oral questions, games, role-play or an in-class or practical activity. IGs offer suggestions for how to conduct end of lesson confirmations. Instructors may choose to use those confirmation suggestions or develop their own.

CONCLUSION

The conclusion of a lesson allows the instructor to give a summary of key points and link them to the coming lessons and their practical use.

- **A Summary of Important Points and Any Weak Areas.** The summary reviews the main TPs. The depth of the summary will be determined by the lesson objectives and the results of the cadets' end of lesson confirmation/test. If the cadets achieved the objectives successfully, the summary may be brief. If they experienced some difficulties, the instructor should summarize them here and indicate how the issue will be addressed.
- **Re-Motivation Statement.** The re-motivation statement restates the importance of the lesson (the "why") and re-motivates the cadets. The instructor should also take this time to give an overview of the next lesson and any precautions the cadets should be aware of when using the knowledge they have gained in a practical setting.

Read the "Closing Statement" paragraph in the IG for help in writing the conclusion of the lesson plan.

DRILL LESSON PLAN

<table>
<tr><td colspan="2">EO #:</td><td colspan="2">Title of the EO:</td></tr>
<tr><td colspan="2">Instructor:</td><td>Location:</td><td>Total Time: min</td></tr>
<tr><td>TIME</td><td colspan="2">REVIEW</td><td>NOTES</td></tr>
<tr><td></td><td colspan="2">PO/EO:
ENABLING OBJECTIVE:</td><td></td></tr>
<tr><td>TIME</td><td colspan="2">INTRODUCTION</td><td>NOTES</td></tr>
<tr><td></td><td colspan="2">What:
Why:
Where:</td><td></td></tr>
<tr><td>TIME</td><td colspan="2">BODY</td><td>NOTES</td></tr>
<tr><td></td><td colspan="2">TP 1: (First Movement)
Formation:
Confirm TP 1:</td><td></td></tr>
</table>

	TP 2: (Second Movement): **Confirm TP 2:**	
TIME	**END OF LESSON CONFIRMATION**	NOTES
TIME	**CONCLUSION**	NOTES
	Summary: In this lesson you have learned **Re-Motivation:** Your next lesson will be	

PLAN A DRILL LESSON CHECKLIST

PREPARATION	NOTES
Have you: ❑ Selected an appropriate squad formation? ❑ Written a lesson plan?	
INTRODUCTION	
Does your introduction: ❑ Review previous lesson material? ❑ State what the cadets will learn? ❑ Describe why the movement is important to learn? ❑ Describe where and when the movement can be used? ❑ Describe how the cadets will be assessed?	
BODY	

Does the body of your lesson:
❑ Demonstrate the complete movement with the instructor calling the time?
❑ Explain the movement?
❑ Demonstrate and explain the first part of the movement (Squad 1)?
❑ Permit practice of the first part of the movement (collectively, individually, collectively)?
❑ Teach the second and each subsequent movement following the sequence described above?
❑ Permit practice of the complete movement with:
    ❑ the instructor calling the time;
    ❑ the cadets calling the time; and
    ❑ the cadets judging the time?
❑ Confirm each TP?
❑ Include two complete demonstrations?	

END OF LESSON CONFIRMATION	
❑ Did you conduct an end of lesson confirmation?	
CONCLUSION	
Does your conclusion:	

❑ Restate the movement taught and where or when it will be used?
❑ Re-motivate the cadets by:
    ❑ comment on the cadets' progress; and
    ❑ re-state why the drill movement just learned is important?
❑ Describe the next lesson?	

LIST OF APPROVED 15-MINUTE DRILL TOPICS

Teach the movement of attention from stand at ease, and stand at ease from attention (M108.01 [Adopt the Positions of Attention, Stand at Ease and Stand Easy, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 1]).

Teach the movement of stand easy from stand at ease, and stand at ease from stand easy (M108.01 [Adopt the Positions of Attention, Stand at Ease and Stand Easy, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 1]).

Teach a salute to the front (M108.02 [Execute a Salute at the Halt Without Arms, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 2]).

Teach a salute to the right (left) (M108.02 [Execute a Salute at the Halt Without Arms, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 2]).

Teach the right turn at the halt (M108.03 [Execute Turns at the Halt, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 3]).

Teach the left turn at the halt (M108.03 [Execute Turns at the Halt, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 3]).

Teach the about turn at the halt (M108.03 [Execute Turns at the Halt, A-CR-CCP-801/PG-001, Chapter 4, Section 8 and A-CR-CCP-801/PF-001, Chapter 8, Section 3]).

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – MOVEMENT OF ATTENTION FROM STAND AT EASE, AND STAND AT EASE FROM ATTENTION

A-CR-CCP-801/PG-001

EO M108.01 – ADOPT THE POSITIONS OF ATTENTION, STAND AT EASE, AND STAND EASY

1. **Performance.** Adopt the Positions of Attention, Stand at Ease, and Stand Easy.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall perform the following individual drill movements:

   a. attention from stand at ease; and

   b. stand at ease from attention.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate the movement of attention from stand at ease and allow cadets to practice.	Demonstration and Performance	5 min	A0-002 (pp. 2-2 to 2-8)
TP2	Explain and demonstrate the movement of stand at ease from attention and allow cadets to practice.	Demonstration and Performance	5 min	A0-002 (pp. 2-2 to 2-8)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

A-CR-CCP-801/PG-001

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 1

EO M108.01 – ADOPT THE POSITIONS OF ATTENTION, STAND AT EASE AND STAND EASY

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words "crack", "drive", "seize" and "grasp" suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to adopt the positions of attention and stand at ease.

IMPORTANCE

As members of the Canadian Cadet Movement (CCM) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCM depends on.

Teaching Point 1	**Adopting the Position of Attention From Stand at Ease**
Time: 5 min	Method: Demonstration and Performance

> Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)

> For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

In order to adopt the position of attention from stand at ease, the cadet shall:

On the command ATTENTION BY NUMBERS, SQUAD – ONE, bend the left knee and shift the balance to the right foot.

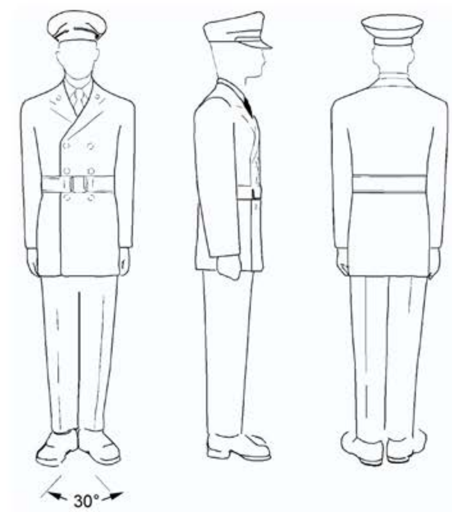
PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT

On the command SQUAD – TWO:

1. straighten the left leg in double time, place the foot smartly on the ground, toe touching first, followed by the heel, and with heels aligned; and
2. simultaneously, with a quick motion, bring the arms and hands to the position of attention.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-1 The Position of Attention

A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-2 Fists at Position of Attention

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command ATTEN – TION, combine the two movements. The timing is called as "one."

The instructor(s) shall provide a full demonstration and allow time for practice.

CONFIRMATION OF TEACHING POINT 1

Cadets will adopt the position of attention as a squad.

Teaching Point 2	Adopting the Position of Stand at Ease From Attention
Time: 5 min	Method: Demonstration and Performance

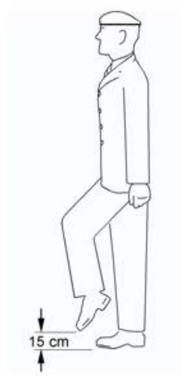
DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

The position of standing at ease is an intermediate position between attention and standing easy. It allows no relaxation, but can be maintained without strain for a longer time than the position of attention.

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)

For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

On the command STAND AT EASE BY NUMBERS, SQUAD – ONE, the cadet shall bend the left knee.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-3 Squad One – Stand at Ease

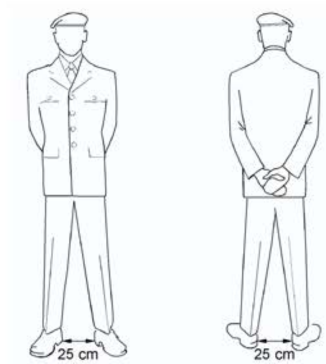
PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT (SECOND NUMBER)

On the command SQUAD – TWO, the cadet shall:

1. carry the left foot to the left, straightening it in double time, and place it smartly flat on the ground with the inside of the heels 25 cm apart;
2. simultaneously, with a quick motion, bring the arms behind the back, stretched to their full extent, and place the back of the right hand in the palm of the left, with thumbs crossed right over left, the fingers together and extended; and
3. balance the body with the weight evenly distributed on both feet.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-4 The Position of Stand at Ease

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command STAND AT – EASE, combine the two movements. The timing is "one."

The instructor(s) shall provide a full demonstration and allow time for practice.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

CONFIRMATION OF TEACHING POINT 2

Cadets will adopt the position of stand at ease as a squad.

END OF LESSON CONFIRMATION

The confirmation for this lesson should consist of the cadets, as a squad, practicing the positions of attention, stand at ease and stand easy, and should emphasize movements that cadets showed difficulty with during the class.

Practice the complete movement, with the:

- **instructor** calling the time;
- **squad** calling the time; and
- squad **judging** the time.

CONCLUSION

HOMEWORK/READING/PRACTICE

Drill movements are skills that must be practiced individually, in order to make the cadet more proficient as a member of a unit. Cadets are encouraged to practice the movements, as opportunities are made available. Ongoing feedback will be provided, and should be heeded during any drill practice.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and in the execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill that is well rehearsed, closely supervised and precise, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – MOVEMENT OF STAND EASY FROM STAND AT EASE, AND STAND AT EASE FROM STAND EASY

A-CR-CCP-801/PG-001

EO M108.01 – ADOPT THE POSITIONS OF ATTENTION, STAND AT EASE, AND STAND EASY

1. **Performance.** Adopt the Positions of Attention, Stand at Ease, and Stand Easy.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall perform the following individual drill movements:

   a. stand easy from stand at ease; and

   b. stand at ease from stand easy

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate the movement of stand easy from stand at ease and allow cadets to practice.	Demonstration and Performance	5 min	A0-002 (pp. 2-2 to 2-8)
TP2	Explain and demonstrate the movement of stand at ease from stand easy and allow cadets to practice.	Demonstration and Performance	5 min	A0-002 (pp. 2-2 to 2-8)

5. **Time**

a.	Introduction/Conclusion:	5 min
b.	Demonstration and Performance:	10 min
c.	Total:	15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

A-CR-CCP-801/PG-001

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 1

EO M108.01 – ADOPT THE POSITIONS OF ATTENTION, STAND AT EASE AND STAND EASY

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words “crack”, “drive”, “seize” and “grasp” suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

A-CR-CCP-801/PF-001

IMPORTANCE

As members of the Canadian Cadet Movement (CCM) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCM depends on.

Teaching Point 1	**Adopting the Position of Stand Easy**
Time: 5 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

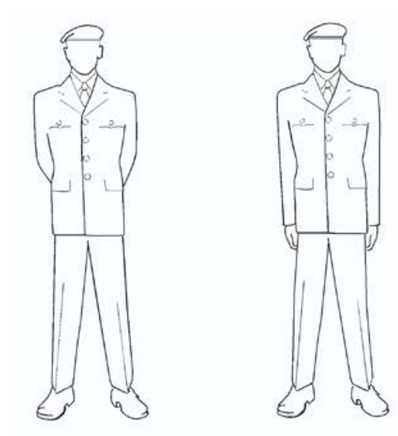
The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

The position of stand easy is ordered when it is desirable to permit cadets to relax. This command is only given when the squad is in the position of stand at ease.

On the command STAND – EASY, the cadet shall:

1. close the hands and bring the arms to the position of attention; and
2. relax.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-1 Stand Easy From Stand at Ease

When standing easy, the cadet may, with permission, move all but the feet and adjust clothing and equipment, but shall not talk.

PRACTICE THE COMPLETE MOVEMENT WITH TIMING

Practice the squad on the first movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

Combine the preceding movements with timing. The instructor(s) shall provide a full demonstration and allow time for practice.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

CONFIRMATION OF TEACHING POINT 1

Cadets will adopt the position of stand easy as a squad.

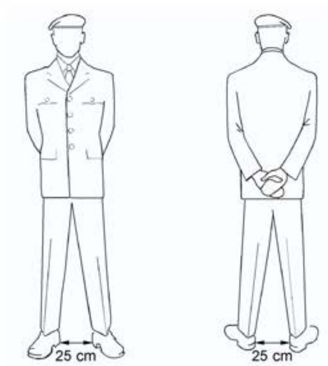
Teaching Point 2	**Adopting the Position of Stand at Ease From Standing Easy**
Time: 5 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

In order to adopt the position of stand at ease from easy the cadet shall, on the cautionary command SQUAD (or formation title), assume the position of stand at ease.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-1-2 The Position of Stand at Ease

This teaching point is best taught as a group practice to ensure adherence to timings and togetherness of the squad.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

CONFIRMATION OF TEACHING POINT 2

Cadets will adopt the position of stand at ease as a squad.

END OF LESSON CONFIRMATION

The confirmation for this lesson should consist of the cadets, as a squad, practicing the positions of attention, stand at ease and stand easy, and should emphasize movements that cadets showed difficulty with during the class.

Practice the complete movement, with the:

- **instructor** calling the time;
- **squad** calling the time; and
- squad **judging** the time.

CONCLUSION

HOMEWORK/READING/PRACTICE

Drill movements are skills that must be practiced individually, in order to make the cadet more proficient as a member of a unit. Cadets are encouraged to practice the movements, as opportunities are made available. Ongoing feedback will be provided, and should be heeded during any drill practice.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and in the execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill that is well rehearsed, closely supervised and precise, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – SALUTE TO THE FRONT

A-CR-CCP-801/PG-001

EO M108.02 – EXECUTE A SALUTE AT THE HALT WITHOUT ARMS

1. **Performance.** Execute a Salute at the Halt Without Arms.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall execute salutes at the halt without arms, to the front.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate saluting to the front at the halt and allow cadets to practice.	Demonstration and Performance	10 min	A0-002 (pp. 2-10 to 2-12)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 2

EO M108.02 – EXECUTE A SALUTE AT THE HALT WITHOUT ARMS

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words "crack", "drive", "seize" and "grasp" suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to execute a salute at the halt without arms.

IMPORTANCE

As members of the Canadian Cadet Organization (CCO) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCO depends on.

Teaching Point 1	**Execute a Salute to the Front**
Time: 10 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

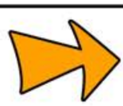
Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

The salute is given with the right hand. When physical incapacity or carrying of articles makes a salute with the right hand impracticable, compliments will be paid by turning the head and eyes to the left or right or standing to attention, as appropriate (see also A-PD-201-000/PT-000, Chapter 1, Section 2).

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)



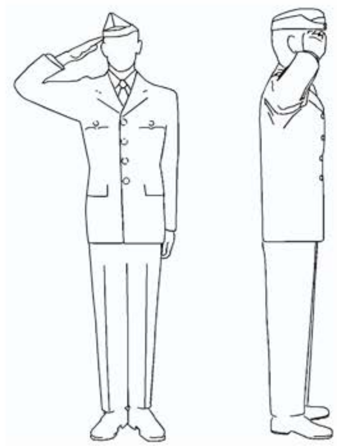
For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

On the command TO THE FRONT SALUTE BY NUMBERS, SQUAD – ONE, the cadet shall:

1. bend the right elbow and open the palm of the right hand as it passes the shoulder; and
2. force the right hand by its shortest route to the front of the headdress so that the:
   a. palm of the hand is facing down;
   b. thumb and fingers are fully extended and close together;
   c. tip of the second finger is in line with the outside of the right eyebrow and touching the outside edge of the headdress or arm of glasses, if worn;
   d. hand, wrist and forearm are in a straight line and at a 45-degree angle to the upper arm;

e. elbow is in line with the shoulders; and

f. upper arm is parallel to the ground.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-2-1 Saluting to the Front Without Arms

PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT

On the command SQUAD – TWO, the hand is:

1. brought sharply to the position of attention by the shortest route, without slapping the thigh; and
2. closed after the forearm is lowered below shoulder level.

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command TO THE FRONT – SALUTE, the two movements are combined. The standard pause shall be observed between movements.

The instructor(s) shall provide a full demonstration and allow time for practice.

Note: When wearing headdress, other than a cap with a peak, the second finger is 2 cm above and in line with the outer tip of the right eyebrow.

Standard Pause: The standard pause between each movement is two beats in quick time. For example, on the command MOVE TO THE RIGHT IN FILE, RIGHT – TURN, the squad:

1. executes the first movement of the turn on the executive order and simultaneously calls out "ONE";
2. after completing the first movement, calls "TWO", "THREE" while observing the standard pause; and
3. when executing the final movement, calls out "ONE".

CONFIRMATION OF TEACHING POINT 1

Cadets will execute salutes to the front as a squad.

END OF LESSON CONFIRMATION

The cadets' participation in TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill, that is well rehearsed, closely supervised and precise, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – SALUTE TO THE RIGHT (LEFT)

A-CR-CCP-801/PG-001

EO M108.02 – EXECUTE A SALUTE AT THE HALT WITHOUT ARMS

1. **Performance.** Execute a Salute at the Halt Without Arms.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall execute salutes at the halt without arms, to the left, and right.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate saluting to the left and right at the halt and allow cadets to practice.	Demonstration and Performance	10 min	A0-002 (pp. 2-10 to 2-12)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 2

EO M108.02 – EXECUTE A SALUTE AT THE HALT WITHOUT ARMS

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words “crack”, “drive”, “seize” and “grasp” suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

A-CR-CCP-801/PF-001

OBJECTIVES

By the end of this lesson the cadet shall be expected to execute a salute at the halt without arms.

IMPORTANCE

As members of the Canadian Cadet Organization (CCO) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCO depends on.

Teaching Point 1	**Execute a Salute to the Right (Left)**
Time: 10 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

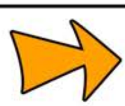
Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

The salute is given with the right hand. When physical incapacity or carrying of articles makes a salute with the right hand impracticable, compliments will be paid by turning the head and eyes to the left or right or standing to attention, as appropriate (see also A-PD-201-000/PT-000, Chapter 1, Section 2).

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)

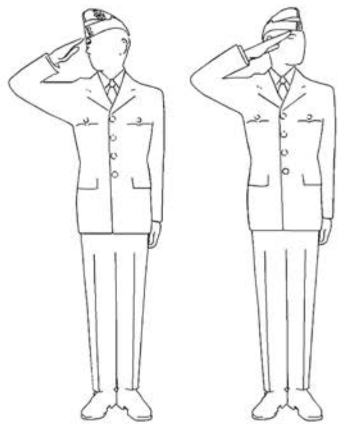


For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

On the command TO THE RIGHT (LEFT) SALUTE BY NUMBERS, SQUAD – ONE, saluting shall:

1. bend the right elbow and open the palm of the right hand as it passes the shoulder; and
2. force the right hand by its shortest route to the front of the headdress so that the:
    a. palm of the hand is facing down;
    b. thumb and fingers are fully extended and close together;
    c. tip of the second finger is in line with the outside of the right eyebrow and touching the outside edge of the headdress or arm of glasses, if worn;
    d. hand, wrist and forearm are in a straight line and at a 45 degree angle to the upper arm; and
    e. upper arm is parallel to the ground.

3. the head and eyes shall be turned smartly to the right (left) as far as possible without straining, remembering the following:
   a. when saluting to the left, the right hand, wrist and arm are brought further over to the left to the correct position in line with the outside edge of the right eyebrow; and
   b. when saluting to the right, the arm is moved to the rear, with the tip of the second finger remaining in line with the outside edge of the right eyebrow.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-2-2 Saluting to the Right and Left

PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT

On the command SQUAD – TWO, the hand is brought sharply to the position of attention, and simultaneously the head and eyes are turned smartly to the front.

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command TO THE RIGHT (LEFT) – SALUTE, the two movements are combined. The standard pause shall be observed between movements.

The instructor(s) shall provide a full demonstration and allow time for practice.

Standard Pause: The standard pause between each movement is two beats in quick time. For example, on the command MOVE TO THE RIGHT IN FILE, RIGHT – TURN, the squad:

1. executes the first movement of the turn on the executive order and simultaneously calls out "ONE";
2. after completing the first movement, calls "TWO", "THREE" while observing the standard pause; and
3. when executing the final movement, calls out "ONE".

CONFIRMATION OF TEACHING POINT 1

Cadets will execute salutes to the left and left as a squad.

END OF LESSON CONFIRMATION

The cadets' participation in TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill, that is well rehearsed, closely supervised and precise, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

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MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – RIGHT TURN AT THE HALT

A-CR-CCP-801/PG-001

EO M108.03 – EXECUTE TURNS AT THE HALT

1. **Performance.** Execute Turns at the Halt.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall perform the movement of right turn at the halt.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate the movement of right turn at the halt and allow cadets to practice.	Demonstration and Performance	10 min	A0-002 (pp. 2-12 to 2-13)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 3

EO M108.03 – EXECUTE TURNS AT THE HALT

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words "crack", "drive", "seize" and "grasp" suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

A-CR-CCP-801/PF-001

OBJECTIVES

By the end of this lesson the cadet shall be expected to execute right turns at the halt.

IMPORTANCE

As members of the Canadian Cadet Movement (CCM) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCM depends on.

Teaching Point 1	**Execute Right Turns**
Time: 10 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

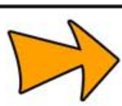
Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

Turns and inclines are made to change direction: right or left turns change direction by 90 degrees, about turns by 180 degrees, and right and left inclines (not instructed in this lesson) by 45 degrees.

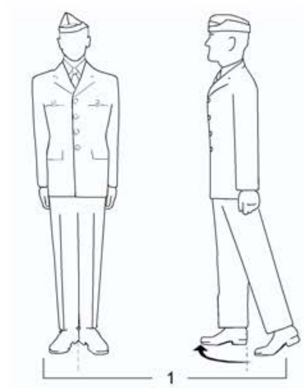
DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)



For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number.

The cadet shall execute a right turn, by:

On the command RIGHT TURN BY NUMBERS, SQUAD – ONE, turning 90 degrees to the right by pivoting on the right heel and left toe and raising the left heel and right toe simultaneously. Both knees will be kept braced during the turn, arms at the sides and body erect. On the completion of the movement, the weight of the body is placed on the right foot and the left leg is braced with the heel off the ground.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-1 Squad One – Right Turn at the Halt

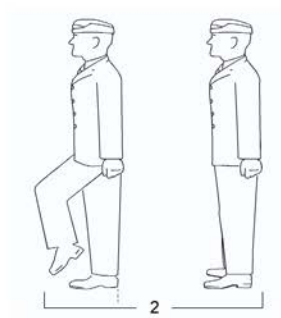
PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT

On the command SQUAD – TWO, the cadets shall bend the left knee, straightening it in double time and smartly placing the left foot beside the right to assume the position of attention.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-2 Squad Two – Right Turn at the Halt

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

A-CR-CCP-801/PF-001

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command RIGHT – TURN, combine the two movements. The standard pause shall be observed between the movements.

The instructor(s) shall provide a full demonstration and allow time for practice.

Standard Pause: The standard pause between each movement is two beats in quick time. For example, on the command MOVE TO THE RIGHT IN FILE, RIGHT – TURN, the squad:

1. executes the first movement of the turn on the executive order and simultaneously calls out "ONE";
2. after completing the first movement, calls "TWO", "THREE" while observing the standard pause; and
3. when executing the final movement, calls out "ONE".

CONFIRMATION OF TEACHING POINT 1

Cadets will execute right turns as a squad.

The cadets' participation in TP1 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and in the execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill that is well rehearsed, closely supervised and precice, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – LEFT TURN AT THE HALT

A-CR-CCP-801/PG-001

EO M108.03 – EXECUTE TURNS AT THE HALT

1. **Performance.** Execute Turns at the Halt.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall perform the movement of left turn at the halt.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate the movement of left turn at the halt and allow cadets to practice.	Demonstration and Performance	10 min	A0-002 (pp. 2-12 to 2-13)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

A-CR-CCP-801/PF-001

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

CADETS CANADA

SECTION 3

EO M108.03 – EXECUTE TURNS AT THE HALT

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words "crack", "drive", "seize" and "grasp" suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to execute turns at the halt.

IMPORTANCE

As members of the Canadian Cadet Movement (CCM) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCM depends on.

Teaching Point 1	Execute Left Turns
Time: 10 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

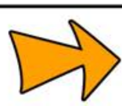
Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

Turns and inclines are made to change direction: right or left turns change direction by 90 degrees, about turns by 180 degrees, and right and left inclines (not instructed in this lesson) by 45 degrees.

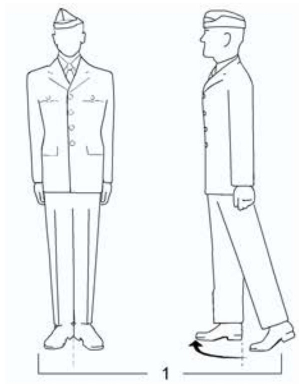
DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)



For ease of instruction, drill commands have been broken down into individual movements, or numbers. The instructor(s) shall demonstrate and explain each number

The cadet shall execute a left turn, by:

On the command LEFT TURN BY NUMBERS, SQUAD – ONE, turning 90 degrees to the left by pivoting on the left heel and right toe and raising the right heel and left toe simultaneously. Both knees will be kept braced during the turn, arms at the sides and body erect. On the completion of the movement, the weight of the body is placed on the left foot and the right leg is braced with the heel off the ground.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-1 Squad One – Turn at the Halt

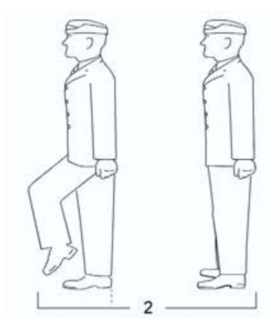
PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT (SECOND NUMBER)

On the command SQUAD – TWO, bend the right knee, straightening it in double time and smartly placing the right foot beside the left to assume the position of attention.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-2 Squad Two – Turn at the Halt

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command LEFT – TURN, combine the two movements. The standard pause shall be observed between the movements.

The instructor(s) shall provide a full demonstration and allow time for practice.

> **Standard Pause:** The standard pause between each movement is two beats in quick time. For example, on the command MOVE TO THE LEFT IN FILE, LEFT – TURN, the squad:
>
> 1. Executes the first movement of the turn on the executive order and simultaneously calls out "ONE".
> 2. After completing the first movement, calls "TWO", "THREE" while observing the standard pause.
> 3. When executing the final movement, calls out "ONE".

CONFIRMATION OF TEACHING POINT 1

Cadets will execute LEFT turns as a squad.

END OF LESSON CONFIRMATION

The cadets' participation in TP1 will serve as the confirmation of this lesson

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and in the execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill that is well rehearsed, closely supervised and precice, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

A-CR-CCP-801/PF-001

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – ABOUT TURN AT THE HALT

A-CR-CCP-801/PG-001

EO M108.03 – EXECUTE TURNS AT THE HALT

1. **Performance.** Execute Turns at the Halt.

2. **Conditions**

   a. Given:

      (1) words of command;

      (2) supervision; and

      (3) assistance as required.

   b. Denied: N/A.

   c. Environmental: A drill hall or, in favourable weather, an outdoor parade square.

3. **Standard.** In accordance with A-PD-201-000/PT-000, the cadet shall perform the movement of about turn at the halt.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain and demonstrate the movement of about turn at the halt and allow cadets to practice.	Demonstration and Performance	10 min	A0-002 (pp. 2-12 to 2-13)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Demonstration and Performance: 10 min

   c. Total: 15 min

6. **Substantiation.** The demonstration-performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

7. **References.** A0-002 A-PD-201-000/PT-000 DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial*. Ottawa, ON: The Department of National Defence.

8. **Training Aids.** Assistant instructors as required.

9. **Learning Aids.** N/A.

10. **Test Details.** There is no formal assessment of this EO. Instructors will confirm the cadets' ability to perform the movements during the end of lesson check, and ongoing feedback will be provided during future drill practices, weekly parade nights, and ceremonial parades.

11. **Remarks.** N/A.

COMMON TRAINING

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 3

EO M108.03 – EXECUTE TURNS AT THE HALT

Total Time:	15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

A complete list of resources needed for the instruction of this EO is located at Chapter 4 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material; and
- select the most effective squad formation for the lesson being taught. A squad may be in a single rank, hollow square or semi-circle for elementary drill instruction. (Note: All cadets **must** be able to fully observe all demonstrations and explanations.)

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

This lesson will be presented using the demonstration and performance method. The demonstration and performance method was chosen to allow cadets to participate in supervised exploration of practical instructional material. This method provides the instructor the opportunity to introduce the subject matter, demonstrate and explain procedures, and supervise the cadets while they imitate the skill. This method appeals to all learning styles.

> The instructor shall develop and use a vocabulary of short, concise words to impress on the squad that the movements must be performed smartly. For example, the words “crack”, “drive”, “seize” and “grasp” suggest the degree of smartness required. Profanity or personal sarcasm shall never be used.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to execute turns at the halt.

IMPORTANCE

As members of the Canadian Cadet Movement (CCM) cadets will be required to perform drill movements at a competent level, developing sharpness, esprit de corps, physical coordination, and alertness. These movements will be executed with ease and without hesitation. Ensuring that the cadets efficiently move together as one will promote discipline, alertness, precision, pride, steadiness, and cohesion. This develops the basis of teamwork that the CCM depends on.

Teaching Point 1	**Execute About Turns**
Time: 10 min	Method: Demonstration and Performance

DEMONSTRATE THE COMPLETE MOVEMENT WITH TIMING

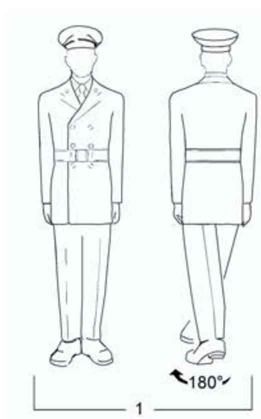
Instructors are reminded that they are to present the example with regards to drill, from the moment they step onto the parade square. Proper drill movements, combined with a professional demeanour, are of paramount importance, and must be exemplified throughout the period of instruction.

The instructor shall provide a complete demonstration of the drill movement, with timing. A practiced assistant instructor may carry out this demonstration.

The demonstration shall be provided from various vantage points, as required.

DEMONSTRATE FIRST PART OF MOVEMENT (FIRST NUMBER)

On the command ABOUT TURN BY NUMBERS, SQUAD – ONE, turning 180 degrees to the right by pivoting on the right heel and left toe and raising the left heel and right toe simultaneously. Both knees will be kept braced during the turn, arms at the sides and body erect. On the completion of the movement, the weight of the body is placed on the right foot and the left leg is braced with the heel off the ground.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-3 Squad One – About Turn at the Halt

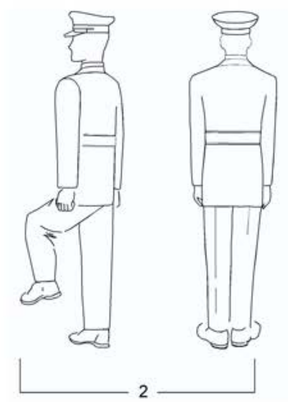
PRACTICE THE SQUAD ON THE FIRST MOVEMENT

Practice the squad on the first movement collectively, individually and collectively.

Constant checking and correcting of all faults is essential. Faults shall be corrected immediately after they occur.

DEMONSTRATE AND EXPLAIN THE SECOND PART OF THE MOVEMENT

On the command SQUAD – TWO, bending the left knee, straightening it in double time and smartly placing the left foot beside the right to assume the position of attention.



A-PD-201-000/PT-000, The Canadian Forces Manual of Drill and Ceremonial, 2001

Figure 8-3-4 Squad Two – About Turn at the Halt

PRACTICE THE SQUAD ON THE SECOND MOVEMENT

Practice the squad on the second movement collectively, individually and collectively.

GIVE TWO COMPLETE AND FINAL DEMONSTRATIONS

On the command ABOUT – TURN, combine the two movements. The standard pause shall be observed between the movements.

The instructor(s) shall provide a full demonstration and allow time for practice.

Standard Pause: The standard pause between each movement is two beats in quick time. For example, on the command ABOUT – TURN, combine the two movements. The standard pause shall be observed between the movements:

1. Executes the first movement of the turn on the executive order and simultaneously calls out "ONE".
2. After completing the first movement, calls "TWO", "THREE" while observing the standard pause.
3. When executing the final movement, calls out "ONE".

CONFIRMATION OF TEACHING POINT 1

Cadets will execute about turns as a squad.

END OF LESSON CONFIRMATION

The cadets' participation in TP1 will serve as the confirmation of this lesson

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

In accordance with A-PD-201-000/PT-000, *The Canadian Forces Manual of Drill and Ceremonial*, the cadet shall participate in an Annual Ceremonial Review (ACR) parade. This movement will be used in preparation for, and in the execution of, the ACR parade.

CLOSING STATEMENT

The hallmarks of cadet drill are efficiency, precision, and dignity. These qualities are developed through self-discipline and practice. They lead to unit pride and cohesion. Good drill that is well rehearsed, closely supervised and precice, is an exercise in obedience and alertness. It sets the standard for the execution of any duty, both for the individual and the unit, and builds a sense of confidence between commander and subordinate that is essential to high morale. The personal qualities developed on the parade ground must be maintained in all aspects of life.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A0-002 A-PD-201-000/PT-000, DHH 3-2. (2001). *The Canadian Forces Manual of Drill and Ceremonial.* Ottawa, ON: The Department of National Defence.

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DRILL INSTRUCTIONAL TECHNIQUES – ASSESSMENT FORM

Cadet's Name: ______________________________ Flight: ______________________________

Lesson Topic: ______________________________

CRITERIA	COMMENTS	Incomplete	Completed With Difficulty	Completed Without Difficulty
PREPARATION				
Maintained dress and deportment.				
Selected an appropriate squad formation.				
Used a lesson plan.				
Reviewed previous lesson.				
INTRODUCTION				
Stated what the cadets will learn.				
Stated why it is important.				
Stated where/when this skill will be applied.				
BODY				
Demonstrated complete movement, calling the time.				
Demonstrated and explained the first part of the movement (Squad 1).				
Had the squad practice the first part of the movement collectively, individually and collectively again.				
Taught the second part of the movement and each subsequent part in the same manner.				
Gave two complete demonstrations.				

CRITERIA	COMMENTS	Incomplete	Completed With Difficulty	Completed Without Difficulty
Practiced the complete movement with: • the instructor calling the time, • the cadets calling the time, and • the cadets judging the time.				
Used clear words of command and correct pauses.				
Gave appropriate and immediate feedback.				
Allowed questions after each movement.				
END OF LESSON CONFIRMATION				
Demonstrated the movement taught.				
Confirmation was conducted as a squad.				
Emphasized aspects of the movement with which the cadets experienced difficulty.				
CONCLUSION				
Summarized the lesson.				
Re-motivated the cadets.				
FEEDBACK				

Assessor's Signature

Date

Cadet's Signature

CHAPTER 10

PO 311 – PARTICIPATE IN A RECREATIONAL SUMMER BIATHLON ACTIVITY

COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO C311.01 – PRACTICE AIMING AND FIRING THE CADET AIR RIFLE FOLLOWING PHYSICAL ACTIVITY

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to review aiming and firing techniques.

A practical activity was chosen for TPs 3 to 6 as it is an interactive way to allow the cadets to experience aiming and firing the cadet air rifle following physical activity.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have practiced aiming and firing the cadet air rifle following physical activity.

IMPORTANCE

It is important for cadets to practice aiming and firing the cadet air rifle following physical activity because these skills are essential to summer biathlon training.

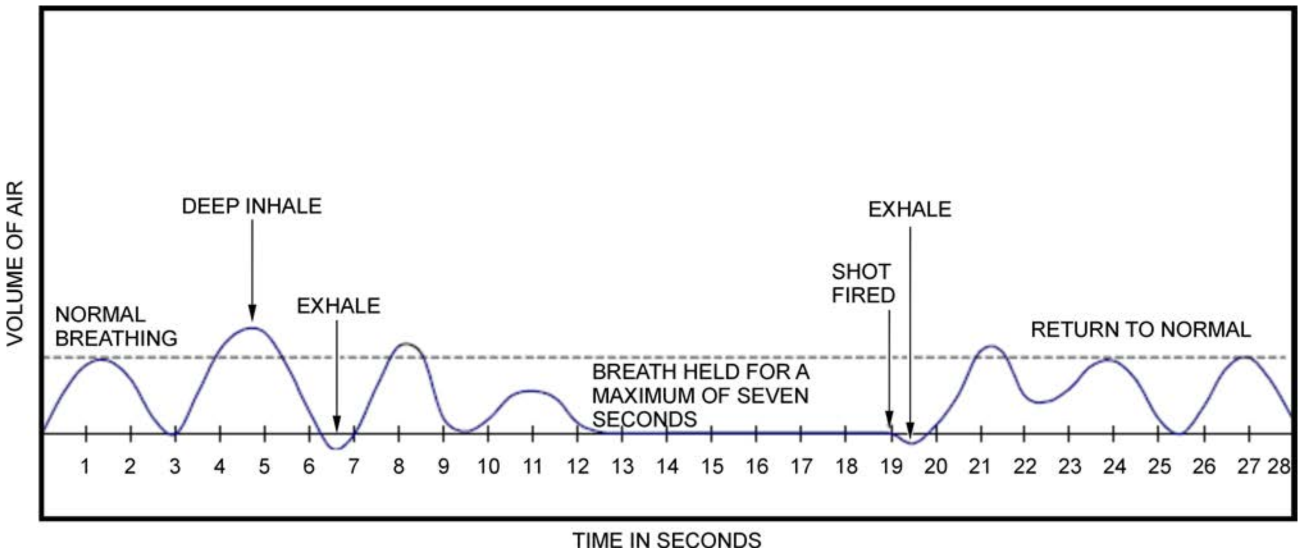
Teaching Point 1 | **IAW EO C206.02 (Practice Aiming Techniques, A-CR-CCP-802/PF-001, Chapter 6, Section 3), Review Breathing Techniques**

Time: 5 min | Method: Interactive Lecture

Breathing supplies the blood stream with oxygen and eliminates waste elements (such as carbon dioxide) from the blood. While breathing, the oxygen inhaled is used to supply muscles with energy, ensuring optimal potential of the muscles. Just like in sports, controlled breathing can affect marksmanship outcomes.

CONTROLLED BREATHING

Once a stable prone position is established, integrate the principles of controlled breathing. For maximum stability when firing, hold the breath for five to seven seconds. It is very important not to hold the breath for more than seven seconds, as tension will increase in the chest, muscles will lack oxygen and stability will be reduced. When the body lacks oxygen, muscles will quiver and eyesight will be negatively affected.



A-CR-CCP-177/PT-001 (p. 1-5-9)

Figure 10-1-1 Marksmanship Breathing Cycle

ACHIEVING A CONTROLLED BREATHING SEQUENCE

The following is the recommended method for achieving a controlled breathing sequence:

1. Adopt the prone position.
2. Relax and breathe normally.
3. Obtain a sight picture.
4. Inhale and exhale deeply.
5. Inhale deeply and exhale normally.
6. Relax the chest muscles, hold a breath for five to seven seconds and squeeze the trigger.
7. Exhale completely and resume normal breathing.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Breathing supplies the blood stream with what?

Q2. Oxygen supplies what with energy?

Q3. For how long should the breath be held while firing?

ANTICIPATED ANSWERS

A1. Oxygen.

A2. The muscles.

A3. Five to seven seconds.

Teaching Point 2 — **IAW EO C206.03 (Practice Firing Techniques, A-CR-CCP-802/PF-001, Chapter 6, Section 4), Review Natural Sight Alignment**

Time: 5 min — Method: Interactive Lecture

Natural alignment describes the direction that the cadet air rifle is aimed when the marksman is in the prone position with the cadet air rifle at the ready. When in a comfortable position, the cadet air rifle should not be forced to point at the target. Even with a perfect prone position and sight alignment, forcing the air rifle can cause muscle tension and will affect the accuracy of each shot.

Natural alignment is obtained by:

1. adopting a comfortable prone position;
2. acquiring a sight picture;
3. closing both eyes;
4. taking several normal breaths to relax the muscles;
5. looking through sights when comfortable;
6. adjusting body position until a proper sight picture is achieved; and
7. proceeding to fire.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is natural alignment?

Q2. What can happen if the air rifle is forced to point at the target?

Q3. What is the first step to obtaining natural alignment?

ANTICIPATED ANSWERS

A1. The direction that the cadet air rifle is aimed when the marksman is in the prone position with the cadet air rifle at the ready.

A2. Forcing the air rifle can cause muscle tension and will affect the accuracy of each shot.

A3. Adopting a comfortable prone position.

Teaching Point 3	Conduct a Warm-Up Session, Composed of Light Cardiovascular Exercises
Time: 5 min	Method: Practical Activity

The following information will be explained to the cadets during the warm-up session.

PURPOSE OF A WARM-UP

A warm-up session is composed of stretches and light cardiovascular exercises designed to:

- stretch the muscles;
- gradually increase respiratory action and heart rate;
- expand the muscles' capillaries to accommodate the increase in blood circulation which occurs during physical activity; and
- raise the muscle temperature to facilitate reactions in muscle tissue.

GUIDELINES FOR STRETCHING

The following guidelines should be followed while stretching to prepare for physical activity and to help prevent injury:

- Stretch all major muscle groups, including the back, chest, legs, and shoulders.
- Never bounce while stretching.
- Hold each stretch for 10 to 30 seconds to let the muscles release fully.
- Repeat each stretch two to three times.
- When holding a stretch, support the limb at the joint.
- Static stretching, which is stretching a muscle and holding it in position without discomfort for 10 to 30 seconds, is considered the safest method.
- Stretching helps to relax the muscles and improve flexibility, which is the range of motion in the joints.
- As a guide, allow 10 minutes to warm up for every hour of physical activity.

The stretches chosen should focus on the areas of the body that will be used the most during the physical activity.

ACTIVITY

OBJECTIVE

The objective of this warm-up activity is to stretch the muscles and perform light cardiovascular exercises to prepare the body for physical activity and to help prevent injuries.

RESOURCES

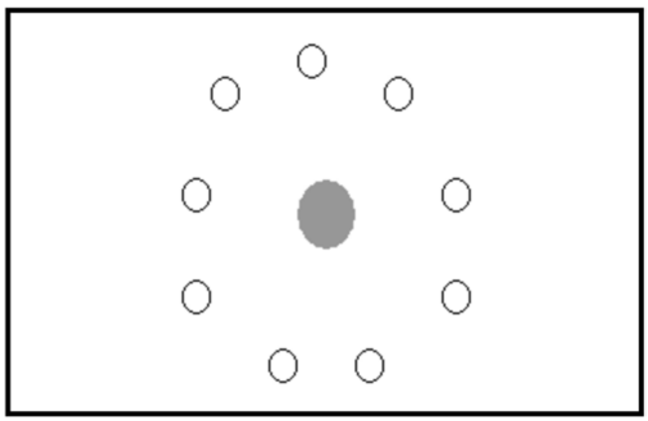
N/A.

ACTIVITY LAYOUT

N/A.

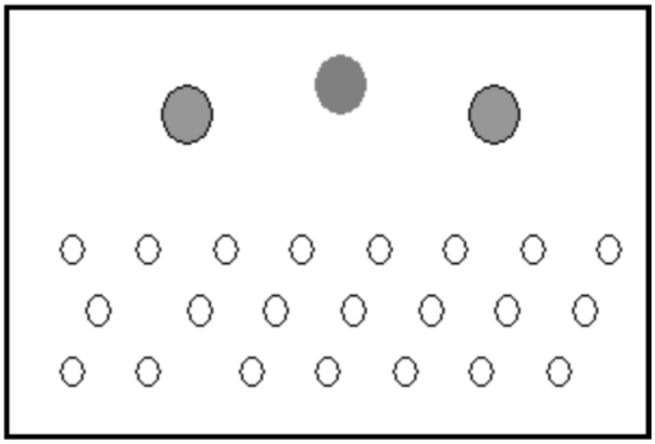
ACTIVITY INSTRUCTIONS

1. Arrange the cadets in either a warm-up circle or in rows (as illustrated in Figures 10-1-2 and 10-1-3).



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 10-1-2 Instructor in the Centre of a Warm-Up Circle



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 10-1-3 Instructor at the Front With Two Assistant Instructors

2. Demonstrate before having the cadets attempt each stretch/light cardiovascular exercise.
3. Assistant instructors may help demonstrate the exercises and ensure the cadets are performing them correctly.
4. Have cadets perform each stretch/light cardiovascular exercise.

Light cardiovascular exercises should be done to warm up the muscles prior to stretching to avoid injury to or tearing of the muscles. For example, running on the spot for 30 seconds or performing jumping jacks should be performed prior to conducting the stretches located at Annex A.

SAFETY

- Ensure there are at least two arm lengths between the cadets so they can move freely.
- Ensure the cadets perform the stretches and light cardiovascular exercises in a safe manner, following the guidelines for stretching listed in this TP.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the warm-up session will serve as the confirmation of this TP.

Teaching Point 4	**Conduct an Activity Where the Cadets Will Aim and Fire the Cadet Air Rifle Following Physical Activity**
Time: 60 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets aim and fire the cadet air rifle following physical activity, practicing breathing techniques and natural alignment.

RESOURCES

- Cadet air rifles (one per firing lane),
- Safety glasses/goggles (two per firing lane),
- Shooting mats (two per firing lane),
- Biathlon Air Rifle Targets (BARTs) (one per firing lane), and
- Coins (one per firing lane).

If resources are available, the number of firing lanes may be increased.

ACTIVITY LAYOUT

A range IAW A-CR-CCP-177/PT-001, Part 1, Section 8.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Have one cadet from each pair run or participate in some sort of activity to elevate their heart rate for five to ten minutes.
3. Have the same cadet from each pair approach the firing point and prepare to fire.
4. Have the cadet adopt the prone position and their partner balance a coin on the barrel of the cadet air rifle, just behind the front sight.
5. While practicing a controlled breathing sequence and natural alignment, the cadet shall dry fire the cadet air rifle while keeping the coin balanced.
6. Circulate throughout the training area and coach the cadets on their breathing techniques and natural alignment.
7. Have the cadets switch positions and repeat Steps 2. to 5. until the activity time is complete.

SAFETY

Range activities will be conducted IAW A-CR-CCP-177/PT-001.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 5 — **Conduct a Cool-Down Session, Composed of Light Cardiovascular Exercises**

Time: 5 min — Method: Practical Activity

The following information will be explained to the cadets during the cool-down session.

PURPOSE OF A COOL-DOWN

A cool-down is composed of stretches and light cardiovascular exercises designed to:

- allow the body time to slowly recover from physical activity and to help prevent injury;
- prepare the respiratory system to return to its normal state; and
- stretch the muscles to help relax and restore them to their resting length.

The stretches chosen should focus on the areas of the body that were used the most during the sports activity.

ACTIVITY

OBJECTIVE

The objective of the cool-down is to stretch the muscles and perform light cardiovascular exercises that allow the body time to recover from physical activity, and to prevent injury.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Arrange the cadets in either a warm-up circle or in rows (as illustrated in Figures 10-1-2 and 10-1-3).
2. Demonstrate before having the cadets attempt each stretch/light cardiovascular exercise.
3. Assistant instructors may help demonstrate the movements and ensure the cadets are performing them correctly.
4. Have cadets perform each stretch/light cardiovascular exercise.

SAFETY

- Ensure there are at least two arm lengths between the cadets so they can move freely.

- Ensure the cadets perform the stretches and light cardiovascular exercises in a safe manner, following the guidelines for stretching listed in TP 3.

CONFIRMATION OF TEACHING POINT 5

The cadets’ participation in the cool-down session will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in the activity in TP 4 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to use breathing techniques and natural alignment while firing following physical activity may help to improve marksmanship skills for summer biathlon.

INSTRUCTOR NOTES/REMARKS

This lesson shall be taught prior to conducting EO C311.02 (Participate in a Recreational Summer Biathlon Activity, Section 2).

REFERENCES

A0-027 A-CR-CCP-177/PT-001 Director Cadets 3. (2001). *Canadian Cadet Movement: Cadet Marksmanship Program Reference Manual*. Ottawa, ON: Department of National Defence.

C0-002 (ISBN 0-88962-630-8) LeBlanc, J., & Dickson, L. (1997). *Straight Talk About Children and Sport: Advice for Parents, Coaches, and Teachers*. Oakville, ON: Mosaic Press.

C0-089 (ISBN 0-936070-22-6) Anderson, B. (2000). *Stretching: 20th Anniversary* (Rev. ed.). Bolinas, CA: Shelter Publications, Inc.

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COMMON TRAINING

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO C311.02 – PARTICIPATE IN A RECREATIONAL SUMMER BIATHLON ACTIVITY

Total Time:	180 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Ensure that all members involved in conducting this activity are familiar with the competition guidelines located at Annex B.

Set up a first aid station.

Set up a running route of 1000 m.

Set up a range IAW A-CR-CCP-177/PT-001, Part 1, Section 8 .

Photocopy Annexes C, D and E.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way for the cadets to participate in recreational summer biathlon. This activity contributes to the development of biathlon skills and knowledge, and promotes physical fitness in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have participated in a recreational summer biathlon activity.

IMPORTANCE

It is important for the cadets to participate in a recreational summer biathlon activity because it requires personal discipline, develops marksmanship skills and promotes physical fitness.

Teaching Point 1 | **Explain the Components of a Recreational Summer Biathlon Activity**

Time: 10 min | Method: Practical Activity

Describe the components of the recreational summer biathlon activity. Ensure that the cadets understand the course layout, rules and regulations, scoring, penalties and out of bound areas before the activity is conducted. The cadets should be made aware of the start area, the course, the firing range and the finish area.

COMPOSITION

Cadets will be divided into teams for the summer biathlon activity. For a group of 25 cadets, the cadets should be divided into groups of five.

COURSE LAYOUT

Each cadet will:

- run a route of approximately 1000 m;
- fire five to eight rounds in an effort to knock down all five targets on the biathlon air rifle target (BART);
- run a second route of approximately 1000 m;
- fire five to eight rounds in an effort to knock down all five targets on the BART;
- run a third route of approximately 1000 m; and
- finish the race.

The 1000 m route should be clearly marked prior to the start of this lesson.

RULES AND REGULATIONS

Rules and regulations for the recreational summer biathlon activity include the following:

- The cadets must remain in their own teams throughout the activity.
- The cadets must use the same firing lane for the duration of the activity.
- The run must be completed in the proper sequence and on the marked route.
- Cadet air rifles must be placed at the firing point by the range staff and will remain there for the duration of the activity.
- All firing will be done in the prone position.
- The cadet air rifle must be made safe upon completion of firing.

- An inoperable cadet air rifle will be replaced by the range staff, the target will be reset, and the cadet will fire five to eight rounds with the new cadet air rifle.
- Safety infractions will result in time penalties.
- Missed targets will result in time penalties.

SCORING

The team's final score is determined by adding the total time for all run routes plus any penalties issued. The team with the lowest final score is considered the winning team.

Scoring will be calculated as follows:

- **Time.** The team's final time is the time from the start to finish, and any penalties.
- **Targets.** For each relay of firing, the number of hit and missed targets will be recorded on the range recording sheet by the lane scorekeeper (located at Annex C). There is no positive point value for each hit target; competitors will be deducted points for each missed target.

PENALTIES

The following penalties will be added to the team's time:

- Each violation of the principles of fair play or good sportsmanship will result in a one-minute penalty, to include:
  - not giving way in an area of congestion;
  - pushing or shoving;
  - using profanity; and
  - interfering with other competitors.
- Each missed target will result in a 10-second penalty.
- Each safety infraction on the firing point will result in a two-minute penalty, to include:
  - not keeping control of the cadet air rifle;
  - moving forward of the firing point; and
  - intentionally firing rounds at objects other than the BART.
- Each team member that does not cross the finish line will receive a two-minute penalty.

OUT OF BOUNDS AREAS

Make cadets aware of all out of bounds areas and safety considerations depending on the training area.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are two rules/regulations for this recreational summer biathlon activity?

Q2. How will the recreational summer biathlon activity be scored?

Q3. What is one violation of the principles of fair play/good sportsmanship?

ANTICIPATED ANSWERS

A1. Rules and regulations for the recreational summer biathlon activity include the following:

- The cadets must remain in their own teams throughout the activity.
- The cadets must use the same firing lane for the duration of the activity.
- The run must be completed in the proper sequence and on the marked route.
- Cadet air rifles must be placed at the firing point by the range staff and will remain there for the duration of the activity.
- All firing will be done in the prone position.
- The cadet air rifle must be made safe upon completion of firing.
- An inoperable cadet air rifle will be replaced by the range staff, the target will be reset, and the cadet will fire five to eight rounds with the new rifle.
- Safety infractions will result in time penalties.
- Missed targets will result in time penalties.

A2. The activity will be scored based on time and penalties.

A3. Violations of the principles of fair play/good sportsmanship include:

- not giving way in an area of congestion;
- pushing or shoving;
- using profanity; and
- interfering with other competitors.

Teaching Point 2	Conduct a Warm-Up Session Composed of Light Cardiovascular Exercises
Time: 10 min	Method: Practical Activity

The following information will be explained to the cadets during the warm-up session.

PURPOSE OF A WARM-UP

A warm-up session is composed of stretches and light cardiovascular exercises designed to:

- stretch the muscles;
- gradually increase respiratory action and heart rate;
- expand the muscles' capillaries to accommodate the increase in blood circulation which occurs during physical activity; and
- raise the muscle temperature to facilitate reactions in muscle tissue.

GUIDELINES FOR STRETCHING

The following guidelines should be followed while stretching to prepare for physical activity and to help prevent injury:

- Stretch all major muscle groups, including the back, chest, legs, and shoulders.
- Never bounce while stretching.
- Hold each stretch for 10 to 30 seconds to let the muscles release fully.
- Repeat each stretch two to three times.
- When holding a stretch, support the limb at the joint.
- Static stretching, which is stretching a muscle and holding it in position without discomfort for 10 to 30 seconds, is considered the safest method.
- Stretching helps to relax the muscles and improve flexibility, which is the range of motion in the joints.
- As a guide, allow 10 minutes to warm up for every hour of physical activity.

The stretches chosen should focus on the areas of the body that will be used the most during the physical activity.

ACTIVITY

OBJECTIVE

The objective of this warm-up activity is to stretch the muscles and perform light cardiovascular exercises to prepare the body for physical activity and to help prevent injuries.

RESOURCES

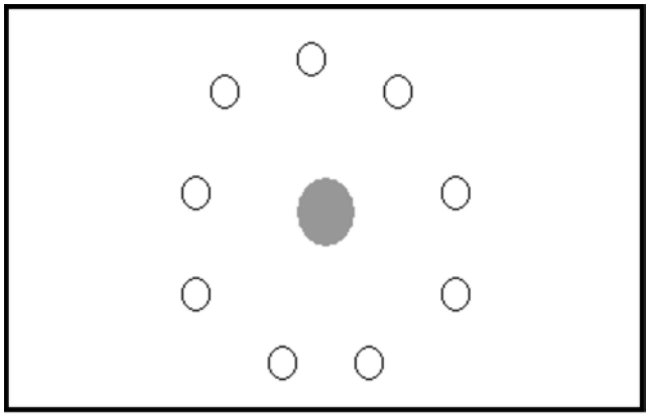
N/A.

ACTIVITY LAYOUT

N/A.

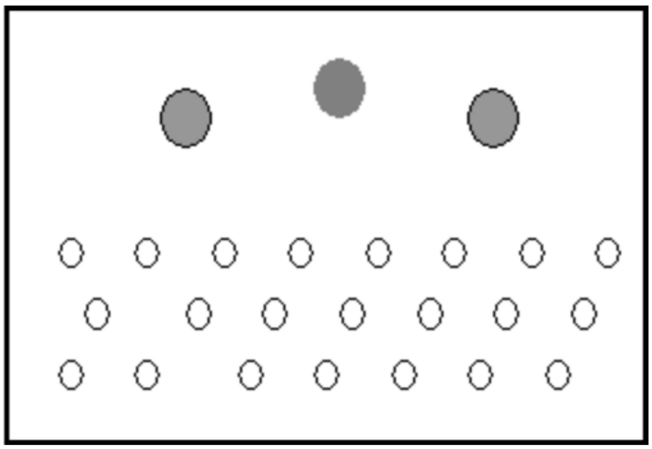
ACTIVITY INSTRUCTIONS

1. Arrange the cadets in either a warm-up circle or in rows (as illustrated in Figures 10-2-1 and 10-2-2).



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 10-2-1 Instructor in the Centre of a Warm-Up Circle



Director Cadets 3, 2006, Ottawa, ON: Department of National Defence

Figure 10-2-2 Instructor at the Front With Two Assistant Instructors

2. Demonstrate before having the cadets attempt each stretch/light cardiovascular exercise.

3. Assistant instructors may help demonstrate the exercises and ensure the cadets are performing them correctly.

4. Have cadets perform each stretch/light cardiovascular exercise.

Light cardiovascular exercises should be done to warm up the muscles prior to stretching to avoid injury to or tearing of the muscles. For example, running on the spot for 30 seconds or performing jumping jacks should be performed prior to conducting the stretches located at Annex A.

SAFETY

- Ensure there are at least two arm lengths between the cadets so they can move freely.
- Ensure the cadets perform the stretches and light cardiovascular exercises in a safe manner, following the guidelines for stretching listed in this TP.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the warm-up session will serve as the confirmation of this TP.

Teaching Point 3 **Conduct a Recreational Summer Biathlon Activity**

Time: 140 min Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets participate in a recreational summer biathlon activity.

RESOURCES

Based on 25 cadets per group, the equipment required to conduct the recreational summer biathlon activity shall include, but is not limited to, the following:

- Cadet air rifles (6),
- Shooting mats (10),
- Air rifle pellets (a minimum of 875 pellets),
- Container to hold pellets (5),
- Stopwatches (6),
- BART (5),
- Safety glasses/goggles (10),
- Notice board,
- Biathlon scoresheets located at Annex C,
- Course control sheets located at Annex D, and
- Range recording sheets located at Annex E.

ACTIVITY LAYOUT

- Set up a first aid station.
- Set up a running route of approximately 1000 m.
- Set up an air rifle range IAW A-CR-CCP-177/PT-001, Part 1, Section 8, with a minimum of five lanes for 25 cadets.
- Set up BARTs.
- Place two shooting mats per firing lane (a minimum of five firing lanes for 25 cadets).
- Place a cadet air rifle at each firing point.
- Place a pair of safety glasses/goggles at each firing point.

ACTIVITY INSTRUCTIONS

Activity instructions are located at Annex B.

SAFETY

- Ensure all range safety procedures are followed.
- Ensure cadets drink fluids and apply sunscreen.
- Ensure the running route is clearly marked and crossing points are monitored anywhere a road may be crossed.
- Ensure a first-aider is identified at the start of the activity and is available at all times.
- Ensure water is available for the cadets during and after the activity.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 4	**Conduct a Cool-Down Session Composed of Light Cardiovascular Exercises**
Time: 10 min	Method: Practical Activity

The following information will be explained to the cadets during the cool-down session.

PURPOSE OF A COOL-DOWN

A cool-down is composed of stretches and light cardiovascular exercises designed to:

- allow the body time to slowly recover from physical activity and to help prevent injury;
- prepare the respiratory system to return to its normal state; and
- stretch the muscles to help relax and restore them to their resting length.

The stretches chosen should focus on the areas of the body that were used the most during the sports activity.

ACTIVITY

OBJECTIVE

The objective of the cool-down is to stretch the muscles and perform light cardiovascular exercises that allow the body time to recover from physical activity, and to prevent injury.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Arrange the cadets in either a warm-up circle or in rows (as illustrated in Figures 10-2-1 and 10-2-2).
2. Demonstrate before having the cadets attempt each stretch/light cardiovascular exercise.
3. Assistant instructors may help demonstrate the movements and ensure the cadets are performing them correctly.
4. Have cadets perform each stretch/light cardiovascular exercise.

SAFETY

- Ensure there are at least two arm lengths between the cadets so they can move freely.
- Ensure the cadets perform the stretches and light cardiovascular exercises in a safe manner, following the guidelines for stretching listed in TP 1.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the cool-down session will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in a recreational summer biathlon activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Recreational summer biathlon is an activity that requires personal discipline, develops marksmanship skills and promotes physical fitness. Participation in a recreational summer biathlon activity may improve personal fitness level.

INSTRUCTOR NOTES/REMARKS

EO C311.01 (Practice Aiming and Firing the Cadet Air Rifle Following Physical Activity, Section 1) shall be taught prior to conducting this activity.

REFERENCES

A0-027 A-CR-CCP-177/PT-001 Director Cadets 3. (2001). *Cadet Marksmanship Program: Reference Manual*. Ottawa, ON: Department of National Defence.

A0-036 Cadets Canada. (n.d.). *Canadian Cadet Movement: Biathlon Championship Series*. Ottawa, ON: Department of National Defence.

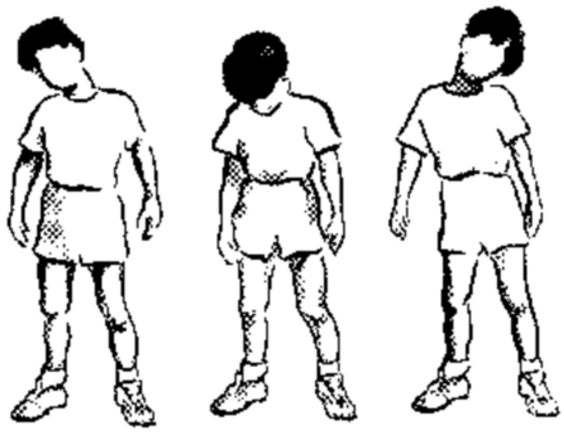
A0-098 Director Cadets 3. (2007). CATO 14-42, *Biathlon Common Program*. Ottawa, ON: Department of National Defence.

C0-002 (ISBN 0-88962-630-8) LeBlanc, J., & Dickson, L. (1997). *Straight Talk About Children and Sport: Advice for Parents, Coaches, and Teachers*. Oakville, ON: Mosaic Press.

C0-089 (ISBN 0-936070-22-6) Anderson, B. (2000). *Stretching: 20th Anniversary* (Rev. ed.). Bolinas, CA: Shelter Publications, Inc.

SAMPLE STRETCHES

a. Neck:

 *B. Hanson, Moving on the Spot: A Collection of 5 Minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 10A-1 Neck Stretch	Slowly roll your head across your chest from shoulder to shoulder. Do not roll your head backwards.

b. Shoulders:

 *B. Hanson, Moving on the Spot: A Collection of 5 Minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 10A-2 Shoulder Push	Stand and extend your arms behind you, interlocking your fingers. Push up and back with your shoulders. Hold this position for a minimum of 10 seconds.
 *B. Hanson, Moving on the Spot: A Collection of 5 Minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 10A-3 Shoulder Shrug	Stand and raise your shoulders as high as possible and then lower your shoulders, stretching your neck up. Pull your shoulders back as far as possible and then round your shoulders forward by pushing your shoulders forward as far as possible. Hold each position for a minimum of 10 seconds.
 *Warm Ups, by Martha Jefferson Hospital, Copyright 2001 by Martha Jefferson Hospital. Retrieved October 26, 2006, from http://www.marthajefferson.org/warmup.php* Figure 10A-4 Arm Circles	Hold your arms straight out, palms up. Make small circles with your arms, gradually increasing the size. Reverse the direction of your circles.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-5 Shoulder Stretch	Either standing or sitting, take your right arm in your left hand and bring it across your chest, supporting the joint by holding it behind the elbow. Pull lightly on the elbow towards your chest. You should feel the stretch in your right shoulder. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

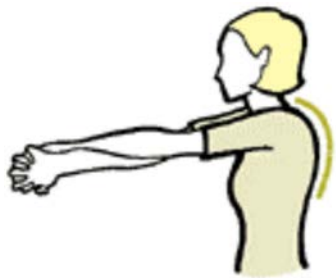
c. Arms:

 *Exercises. Copyright 1998 by Impacto Protective Products Inc. Retrieved October 26, 2006, from http://www.2protect.com/home.htm* Figure 10A-6 Wrist Rotations	Rotate your hands in circular motions at the wrist. Change direction and repeat on both sides.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-7 Triceps Stretch	Stand and bring your right arm over your head, bent at the elbow. Use your left hand to gently pull your arm down. Hold this position for a minimum of 10 seconds and repeat on the opposite side.
 *Exercise Programme for Squash, Tennis, Softball, Handball. Retrieved October 26, 2006, from http://www.physionline.co.za/conditions/article.asp?id=49* Figure 10A-8 Forearm Stretch	In a kneeling position, place your hands on the floor in front of you turned so that your fingers are pointing toward your knees, and your thumbs are pointing out. Keeping your hands flat on the floor, lean back. Hold this position for a minimum of 10 seconds.

d. Chest and Abdominals:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-9 Chest Stretch	Stand facing a wall. With your right arm bent and your elbow at shoulder height, place your palm against the wall. Turn your body away from your right arm. You should feel the stretch on the front side of your armpit and across the front of your chest. Hold this position for a minimum of 10 seconds and repeat on the opposite side.
 *B. Hanson, Moving on the Spot: A Collection of 5 Minute Stretch and Movement Sessions, Toronto Public Health. Retrieved October 26, 2006, from http://www.lin.ca/resource/html/dn3.htm#l1* Figure 10A-10 Side Stretch	Stand with your left arm up over your head. Bend at your waist towards the right side of your body. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

e. Back:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-11 Lower Back Stretch	Lie on your back and bring your knees toward your chest. Grasp the back of your knees. Hold this position for a minimum of 10 seconds.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from m http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-12 Upper Back Stretch	Extend your arms straight in front of you at shoulder height crossing one arm over the other. With the palms facing each other, intertwine your fingers and press out through your arms. Let your chin fall to your chest as you exhale. You should feel the stretch in the upper back. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

f. Legs:

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-13 Hamstring Stretch	Lie flat on the floor with your knees bent and your back flat on the floor. Slowly raise and straighten one leg, grasping it behind your thigh with both hands. Hold this position for a minimum of 10 seconds.

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-14 Inner Thigh Stretch	Sit on the floor with your knees bent and the soles of your feet together. Grab your toes and pull yourself forward while keeping your back and neck straight. Hold this position for a minimum of 10 seconds. Grab your ankles and push your knees down toward the floor with your elbows. Hold this position for a minimum of 10 seconds.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-15 Hip Flexor	Kneel on your right knee. Position your left foot in front of you, bending your knee and placing your left hand on that leg for stability. Keep your back straight and abdominal muscles tight. Lean forward, shifting more body weight onto your front leg. You should feel the stretch in the front of your hip and the thigh of the leg you are kneeling on. Cushion your kneecap with a folded towel if necessary. Hold this position for a minimum of 10 seconds and repeat on the opposite side.
 *Running Exercises. Retrieved October 26, 2006, http://www.physionline.co.za/conditions/article.asp?id=46* Figure 10A-16 Ankle Rotations	From a sitting position, rotate your foot in a clockwise, and then a counter-clockwise, direction. Switch and repeat on the opposite side.
 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-17 Calf Stretch	Stand three steps away from and facing a wall. Step in towards the wall with your right leg, bending your right knee and keeping your left leg straight. Extending your arms with your palms forward, reach out to the wall and let your body fall toward the wall. Keep your toes forward and your heels down. Lean your body into the wall with your left leg straight behind your body. You should feel the stretch in your left calf. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

 *Smart Start: A Flexible Way to Get Fit. Retrieved October 26, 2006, from http://www.in-motion.ca/walkingworkout/plan/flexibility/* Figure 10A-18 Quadriceps Stretch	Stand with your hand against a wall for balance. Lift your left foot off the ground, bending your knee as if you are trying to kick your bottom with your heel. Do not lean forward at the hips. Grab and hold your ankle with your left hand. You should feel the stretch in your left thigh. Hold this position for a minimum of 10 seconds and repeat on the opposite side.

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GUIDELINES TO CONDUCT A RECREATIONAL SUMMER BIATHLON ACTIVITY

OBJECTIVES

The objectives of the recreational summer biathlon activity are:

- to practice and improve marksmanship skills;
- to improve personal fitness level; and
- to introduce the cadets to the sport of summer biathlon.

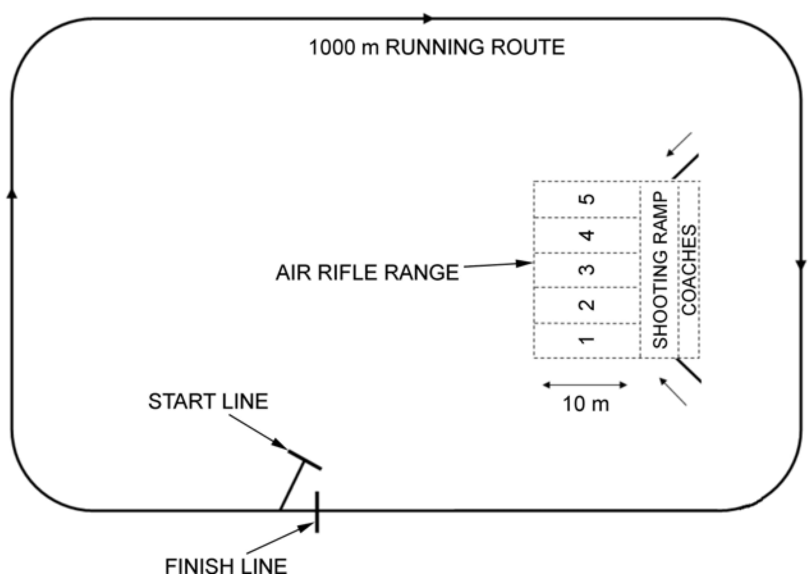
COMPOSITION

Cadets will be divided into teams for the summer biathlon activity. For a group of 25 cadets, the cadets should be divided into groups of five.

FACILITIES

The facilities required to conduct a recreational summer biathlon activity are:

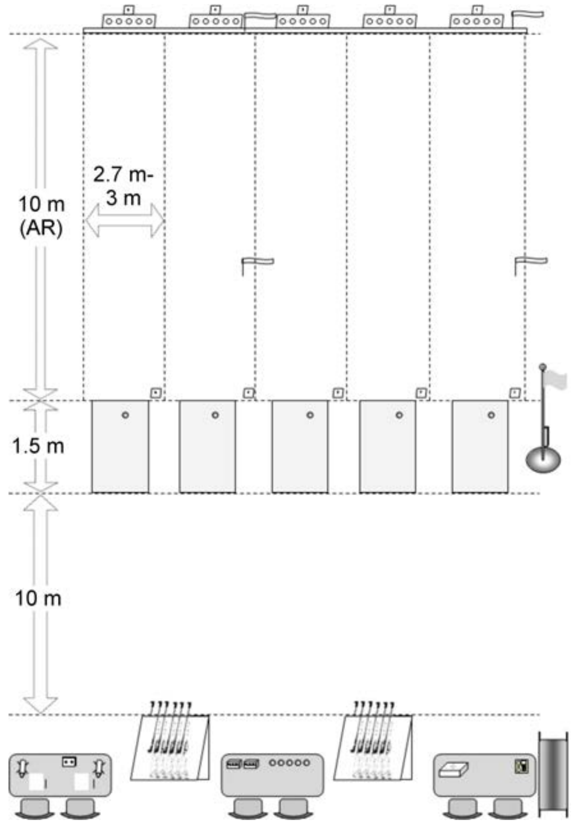
- a route, approximately 1000 m with the start and finish lines located close to the range. The route should be wide enough to accommodate a maximum of 10 cadets running at one time. When roads are to be crossed, they must be clearly marked and a central crossing point established with traffic control provided, and



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 10B-1 Recreational Summer Biathlon Activity Course Layout

- an air rifle range constructed IAW A-CR-CCP-177/PT-001, Part 1, Section 8, with a minimum of one firing lane per cadet per group.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 10B-2 Recreational Summer Biathlon Air Rifle Range Layout

STAFFING

Numerous staff are required to conduct a recreational summer biathlon activity. These appointments shall include:

- **Technical Delegate.** Responsible for the overall conduct of the competition, including issuing penalties, and interpreting the rules.
- **Range Safety Officer (RSO).** Responsible for the overall conduct of the activities on the range.
- **Assistant RSO.** Responsible for targets, issuing ammunition, and assisting the RSO, as required.
- **Lane Scorekeeper.** Responsible for scoring targets and recording results on the range recording sheet (located at Annex E).
- **Chief of Statistics.**Responsible for compiling all the event data (eg, range results, start/finish time, and any penalties assessed).
- **Runner.**Responsible for collecting the scoring sheets and delivering them to the chief of statistics.
- **Start and Finish Line Chief.** Responsible for starting the run and recording the finish times on the scoresheet (located at Annex C).
- **Course Controller.** Responsible for recording each time the cadet runs a route on the course control sheet (located at Annex D).
- **First-Aider.** Responsible for dealing with any injuries that may occur during the competition.

FORMAT

Briefing

All cadets will attend an initial briefing. This will include the essential information required by the cadets to participate in the recreational summer biathlon activity. The cadets are given:

- start times,
- range lane assignments,
- weather updates, and
- an introduction to the competition staff.

The Running Route

Each cadet will run three separate routes of approximately 1000 m. Each running route will consist of:

- each team assembling for a mass start (teams will have a two-minute interval between start times);
- each team finishing as a complete team; and
- crossing the finish line as a team.

The Range

Each cadet will fire five to eight pellets in an effort to knock down all five targets on the BART. After each bout of firing, the appropriate lane scorer will record the team's results and reset the BART.

When all members of the team have completed firing, they will re-assemble for a mass start for the next running route.

SEQUENCE

This recreational summer biathlon activity will be conducted in the following sequence:

- running a route of approximately 1000 m;
- firing five to eight pellets at the BART;
- running a route of approximately 1000 m;
- firing five to eight pellets at the BART;
- running a third route of approximately 1000 m; and
- crossing the finish line.

EQUIPMENT

Based on 25 cadets, the equipment required to conduct the recreational summer biathlon activity shall include, but is not limited to, the following:

- Cadet air rifles (6),
- Shooting mats (10),
- Air rifle pellets (a minimum of 875 pellets),
- Container to hold pellets (5),
- Stopwatches (6),

- BART (5),
- Safety glasses/goggles (10),
- Notice board,
- Biathlon scoresheets located at Annex C,
- Course control sheets located at Annex D, and
- Range recording sheets located at Annex E.

DRESS

Appropriate clothing according to the weather forecast.

RULES AND REGULATIONS

- The cadets must remain in their own teams throughout the activity
- The cadets must use the same firing lane for the duration of the activity.
- The run must be completed in the proper sequence and on the marked route.
- Cadet air rifles must be placed on the firing point by the range staff and will remain there for the duration of the activity.
- All firing will be done in the prone position.
- The cadet air rifle must be made safe upon completion of firing.
- An inoperable cadet air rifle will be replaced by the range staff, the target will be reset, and the cadet will fire five to eight rounds with the new rifle.
- Safety infractions will result in time penalties.
- Missed targets will result in time penalties.

SCORING

The team's final score is determined by adding the total time for all run routes plus any penalties issued. The team with the lowest final score is considered the winning team.

Scoring will be calculated as follows:

- **Time.** The team's final time is the time from the start to finish, and any penalties.
- **Targets.** For each relay of firing, the number of hit and missed targets will be recorded on the range recording sheet by the lane scorekeeper (located at Annex C). There is no positive point value for each hit target; competitors will be deducted points for each missed target.

PENALTIES

The following penalties will be added to the team's time:

- Each violation of the principles of fair play or good sportsmanship will result in a one-minute penalty, to include:
    - not giving way in an area of congestion;
    - pushing or shoving;
    - using profanity; and
    - interfering with other competitors.

- Each missed target will result in a 10-second penalty.
- Each safety infraction on the firing point will result in a two-minute penalty, to include:
  - not keeping control of the cadet air rifle;
  - moving forward of the firing point; and
  - intentionally firing rounds at objects other than the BART.
- Each team member not crossing the finish line will result in a two-minute penalty.

OUT OF BOUNDS AREA

Out of bounds areas will be clearly identified prior to the start of the recreational summer biathlon activity.

NOTES

- Course control staff will record each time a team completes a route. See course control sheet located at Annex D.
- The start and finish line chief will keep records for each team. When the sheet is full or nearly full the runner will take the sheet to the chief of statistics. See scoresheet located at Annex C.
- Bibs may be used to identify cadets, if available.

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BIATHLON SCORESHEET

Scorekeeper's Name: ____________

Cadet Name	Bib #	Start Time	Route 1	Route 2	End Time (Route 3)	Run/Safety Penalties	Firing Penalties	Total Time

Note: The start and finish line chief is responsible for recording the run times and presenting the scoresheet(s) to the scorekeeper.

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COURSE CONTROL SHEET

Course Control's Name: ______________________________

Cadet Name	Route 1 Verification	Route 2 Verification	Route 3 Verification

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

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RANGE RECORDING SHEET

Scorekeeper's Name: ____________

Cadet Name:	Lane	Shots Fired	X = Miss	Misses	Comments/Penalties
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			
Cadet Name:	Lane	Shots Fired	X = Miss	Misses	
		3 Spare			

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National Defence | Défense nationale

ROYAL CANADIAN AIR CADETS

BOOK 2 OF 2

PROFICIENCY LEVEL THREE INSTRUCTIONAL GUIDES

(ENGLISH)

(Supersedes A-CR-CCP-803/PF-001 dated 2015-09-01)

Cette publication est disponible en français sous le numéro A-CR-CCP-803/PF-002.

Issued on Authority of the Chief of the Defence Staff

Canada

National Defence / Défense nationale

A-CR-CCP-803/PF-001

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OPI: D Cdts & JCR 4 – Senior Staff Officer Youth Programs Development **2016-09-14**

Canada

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable orders.

NOTE

On a changed page, the portion of the text affected by the latest change is indicated by a vertical line in the margin of the page. Changes to illustrations by miniature pointing hands, or black vertical lines.

Dates of issue for original and changed pages are:

Original	0	2016-09-14	Change	3
Change	1		Change	4
Change	2		Change	5

Zero in Change No. column indicates an original page. Total number of pages in this publication is 953, consisting of the following:

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15E-1 to 15E-4	0
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17A-1 to 17A-2	0
17B-1 to 17B-4	0
17C-1 to 17C-6	0
17D-1 to 17D-4	0
17E-1 to 17E-4	0
17F-1 to 17F-4	0
17G-1 to 17G-6	0
17H-1 to 17H-6	0
17I-1 to 17I-2	0
17J-1 to 17J-2	0
17K-1 to 17K-2	0
17L-1 to 17L-2	0
17M-1 to 17M-2	0
17N-1 to 17N-2	0
17O-1 to 17O-4	0
17P-1 to 17P-2	0
17Q-1 to 17Q-4	0
17R-1 to 17R-12	0
17S-1 to 17S-6	0
17T-1 to 17T-8	0
17U-1 to 17U-4	0
17V-1 to 17V-2	0
17W-1 to 17W-2	0
17X-1 to 17X-2	0
17Y-1 to 17Y-2	0
17Z-1 to 17Z-2	0
17AA-1 to 17AA-2	0
17AB-1 to 17AB-2	0
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Contact Officer: D Cdts & JCR 4-7-4 – Air Cadet Program Development Staff Officer

FOREWORD AND PREFACE

1. **Issuing Authority.** This Instructional Guide (IG) A-CR-CCP-803/PF-001 was developed under the authority of the Director Cadets and Junior Canadian Rangers, and issued on the authority of the Chief of Defence Staff.

2. **Development.** Development of this IG was in accordance with the performance oriented concept of training outlined in the A-P9-050 Series, Canadian Forces Individual Training and Education System, with modifications to meet the needs of the Canadian Cadet Organization.

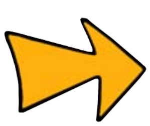
3. **Purpose of the IG.** The IG is to be used by Royal Canadian Air Cadet Squadrons in conjunction with other resources to conduct the Proficiency Level Three Program. The IG provides instructors with the base means from which to deliver training. Individual IGs are to be reviewed in conjunction with the Lesson Specifications (LSs) found in A-CR-CCP-803/PG-001, *Royal Canadian Air Cadet Proficiency Level Three Qualification Standard and Plan*, Chapter 4, before instructing, so that each instructor can adequately plan for and prepare each lesson. Instructors may be required to develop instructional materials to support training in addition to any that may be provided, eg, posters, videos, handouts, models, etc, supplemental to training control and support documents. Suggested instructional activities are included in most IGs to maximize learning and fun. Instructors are also encouraged to modify and/or enhance the activities, as long as they continue to contribute to enabling objective achievement.

4. **Use of the IG.** Throughout these instructional guides, a series of information boxes are used to highlight information; they include:

Note to the Instructor.

Key information to pass along to cadets.

Refer to the following CF regulations and policies.



Points of interest or special instructions the instructor should pass along to cadets.

5. **Suggested Changes.** Suggested changes to this document may be sent directly to cadettraining@canada.ca.

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CHAPTER 11

PO X20 – PARTICIPATE IN CANADIAN FORCES (CAF) FAMILIARIZATION ACTIVITIES

COMMON TRAINING

ALL TRAINING LEVELS

INSTRUCTIONAL GUIDE
CANADIAN ARMED FORCES
(CAF) FAMILIARIZATION

PO X20 – PARTICIPATE IN CAF FAMILIARIZATION

Total Time:

For the following EOs, refer to the lesson specifications located in A-CR-CCP-801/PG-001, *Royal Canadian Air Cadets Proficiency Level One Qualification Standard and Plan*:

- MX20.01A – Participate in a CAF Activity,
- MX20.01B – Participate in a CAF Familiarization Tour,
- MX20.01E – Attend a CAF Presentation,
- MX20.01F – Attend a CAF Commemorative Ceremony, and
- CX20.01 – Participate in CAF Familiarization Activities.

For the following EOs, refer to the instructional guides located in A-CR-CCP-801/PF-001, *Royal Canadian Air Cadets Proficiency Level One Instructional Guides*:

- MX20.01C – Fire the C7 Rifle,
- MX20.01D – Participate in a Mess Dinner,
- MX20.01G – Participate in CAF Familiarization Video Activities, and
- MX20.01H – Participate in CAF Familiarization Learning Stations.

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CHAPTER 12

PO 331 – DESCRIBE PRINCIPLES OF FLIGHT

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M331.01 – DESCRIBE AIRCRAFT STABILITY

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Set up the four stations as described in Annex A.

Create slide of Annex B.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP 1 as it is an interactive way to introduce aircraft stability.

An interactive lecture was chosen for TPs 2–5 to review axes of rotation and introduce stability about the axes.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described aircraft stability.

IMPORTANCE

It is important for cadets to describe aircraft stability so that they understand why aircraft are designed with certain features. Cadets will also understand how an aircraft will react when flying through turbulent weather or when it is put through aggressive manoeuvres.

Teaching Point 1 | **Demonstrate the Characteristics of Stability**

Time: 15 min | Method: In-Class Activity

CHARACTERISTICS OF STABILITY

Stability. The tendency of an aircraft in flight to remain in straight, level, upright flight and to return to this attitude, if displaced, without corrective action by the pilot.

Static Stability. The initial tendency of an aircraft to return to its original attitude, if displaced.

Dynamic Stability. The overall tendency of an aircraft to return to its original attitude.

Positive Stability. The aircraft is able to return to its original attitude without any corrective measure.

Neutral Stability. The aircraft will remain in the new attitude of flight after being displaced, neither returning to its original attitude, nor continuing to move away.

Negative Stability. The aircraft will continue moving away from its original attitude after being displaced.

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to provide a tactile method of illustrating the different types of aircraft stability.

RESOURCES

- Tennis ball,
- Three marbles,
- Table,
- Tape, and
- Two bowls.

ACTIVITY LAYOUT

Set up four stations IAW Annex A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into four groups of equal size.
2. Assign each group to a station.
3. Have each group perform the activity at each station.
4. After the cadets have been to all stations, ask the cadets what they observed.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the stability activity will serve as confirmation of this TP.

Teaching Point 2	**Review the Axes of an Aircraft**
Time: 10 min	Method: Interactive Lecture

AXES OF THE AIRCRAFT

Present the slide located at Annex B to the cadets.

Demonstrate each axis with the model aircraft.

Each axis is an imaginary straight line which runs through the aircraft in a particular direction. All three axes intersect at the centre of gravity.

Ask the cadets what the three axes of an aircraft are.

Longitudinal Axis and Roll

This axis runs the length of the aircraft from the tip of the nose to the end of the empennage. Movement around this axis is roll.

Ask the cadets which control surface controls roll.

Lateral Axis and Pitch

This axis runs through the aircrafts' wings, from wing tip to wing tip. Movement around this axis is pitch.

Ask the cadets which control surface controls pitch.

Normal (Vertical) Axis and Yaw

This axis runs through the aircraft vertically top to bottom. Movement about this axis is yaw.

Ask the cadets which control surface controls yaw.

Have the cadets make a paper airplane, marking each of the axes. Have them hold their airplanes in the air while you call out a movement (eg, roll) which they will demonstrate individually using their airplanes.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the paper airplane activity will serve as the confirmation of this lesson.

Teaching Point 3	**Explain Longitudinal Stability**
Time: 10 min	Method: Interactive Lecture

LONGITUDINAL STABILITY

Longitudinal stability is stability around the lateral axis and is known as pitch stability. To achieve longitudinal stability, aircraft are designed to be nose heavy if loaded correctly.

Two principle factors influence longitudinal stability:

- the horizontal stabilizer, and
- the centre of gravity.

The Effects of the Horizontal Stabilizer

The horizontal stabilizer is located at the tail end of the aircraft. Its function is similar to a counterweight at the end of a lever. When the nose of the aircraft is pushed up, this will force the tail down. Since the stabilizer now meets the airflow at a higher angle of attack, it will now produce more lift. This extra lift will counter the initial disturbance.

Use the model airplane to demonstrate the effects of the horizontal stabilizer.

The Effects of the Centre of Gravity

The centre of gravity is an important factor in aircraft stability. Every aircraft has a naturally occurring centre of gravity which is inherent in its design. As the aircraft is loaded, the position of the centre of gravity can change. If this change is drastic, it can have an adverse affect on the stability of an aircraft.

Use the model airplane to demonstrate a forward centre of gravity.

If the centre of gravity is too far forward, it will produce a nose-down tendency. This will force the pilot to use excessive back pressure on the controls to maintain normal flight. If left uncorrected, the aircraft will speed up and lose altitude.

If the centre of gravity is too far aft, it will produce a nose-up tendency. This will force the pilot to use excessive forward pressure on the controls to maintain normal flight. Uncorrected, the aircraft will slow down and eventually stall.

Use the model airplane to demonstrate an aft centre of gravity.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is longitudinal stability?

Q2. What does the horizontal stabilizer act like?

Q3. What is the danger of an aft centre of gravity?

ANTICIPATED ANSWERS

A1. Stability around the lateral axis.

A2. A counterweight at the end of a lever.

A3. Stall.

Teaching Point 4	**Explain Lateral Stability**
Time: 10 min	Method: Interactive Lecture

LATERAL STABILITY

Lateral stability is stability around the longitudinal axis and is called roll stability. To achieve lateral stability certain design features are built into the aircraft. Three of these design features are:

- dihedral,
- sweepback, and
- keel effect.

The Effects of Dihedral and Anhedral

Dihedral is the angle that the wings make with the horizontal plane. As one looks at an aircraft from the front, the wings will slowly angle away from the ground so that the wing tip is higher than the wing root.

This assists the aircraft in maintaining lateral stability by changing the angle that the leading edge makes with the airflow.

When an aircraft with dihedral wings is forced in to a side-slipping motion, the down-going wing will meet the airflow at a right angle. This will increase the lift produced on that wing, forcing it back into place.

Use the model airplane to demonstrate dihedral.

Some aircraft have been designed with a negative dihedral, also known as anhedral. Anhedral acts opposite to dihedral, creating less stability. Usually found in aircraft with both sweepback and keel effect.

The Effects of Sweepback

Similar to the dihedral, sweepback is a design feature where the wings sweep back instead of protruding straight out from the fuselage.

This assists the aircraft in maintaining lateral stability by changing the angle that the leading edge makes with the airflow.

When an aircraft with sweepback is forced into a slipping motion, the down going wing will meet the airflow at a right angle. This will increase the lift produced by that wing forcing it back into place.

Use the model airplane to demonstrate sweepback.

Keel Effect

While dihedral and sweepback are usually found on low-wing aircraft, high-wing aircraft have stability built-in. Since the bulk of the aircraft is below the plane of the wings, it acts as a keel. When a wing is forced up by a disturbance, the fuselage acts like a pendulum swinging the aircraft back into position.

Use the model airplane to demonstrate keel effect.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is lateral stability?

Q2. What are three design features which provide lateral stability?

Q3. How does keel effect work?

ANTICIPATED ANSWERS

A1. Lateral stability is stability around the longitudinal axis.

A2. Dihedral, sweepback, and keel effect.

A3. When a wing is forced up by a disturbance, the fuselage acts like a pendulum swinging the aircraft back into position.

Teaching Point 5	Explain Directional Stability and the Effects of the Fin
Time: 5 min	Method: Interactive Lecture

DIRECTIONAL STABILITY

Directional stability is stability around the vertical or normal axis. The principle factor influencing directional stability is the vertical tail surface, or fin.

The Effects of the Fin

Aircraft, specifically airplanes, have a tendency of always flying head-on into the relative airflow. This tendency, called weather vaning, is a direct result of the vertical tail fin. If the aircraft yaws away from its course, the airflow strikes the fin from the side, forcing it back into position.

This will only work if the side area of the aircraft is greater aft of the centre of gravity than the area forward of the centre of gravity.

Use the model airplane to demonstrate the effects of the fin.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What is directional stability?

Q2. What is the principle factor influencing directional stability?

Q3. What is the effect of the fin?

ANTICIPATED ANSWERS

A1. Directional stability is stability around the vertical or normal axis.

A2. The principle factor influencing directional stability is the vertical tail surface, or fin.

A3. If the airplane yaws away from its course, the airflow strikes the fin from the side, forcing it back into position.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is dynamic stability?

Q2. What is the danger of an aft centre of gravity?

Q3. What are three design features which provide lateral stability?

ANTICIPATED ANSWERS

A1. The overall tendency of an aircraft to return to its original position.

A2. Stall.

A3. Dihedral, sweepback, and keel effect.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW Chapter 3, Annex B, Aviation Subjects–Combined Assessment PC.

CLOSING STATEMENT

Aircraft, airplanes in particular, require a lot of stability in order to operate safely. All airplanes have stability designed into them. Commercial and private airplanes tend to have positive stability, while military fighters tend to have neutral or negative stability.

INSTRUCTOR NOTES/REMARKS

If EO C331.01 (Review Principles of Flight, Section 2) is chosen as a complementary period, it should be scheduled prior to this EO.

When developing activities for the mandatory familiarization flying/elemental training day, it is recommended that the cadet be given the opportunity to identify and describe the stability of the aircraft.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

C3-229 (ISBN 0-521-02128-6) Abzug, M. J., & Larrabee, E. E. (2002). *Airplane Stability and Control* (Second Edition). Cambridge, England: Cambridge University Press.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO C331.01 – REVIEW PRINCIPLES OF FLIGHT

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Make copies of the handout located at Annex C for each cadet.

Make a slide of Annex C.

Bring a model airplane.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for this lesson as an interactive way for the cadets to review the three axes of an aircraft and control surfaces.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have reviewed principles of flight.

IMPORTANCE

It is important for cadets to review the principles of flight as a basis for learning new knowledge and skills. Comprehension of the basic principles of flight will enhance any familiarization flying activity.

Teaching Point 1 | **Review the Three Axes of an Aircraft**

Time: 5 min | Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to review the three axes of an aircraft.

RESOURCES

- Handout located at Annex C,
- Slide of Annex C, and
- Overhead projector.

ACTIVITY LAYOUT

Arrange the classroom to allow for small group work.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of no more than four.
2. Distribute handout to each group.
3. Have the cadets label the diagram.
4. Have a cadet from each group move to another group and cross-check their answers. Have the cadets return to their group when done.
5. Project the slide onto a screen or wall.
6. Have a representative from three of the groups label one of the axes on the projected slide.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the in-class activity will serve as confirmation of this TP.

Teaching Point 2 — **As a Member of a Group, Have the Cadet Describe a Control Surface and its Effects on Attitudes and Movements**

Time: 20 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is review control surfaces and their effects on attitudes and movements.

RESOURCES

- Model airplane,
- Flip chart paper, and
- Flip chart markers.

ACTIVITY LAYOUT

Arrange the classroom to allow for small group work.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into equal groups.
2. Assign each group a control surface (rudder, aileron, or elevator).
3. Have the cadets illustrate, in the fullest detail possible, the control surface assigned to their group. Allow the cadets 10 minutes to complete their illustration.
4. Have the cadets post their group's illustration on the wall. Have the cadets conduct a gallery walk for five minutes.
5. With the remaining five minutes, lead the cadets in a discussion on each of the control surfaces. Use the model airplane for demonstration purposes.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the in-class activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the activity in TP 2 will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

A review of principles of flight is important for understanding higher level material. Cadets who wish to pursue training in aviation must have a solid understanding of how aircraft fly.

INSTRUCTOR NOTES/REMARKS

If this complementary EO is chosen, it should be scheduled before any other EOs from this PO.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C331.02 – READ PITOT STATIC INSTRUMENTS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the worksheets located at Annexes D, F, and H for each cadet.

Create OHPs of the answer keys located at Annexes E, G, and I.

Construct a working model of each of the pitot static instruments IAW Annex J.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 to 4 to introduce pitot static instruments.

An in-class activity was chosen for TP 5 as an interactive way to confirm the cadets' comprehension of pitot static instruments.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to read the airspeed indicator (ASI), altimeter, and vertical speed indicator (VSI).

IMPORTANCE

It is important for the cadets to be able to read pitot static instruments so that they are aware of what is happening in the aircraft while participating in familiarization flying or using a flight simulator.

Teaching Point 1	Explain That the Basic Instruments of an Aircraft Rely on the Pitot Source and the Static Port as Sources of Information
Time: 10 min	Method: Interactive Lecture

BASIC INSTRUMENTS OF AN AIRCRAFT

There are two main sources from which the pitot static instruments receive information. The first of these is the pitot source and the second is the static source.

Pitot and Static Sources Provide Information for the ASI

The pitot source on a light aircraft is usually a pitot tube which is attached to the nose or wing of the aircraft. The information from the pitot source goes directly to the ASI, which then translates the pressure into airspeed. Since the pitot source is facing forward, it acts as an intake for air. Therefore the faster the aircraft is moving, the greater the pressure at the pitot source, which in turn means the higher the reading on the ASI.

The ASI also receives information from the static source. This information will allow the ASI to compensate for changes in the air pressure when at different altitudes.

Static Port Provides Information for the Altimeter

The static port is a small vent on the side of the aircraft. This senses the surrounding pressure of the air and feeds it to the altimeter. The static port relies on changes in air pressure to work. For example, as the aircraft increases in altitude, the air pressure decreases. This causes the altimeter to indicate a higher altitude.

Static Port Provides Information for the VSI

The static port also provides information to the VSI. As the aircraft changes its altitude, the VSI will indicate the rate of change. This reading is based on the rate at which the surrounding air pressure is changing.

The ASI is the only pitot static instrument which receives pressure from both sources.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Which is the only instrument that uses the pitot source?

Q2. Where on a light aircraft is the pitot source usually located?

Q3. How does pressure affect the altimeter?

ANTICIPATED ANSWERS

A1. ASI.

A2. The pitot source is usually attached to the nose or wing.

A3. As pressure decreases, the indicated altitude on the altimeter will increase.

Teaching Point 2 **Explain How to Read an ASI**

Time: 10 min Method: Interactive Lecture

READ THE AIRSPEED INDICATOR (ASI)

Reading the ASI is straightforward, and is nearly the same as reading a speedometer in a car. There is one needle and it points to the speed at which the aircraft is travelling. The biggest difference between the speedometer and the ASI is that the ASI has a colour code lining the speed scale.

Each of these arcs represent a speed range for certain flying conditions. The three colours common to all ASIs are:

- green,
- yellow, and
- red.

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 12-3-1 Airspeed Indicator

Normal Operating Range

The green arc indicates safe and normal flying speeds. During normal flying the pilot will modify engine power and pitch attitude so that the airspeed flown is somewhere within the green arc. This does not apply for the early part of takeoff or the last part of landing, and may not apply during aerobatic manoeuvres.

Cautionary Range

The yellow arc indicates the cautionary speed range. The aircraft can fly safely at speeds in the yellow arc range, but only if manoeuvres are kept small and gentle. Aggressive manoeuvres at speeds in the yellow arc can cause structural damage to the aircraft.

Never Exceed Speed

The red line indicates the maximum speed that the aircraft should be flown at under any circumstances. If the airspeed exceeds the red line speed, then the aircraft has to be grounded and undergo a structural inspection. Exceeding the red line may cause structural damage.

Units of Measurement

When reading the ASI, it is very important to know what units of measurement are used. In most ASIs, the unit of measurement is knots indicated airspeed (KIAS). In slower aircraft ASIs may use miles per hour (mph) as the unit of measurement. The difference between the two units is that one nautical mile (used for KIAS) is 6 080 feet, whereas one statute mile is 5 280 feet.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is for the cadet to practice reading an ASI.

RESOURCES

- ASI worksheet located at Annex D, and
- OHP of the answer key located at Annex E.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute the ASI worksheet to each cadet.
3. Allow the cadets two to three minutes to complete the worksheet.
4. Allow the cadets two minutes to share and review answers with their partner.
5. Show the OHP of the answer key.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 3	**Explain How to Read an Altimeter**
Time: 10 min	Method: Interactive Lecture

READ AN ALTIMETER

The altimeter is the instrument which tells the pilot how high above sea level (ASL) the aircraft is. In North America the altimeter measures in feet ASL.

Units of Measurement

Every altimeter has at least three hands: one long, one short and stubby, and one long and thin with a triangle on the end.

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 12-3-2 The Altimeter

The long hand measures altitude in hundreds of feet ASL. This is the fastest moving hand of the three and a change in altitude will make it move.

The short hand measures altitude in thousands of feet ASL. This hand moves slowly as the altitude changes. Every time the long hand goes through a 360-degree rotation, the short hand will move to the next number on the dial.

The third hand is the thinnest and the slowest moving. It measures altitude in tens of thousands of feet ASL. As the short hand goes through a 360-degree rotation the short hand will move to the next number indicating ten thousand, twenty thousand, thirty thousand feet ASL and so on.

Pressure Sub-Scale

On the right hand side of the altimeter, there is a sub-scale. This sub-scale is used to adjust the altimeter to account for differences in the pressure of the surrounding air. The altimeter is sensitive to air pressure, and readings will change as pressure changes. Pilots have to be diligent and ensure that the sub-scale is set properly.

Field Elevation Versus Pressure Altitude

The sub-scale relies on pressure altitude to calibrate the altimeter. Pressure altitude is the perceived altitude based on the current air pressure. If this information is not available, pilots can set their altimeter to the elevation of the airfield, called field elevation. This will set the altimeter sub-scale to the proper reading.

Height Above Sea Level (ASL)/Above Ground Level (AGL)

The altimeter is designed to be used relative to sea level and is used on long flights where the ground changes in elevation. When arriving and departing an airport, all procedures are followed relative to the height above the ground. This is known as height AGL.

Reading an altimeter is very similar to reading an analog clock. Every time the second hand passes 12, the minute hand advances to the next minute. Every time the minute hand passes 12, the hour hand advances to the next hour. The altimeter works the same way.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to allow the cadet to practice reading an altimeter.

RESOURCES

- Altimeter worksheet located at Annex F, and
- OHP of the answer key located at Annex G.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute the altimeter worksheet to each cadet.
2. Using the first two questions as examples, show the cadets how to read the altimeter.
3. Have the cadets complete the worksheet with a partner.
4. Show the OHP of the answer key.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 4 **Explain How to Read a VSI**

Time: 10 min Method: Interactive Lecture

READ A VERTICAL SPEED INDICATOR (VSI)

The VSI is an instrument, which measures the rate at which the aircraft is changing altitude.

Units of Measurement

The VSI is different than the altimeter in that the altimeter measures the exact height ASL, whereas the VSI measures how fast the aircraft is gaining or losing altitude in feet per minute.

Positive/Negative Rates of Climb

The VSI is divided in half, top and bottom. Both halves are measured in increments of 100 feet, represented by the numbers 1–10 or 1–20. When the needle on the VSI is pointed to the number 1, it means 100 feet per minute. The top half is a positive rate of change in altitude or rate of climb, while the bottom half is a negative rate of change in altitude or rate of descent.

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 12-3-3 The Vertical Speed Indicator

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to allow the cadet to practice reading the VSI.

RESOURCES

- VSI worksheet located at Annex H, and
- OHP of the answer key located at Annex I.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute VSI worksheet to each cadet.
2. Have the cadets to complete the worksheet.
3. Show the OHP of the answer key.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 5 **Have the Cadet Read Pitot Static Instruments**

Time: 10 min Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadet to practice reading pitot static instruments.

RESOURCES

- One working model of each of the pitot static instruments, including:
  - ASI,
  - Altimeter, and
  - VSI; and
- Questions located at Annex K.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two teams.
2. Set one model at a time (in no particular order) and allow each team five seconds to read the instrument.
3. Alternate which team answers. The teams get one point for every correct answer that they give.
4. If a team cannot correctly answer the question within five seconds then the other team can steal the point.
5. The team which answers the most questions correctly wins.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in each of the activities will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing how to read the pitot static instruments is essential in order to fly an aircraft. Even if a pilot is not flying under IFR conditions, these three instruments are required in order to safely operate the aircraft. They also allow the pilot to coordinate with other pilots and ATS to ensure traffic avoidance or to fly circuits at an aerodrome.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

C3-139 (ISBN 0-7715511-5-0) Transport Canada. (1999). *Flight Training Manual: 4th Edition Revised*. Ottawa, ON: Transport Canada.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C331.03 – IDENTIFY ASPECTS OF HELICOPTER AERODYNAMICS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Annexes L and M.

Bring a model helicopter to class. If possible use a radio-controlled helicopter to illustrate helicopter aerodynamics.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the cadets to aspects of helicopter aerodynamics.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify aspects of helicopter aerodynamics.

IMPORTANCE

It is important for cadets to identify aspects of helicopter aerodynamics so that they can appreciate the differences between airplanes and helicopters.

Teaching Point 1	**Describe the Main Rotor of a Helicopter**
Time: 15 min	Method: Interactive Lecture

THE MAIN ROTOR OF A HELICOPTER

Helicopters, like airplanes, have airfoils. Unlike airplanes, which have fixed airfoils (wings), the airfoils of a helicopter are not in a fixed position. The airfoils on a helicopter are called rotor blades, which are attached to a rotating point on the top of the helicopter's airframe. The whole assembly is referred to as the main rotor or rotor system.

The terms "fixed wing" (airplane) and "rotary wing" (helicopter) are derived from the physical differences between airplane and helicopter airfoils.

Use the model of the helicopter to illustrate each of the following points. If possible, a radio-controlled helicopter model should be used as it will dynamically illustrate the concepts of rotor thrust and rotor drag.

Rotor Systems

The rotor systems of a helicopter incorporate many parts. Three of the basic parts are:

- the rotor blades,
- the rotor head, and
- the drive shaft.

The rotor blades are attached to the rotor head. The rotor head sits on top of the drive shaft. As the drive shaft spins, it moves the blades through the air.

As the blades spin, they act like the wings of an airplane. The shape of the rotor blade is symmetrical, meaning that the top of the blade is shaped the same as the bottom of the blade. As each blade passes through the air, the airflow over the blade creates lift using the same principles of a wing.

In order for a helicopter to move in a horizontal direction, the rotor system must be angled in the direction of travel. This changes the angle of the plane in which the blades rotate, and the rotor blades act the same as propellers.

Flying a helicopter is complicated. Once the angle of the plane of rotation has been changed, the amount of lift being produced will no longer be enough to maintain the helicopter's altitude. The pilot must apply more power in order to counteract this. The total lift force required to maintain the helicopter's altitude and forward motion is referred to as total rotor thrust.

Rotor Drag

Rotor drag is the opposite of rotor thrust. It is commonly known as torque, and acts opposite to the direction that each blade travels. Rotor drag attempts to slow down the rotation of the blades and an increase in engine power is required to maintain the speed of the blades. If the force of rotor drag is stronger than the rotor thrust, then the torque causes the body of the helicopter to rotate instead of the blades.

Rotor drag should not be confused with aerodynamic drag.

Aerodynamic drag is a force that acts on the body of the aircraft as it moves through the air. It acts opposite to thrust (see the four forces acting on an aircraft).

Factors Influencing Rotor Thrust

There are four factors that influence rotor thrust, including:

- **Air Density.** As the rotor blades pass through the air, the reaction between the air molecules and the surface of the blade produces lift. More air molecules will create a stronger reaction. One may state that more lift is produced in higher density air vice lower density air because dense air has more molecules. Air density can decrease with increases in temperature or decreases in pressure.
- **Rotor Revolutions per Minute (rpm).** An increase in rotor rpm increases the total rotor thrust, while a decrease in rotor rpm decreases the total rotor thrust.
- **Blade (Pitch) Angle.** An increase in the blade angle increases the total rotor thrust, while a decrease in the blade angle decreases the total rotor thrust. This is similar to the effects of pitch on an airplane's wings.
- **Disc Area.** Disc area is the total area in which the rotor blades rotate and is determined by the length of the rotor blades. The larger the disc area is, the higher the total rotor thrust will be. This follows the same principle with airplanes, where the larger the wing area, the more lift is produced.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the three basic parts of a rotor system?

Q2. Which force acts opposite to rotor thrust?

Q3. How does disc area influence rotor thrust?

ANTICIPATED ANSWERS

A1. The rotor blades, rotor head, and drive shaft.

A2. Rotor drag.

A3. The larger the disc area is, the higher the total rotor thrust will be.

Teaching Point 2	**Describe the Anti-Torque Rotor of a Helicopter**
Time: 5 min	Method: Interactive Lecture

THE ANTI-TORQUE ROTOR

Show slide of Annex L.

Location on the Airframe

The anti-torque rotor is a smaller version of the main rotor. It is mounted vertically at the end of the tail. Most helicopters have an anti-torque rotor that sits in the right side of the tail, although some designs have the anti-torque rotor mounted on the left side or built into the tail assembly.

Airforce Imagery, 2008, CH-149 Cyclone. Copyright 2006 by Sikorsky Aircraft Corporation. Retrieved April 9, 2008, from http://www.airforceimagery.forces.gc.ca/netpub/server.np?find&catalog=casimages&template=detail2_e.np&field=itemid&op=matches&value=3018&site=casimages

Figure 12-4-1 Location of Anti-Torque Rotor

Function

The function of the anti-torque rotor is to counteract the torque produced by the main rotor. Without the anti-torque rotor, the rotation of the main rotor would transfer to the airframe and rotate the airframe instead of the rotor blades. By installing the anti-torque rotor, the airframe stays relatively still while the rotor blades rotate above the airframe. The anti-torque rotor serves to control movement around the vertical axis of the helicopter.

Power Source

The anti-torque rotor receives power from the main engine through a drive shaft which runs the length of the tail assembly.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Where is the anti-torque rotor normally located?

Q2. What are the functions of the anti-torque rotor?

Q3. How does the anti-torque rotor receive power?

ANTICIPATED ANSWERS

A1. It is mounted vertically at the end of the tail.

A2. The functions of the anti-torque rotor are to counteract the torque produced by the main rotor and to control movement around the vertical axis.

A3. The anti-torque rotor receives power from the main engine through a drive shaft, which runs the length of the tail assembly.

Teaching Point 3	**Explain the Control Inputs of a Helicopter**
Time: 5 min	Method: Interactive Lecture

CONTROL INPUTS OF A HELICOPTER

There are three primary control inputs of a helicopter. They differ from the control inputs of an airplane in some ways, but are similar in others. The three primary control inputs are:

- collective,
- cyclic, and
- pedals.

Show slide of Annex M.

Collective

The collective is an arm lever located on the left side of the pilot's seat (in most helicopters the pilot sits on the right side of the cockpit). The collective controls the angle of attack of the rotor blades which will affect the amount of lift produced. Pulling up on the collective will increase the angle of attack, producing more lift. Pushing down on the collective will decrease the angle of attack, producing less lift.

At the end of the collective is a throttle. The throttle on a helicopter is a twist-style grip. The throttle controls the rpm of the blades. An increase in rpm will increase the amount of lift produced and the speed at which the helicopter travels.

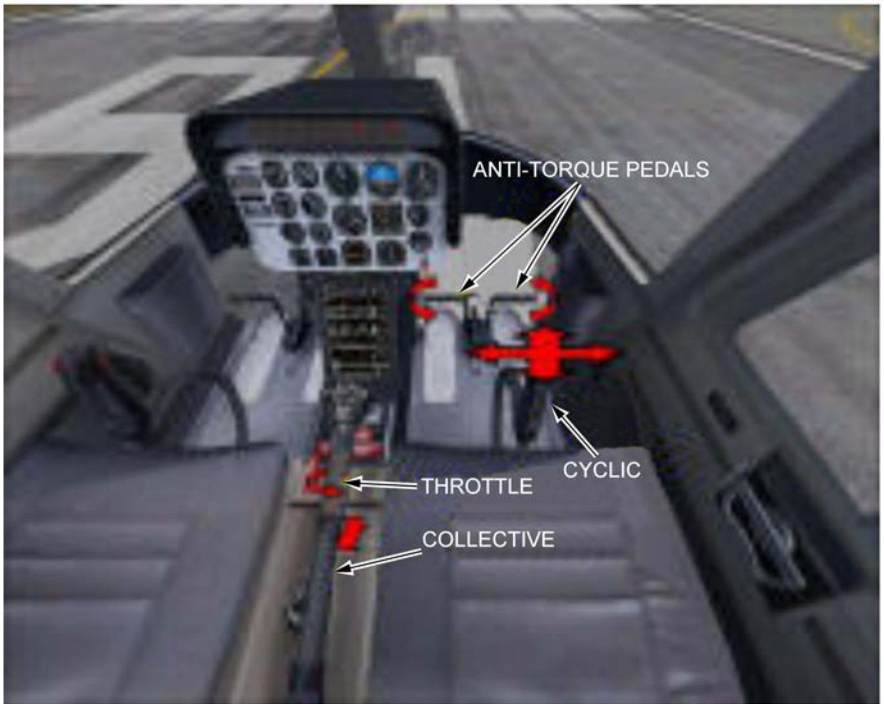
It is important to remember that the rotors act in the same way as both the wings and the propeller of an airplane. They produce the lift and the thrust. The same happens for movements forward, backward and to the right.

Cyclic

In a helicopter, the control column is known as the cyclic. The cyclic controls the angle of the plane in which the rotor blades move. Moving the cyclic left will angle the rotation of the blades left. Maintaining that angle long enough will move the helicopter to the left.

Pedals

The pedals in a helicopter cockpit are similar to rudder pedals. They control the anti-torque rotor, providing directional stability. They also control which direction the nose of the helicopter is pointed. One of the unique capabilities of a helicopter is that the nose can be pointed in a different direction than the direction of travel. This provides the helicopter increased manoeuvrability.



AVSIM Online, by S. Cartwright, 2004, Helicopter Tutorial. Copyright 2004 by AVSIM Online. Retrieved April 8, 2008, from http://www.avsim.com/pages/0604/heli/helitutorial.htm

Figure 12-4-2 Helicopter Control Inputs

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What does the collective control?

Q2. What does the cyclic control?

Q3. What do the pedals control?

ANTICIPATED ANSWERS

A1. The angle of attack of the rotor blades.

A2. The angle of the plane in which the rotor blades move.

A3. They control the anti-torque rotor, providing directional stability. They also control which direction the nose of the helicopter is pointed.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. How do the main rotor systems produce lift?

Q2. What is the function of the anti-torque rotor?

Q3. What is one of the unique capabilities of helicopters?

ANTICIPATED ANSWERS

A1. As each blade passes through the air, the airflow over the blade creates lift using the same principles as a wing.

A2. The function of the anti-torque rotor is to counteract the torque produced by the main rotor.

A3. One of the unique capabilities of a helicopter is that the nose can be pointed in a different direction than the direction of travel.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Helicopters are flown using very different applications of Newtonian physics. Certain parts of the helicopter are similar to airplanes but have different functions. These differences make the helicopter a more manoeuvrable aircraft and more challenging to fly.

INSTRUCTOR NOTES/REMARKS

It is recommended that this EO be scheduled with EO C331.05 (Tour a Local Aviation Facility, A-CR-CCP-803/PG-001, Chapter 4, Section 13) if helicopters are present at the facility.

If the squadron has the opportunity to participate in familiarization flights in a helicopter, this EO should be conducted at that time.

REFERENCES

C3-249 (ISBN 978-1-56027-649-4) Wagtendok, W. J. (2006). *Principles of Helicopter Flight: Second US Edition*. Newcastle, WA: Aviation Supplies & Academics, Inc.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C331.04 – DEMONSTRATE ATTITUDES AND MOVEMENTS IN A FLIGHT SIMULATOR

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a scenario for the computer simulator IAW the manual provided with the software. The guidelines for this scenario should be using a local airport, no weather, and a starting altitude of 5 500 feet ASL.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to give direction on procedures and present basic or background information about flight simulation.

A simulation was chosen for TP 3 as it is an interactive way to allow the cadet to experience attitudes and movements in a safe, controlled environment. This activity contributes to the development of principles of flight skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to demonstrate attitudes and movements and read pitot static instruments in a flight simulator.

IMPORTANCE

It is important for cadets to apply this knowledge in a flight simulator to enhance the learning value of attitudes and movements. This will also serve as a solid foundation for any cadet who participates in flight training in the future.

Teaching Point 1 **Explain Safety Considerations Related to the Location or Design of the Flight Simulator**

Time: 5 min Method: Interactive Lecture

Arrange the cadets so they can hear the safety briefing prior to using the flight simulator.

This briefing is being conducted to pass on safety considerations for use of the flight simulator. The actual content of the briefing will vary by region and squadron based on the squadron's assets, the location of the assets, and other environmental factors. The following should be covered:

- DND regulations concerning the appropriate use of computers, including:
  - CATO 11-07 (Internet Acceptable Use – Cadet Program),
  - DAOD 6001 (Internet),
  - Regional Orders, and
  - Squadron Standing Orders;
- location of the nearest fire exit in case of fire;
- awareness of any moving parts of the simulator; and
- proper entry and exit techniques to avoid damage to assets.

CONFIRMATION OF TEACHING POINT 1

Confirmation of this TP will depend on the actual content covered.

Teaching Point 2 **Explain How to Manipulate the Necessary Control Inputs and the Location of Necessary Instruments**

Time: 15 min Method: Interactive Lecture

CONTROL COLUMN OR YOKE

Using a control column or yoke in a flight simulator is preferable. Accordingly, the following will need to be adjusted if a control column is used instead.

The control yoke is located directly in front of the pilot in the centre of the pilot's side of the instrument panel. The control yoke is very much like the steering wheel of a car, both in look and function. The yoke is designed to move on two planes of motion.

The first plane of motion is left and right. The standard yoke will usually move to approximately 45 degrees left or right of centre when moved like a steering wheel. This motion is what controls the ailerons of the simulated airplane. To roll left, turn the wheel left. To roll right, turn the wheel right. Remember, this must be used as well as the rudder in order to properly turn the aircraft.

The control yoke also moves back and forth. The steering column of the yoke moves in and out of the main assembly. This controls the elevator of the simulated aircraft. To pitch up, pull back (towards the pilot). To pitch down, push forward (away from the pilot).

> Pitch will change your altitude, but more importantly your airspeed.

RUDDER PEDALS

On the floor of the simulator there are two pedals. If you push forward on the left pedal, the right one moves back and vice versa. These pedals control the rudder of the simulated aircraft. To yaw left, push on the left pedal. To yaw right, push on the right pedal.

> Rudder pedals move in different directions so pressure must be taken off the opposite pedal in order for the movement to take place.

LOCATION OF INSTRUMENTS

The instruments of the simulated aircraft will be displayed in front of the pilot, laid out on what is called an instrument panel. The three instruments that are of significance are the pitot static instruments: the airspeed indicator (ASI), vertical speed indicator (VSI), and altimeter. They are usually located just above the control yoke in a cluster of six instruments.

ASI. The ASI is located on the top row of the instrument panel on the far left.

VSI. The VSI is located on the bottom row of the instrument panel on the far right.

Altimeter. The altimeter is located on the top row of the instrument panel on the far right, just above the VSI.

"Design a Virtual Cockpit Instrument Panel", Ngee Ann Polytechnic, 2007. Retrieved October 31, 2007, from http://www.learnerstogether.net/avionics-project-design-problem-based-learning/56

Figure 12-5-1 Cessna Flight Instrument Panel

There is no need to go in to any detail about the other three instruments located in the diagram.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Where is the control yoke located?

Q2. Where are the pitot static instruments located?

Q3. How is pitch controlled?

ANTICIPATED ANSWERS

A1. In front of the pilot centred on the instrument panel.

A2. Clustered together, just above the control yoke.

A3. By moving the yoke towards or away from the pilot.

Teaching Point 3 | **Supervise the Cadets as They Practice Attitudes and Movements Using the Flight Simulator**

Time: 60 min | Method: Simulation

ACTIVITY

OBJECTIVE

The objective of this activity is to allow the cadet to practice attitudes and movements and witness their effect on the pitot static instruments.

RESOURCES

- Computer flight simulator (Microsoft flight simulator, computer, control yoke, and rudder pedals), and
- Scenario using local airport, no weather, and a starting altitude of 5 500 feet ASL.

ACTIVITY LAYOUT

This will depend on the location of the simulator.

ACTIVITY INSTRUCTIONS

1. Start the simulator with the scenario created prior to the lesson.
2. Allow the cadets to take turns in the simulator, practicing attitudes and movements.
3. Each cadet should be given an equal amount of time. This means that the 60 minutes should be divided as evenly as possible by the number of cadets in the class.
4. If a cadet is quickly grasping the concepts, move on to the next cadet. This will allow some flexibility in the event a cadet does not grasp the concepts quickly.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets’ participation in this activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in the flight simulator, practicing attitudes and movements, will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It has been stated by many flight instructors that a significant difference can be seen in the skill quality of students who used a flight simulator compared to those who did not. The military is a large user of computer-based flight simulators, as are Air Canada and WestJet. Cadets are encouraged to train on flight simulators as it will enhance their preparation for future flight training.

INSTRUCTOR NOTES/REMARKS

Concurrent activities may be required based on the number of simulators available.

All staff should be familiar with the operation of the flight simulator prior to the EO. This will better prepare them to troubleshoot and instruct.

REFERENCES

C3-139 (ISBN 0-7715511-5-0) Transport Canada. (1999). *Flight Training Manual: 4th Edition Revised*. Ottawa, ON: Transport Canada.

C3-156 *Computerized Aircraft Simulation Center*. (2007). Retrieved October 2, 2007, from http://www.regions.cadets.forces.gc.ca/pac/aircad/flight/casc_lessons_e.asp.

THE FOUR STATIONS

Station 1: Tennis Ball – Dynamic and Static Stability

This station should be set up in an area of the classroom where there will be a six-foot (2-metre) length of unobstructed floor space. Place a piece of tape on the floor to mark the starting position. Place a tennis ball on the piece of tape.

1. Have the cadet pick up the ball to shoulder height (thus displacing it from its original position) and then drop it back on to the floor.
2. Have the cadet observe the tennis ball as it bounces.
3. The initial bounce is the static stability, while the remaining bounces reflect dynamic stability.

Station 2: Marble With Bowl – Positive Stability

In the centre of the table place the bowl, right-side up. Place a marble in the centre of the bowl.

1. Have the cadet push the marble with their finger to just below the lip of the bowl.
2. Allow the marble to fall back to the bottom of the bowl.
3. Observe the results.
4. The end result is that the marble will return to its original place; positive stability.

Station 3: Marble on Flat Level Surface – Neutral Stability

Place a marble on one end of a table.

1. Have the cadet gently push the marble towards the other end of the surface.
2. Observe the marble as it rolls and then stops.
3. The marble is now in a new position, neither moving further away nor moving back to its starting place.

Station 4: Marble With Bowl – Negative Stability

This station should be set up on a table. In the centre of the table, place a bowl, upside down. Place a marble on top of the bowl.

1. Have the cadet gently push the marble towards the edge of the bowl's base.
2. Watch as the marble continues to move away from its starting place. This is negative stability.
3. Have the cadets chase after the marble and replace it. Replacing the marble is not part of the demonstration of negative stability.

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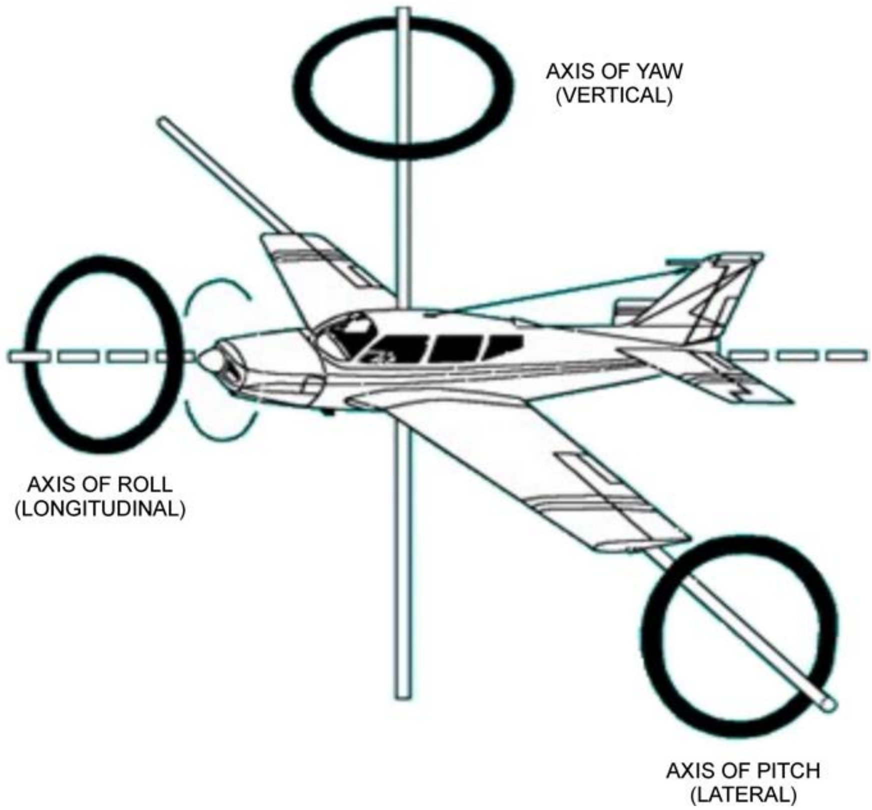
CONTROL SURFACES



"Start Flying", Controlling the Aircraft, (2007). Retrieved October 24, 2007, from http://www.startflying.com/new%20site/controlling_aircraft.htm

Figure 12B-1 Axes of Rotation

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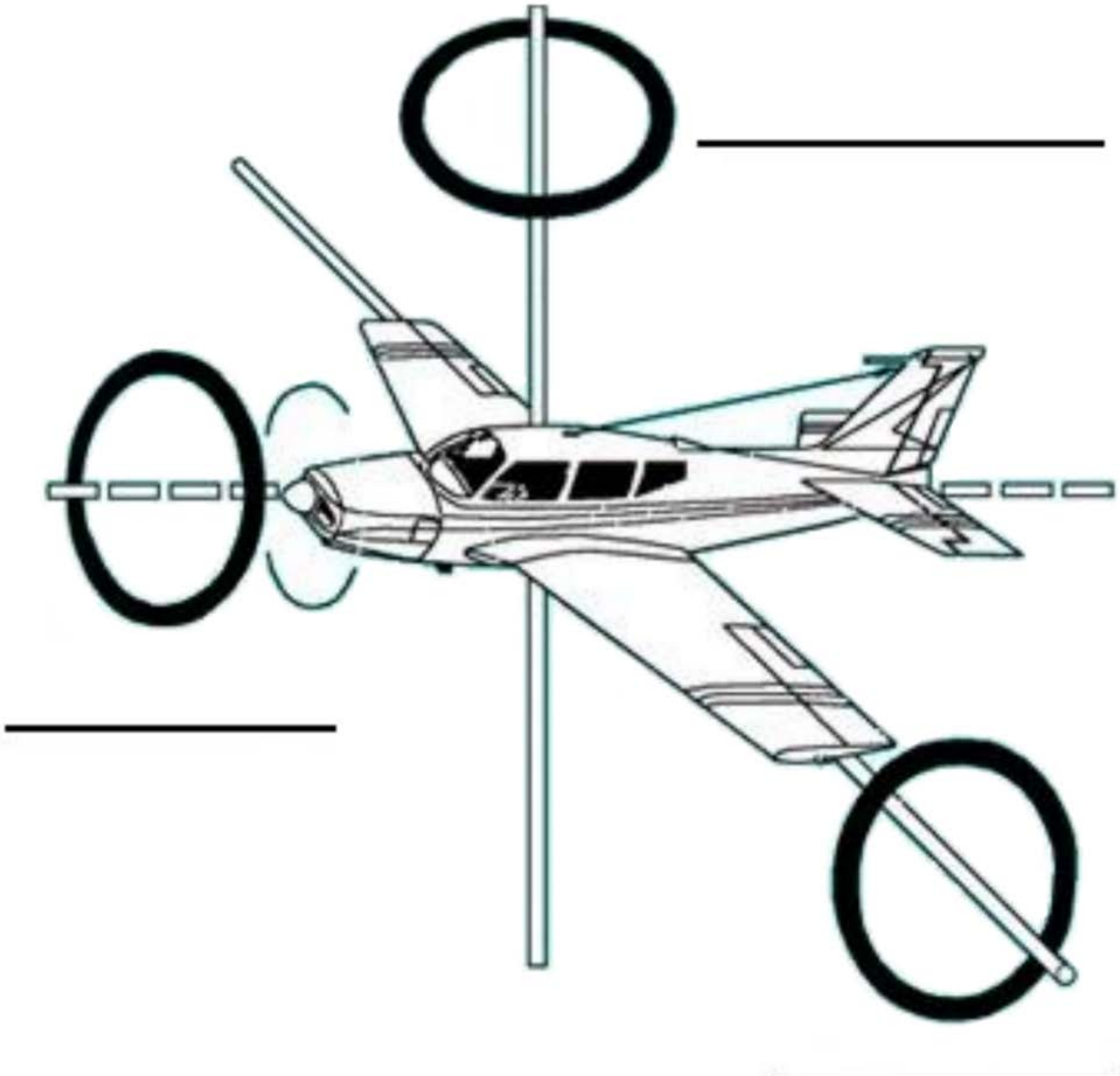
AXES OF ROTATION



"Controlling the Aircraft", Start Flying, (2007). Retrieved October 24, 2007, from http://www.startflying.com/new%20site/controlling_aircraft.htm

Figure 12C-1 Axes of Rotation

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ASI WORKSHEET

______ KNOTS ______ KNOTS ______ KNOTS

______ KNOTS ______ KNOTS ______ KNOTS

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 12D-1 ASI Worksheet

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ASI ANSWER KEY

30 KNOTS

50 KNOTS

170 KNOTS

98 KNOTS

120 KNOTS

65 KNOTS

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 12E-1 ASI Answer Key

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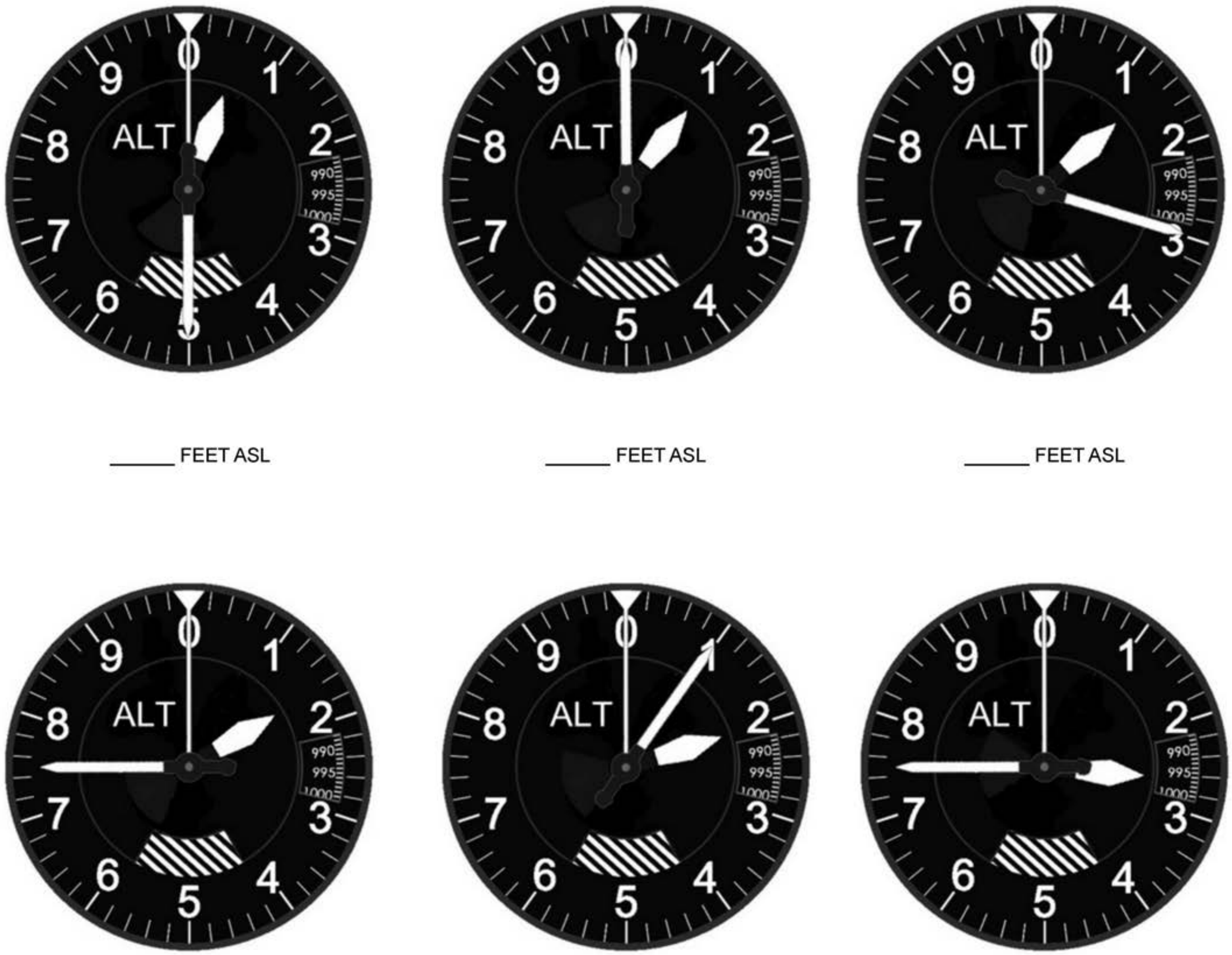
ALTIMETER WORKSHEET



______ FEET ASL ______ FEET ASL ______ FEET ASL

______ FEET ASL ______ FEET ASL ______ FEET ASL

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 12F-1 Altimeter Worksheet

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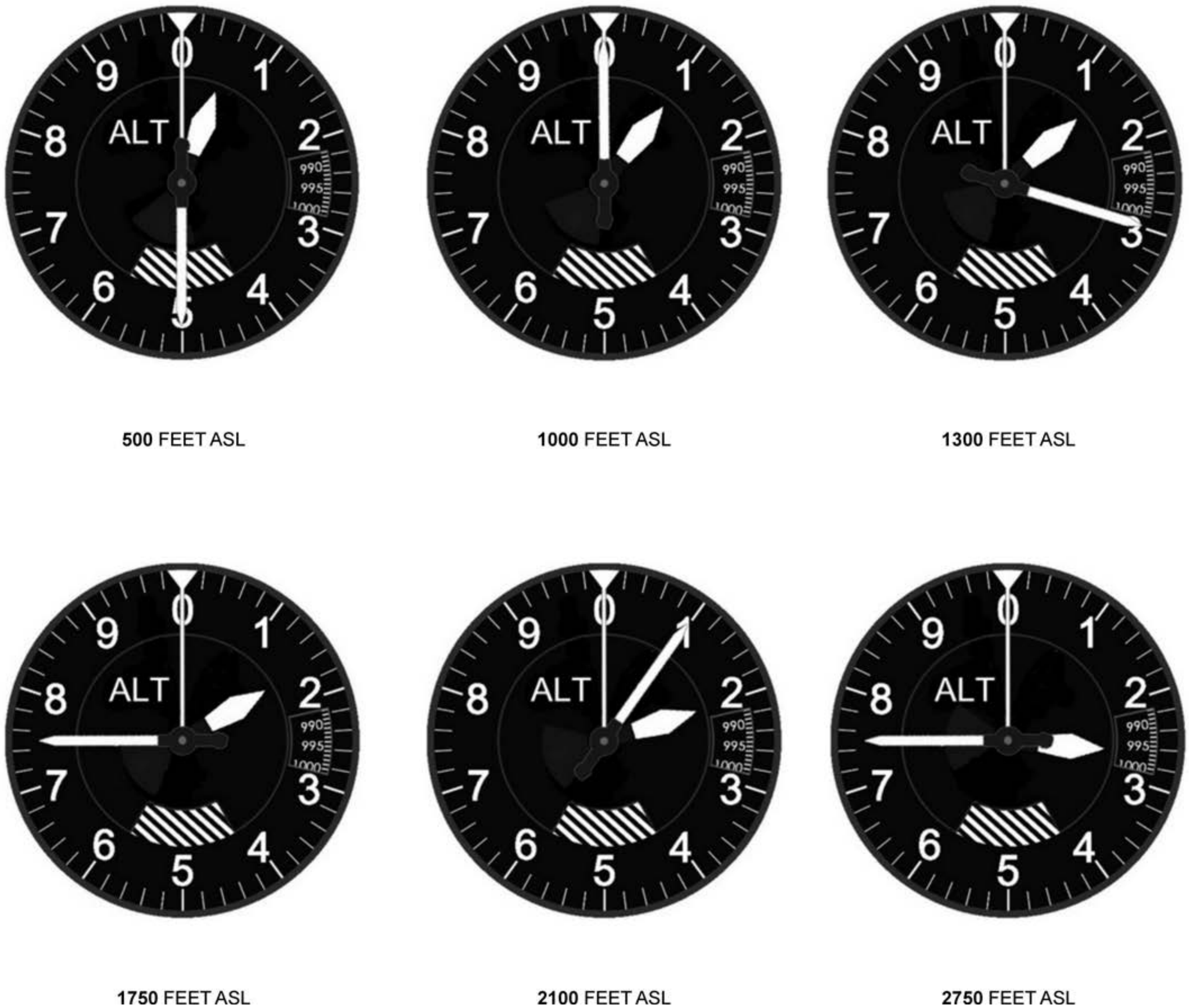
ALTIMETER ANSWER KEY



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 12G-1 Altimeter Answer Key

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VSI WORKSHEET

_____ FEET PER MINUTE

_____ FEET PER MINUTE

_____ FEET PER MINUTE

_____ FEET PER MINUTE

_____ FEET PER MINUTE

_____ FEET PER MINUTE

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 12H-1 VSI Worksheet

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VSI ANSWER KEY

0 FEET PER MINUTE

+200 FEET PER MINUTE

+700 FEET PER MINUTE

-50 FEET PER MINUTE

-400 FEET PER MINUTE

-800 FEET PER MINUTE

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 12I-1 VSI Answer Sheet

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INSTRUCTIONS FOR CREATION OF PITOT STATIC INSTRUCTIONAL AIDS

RESOURCES

- One sheet of Bristol board per training aid,
- One brass Acco fastener per training aid,
- Pencil,
- Compass from a geometry set,
- Ruler or straight edge,
- Coloured markers, and
- Poster board for making dial hands.

INSTRUCTIONS – ASI

1. Draw a representation of an ASI centred on the Bristol board. This will include all of the numbers and coloured arcs/lines. Use figures located at Annex D as guides for layout.
2. Colour in the arcs and lines with the appropriate colours for the green arc, yellow arc and red line. Colouring in the white arc is optional as it is not covered in PO S331.
3. Cut out a dial hand from the poster board.
4. Attach the dial hand to the centre of the representation using the brass Acco fastener.
5. Ensure that the hand can move when needed, but there is enough friction to keep them from moving on their own.

INSTRUCTIONS – ALTIMETER

1. Draw a representation of an altimeter's face centred on the Bristol board. This will include all of the numbers and graduated lines in between the numbers. Use figures located at Annex F as guides for layout.
2. Cut dial hands from the poster board to represent the hands of an altimeter.
3. Colour in the altimeter. To add variety of colour, use yellow and black for the polygon shape under the hands pivot point.
4. Attach the hands to the centre of the altimeter representation using the brass Acco fastener.
5. Ensure that the hands can move when needed, but there is enough friction to keep them from moving on their own.

INSTRUCTIONS – VSI

1. Draw a representation of a VSI centred on the Bristol board. This will include all of the numbers on the positive and negative scales. Ensure that zero is located on the left side. Use the figures located in Annex G as guides for layout.
2. Colour in the VSI.
3. Cut out a dial hand from poster board and attach it to the centre of the representation using the brass Acco fastener.
4. Ensure that the hand can move when needed, but there is enough friction to keep it from moving on its own.

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TRIVIAL PURSUIT QUESTIONS

These are suggested questions that can be used for the Trivial Pursuit game in TP 5. The instructor is able to modify this list in any way. When asking a question, first set the specific training aid to the desired reading. Then allow the team whose turn it is to provide an answer. Be sure to rotate instruments every question.

ASI QUESTIONS

For each question, set the ASI training aid to the desired value. These can be asked in any order desired.

1. 125 KIAS
2. 65 KIAS
3. 40 KIAS
4. 50 KIAS
5. 75 KIAS
6. 180 KIAS
7. 210 KIAS
8. 98 KIAS
9. 110 KIAS
10. 55 KIAS

ALTIMETER QUESTIONS

For each question, set the altimeter training aid to the desired value. These can be asked in any order desired.

1. 8 900 feet ASL
2. 1 300 feet ASL
3. 2 600 feet ASL
4. 11 000 feet ASL
5. 7 500 feet ASL
6. 1 250 feet ASL
7. 600 feet ASL
8. 400 feet ASL
9. 300 feet ASL
10. 1 000 feet ASL

VSI QUESTIONS

For each question, set the VSI training aid to the desired value. These can be asked in any order desired.

1. +200 feet per minute
2. +300 feet per minute
3. +150 feet per minute

4. +500 feet per minute
5. +800 feet per minute
6. -1 000 feet per minute
7. -250 feet per minute
8. -400 feet per minute
9. -900 feet per minute
10. -1 200 feet per minute

LOCATION OF ANTI-TORQUE ROTOR

Airforce Imagery, 2008, CH-149 Cyclone. Copyright 2006 by Sikorsky Aircraft Corporation. Retrieved April 9, 2008, from http://www.airforceimagery.forces.gc.ca/netpub/server.np?find&catalog=casimages&template=detail2_e.np&field=itemid&op=matches&value=3018&site=casimages

Figure 12L-1 Location of Anti-Torque Rotor

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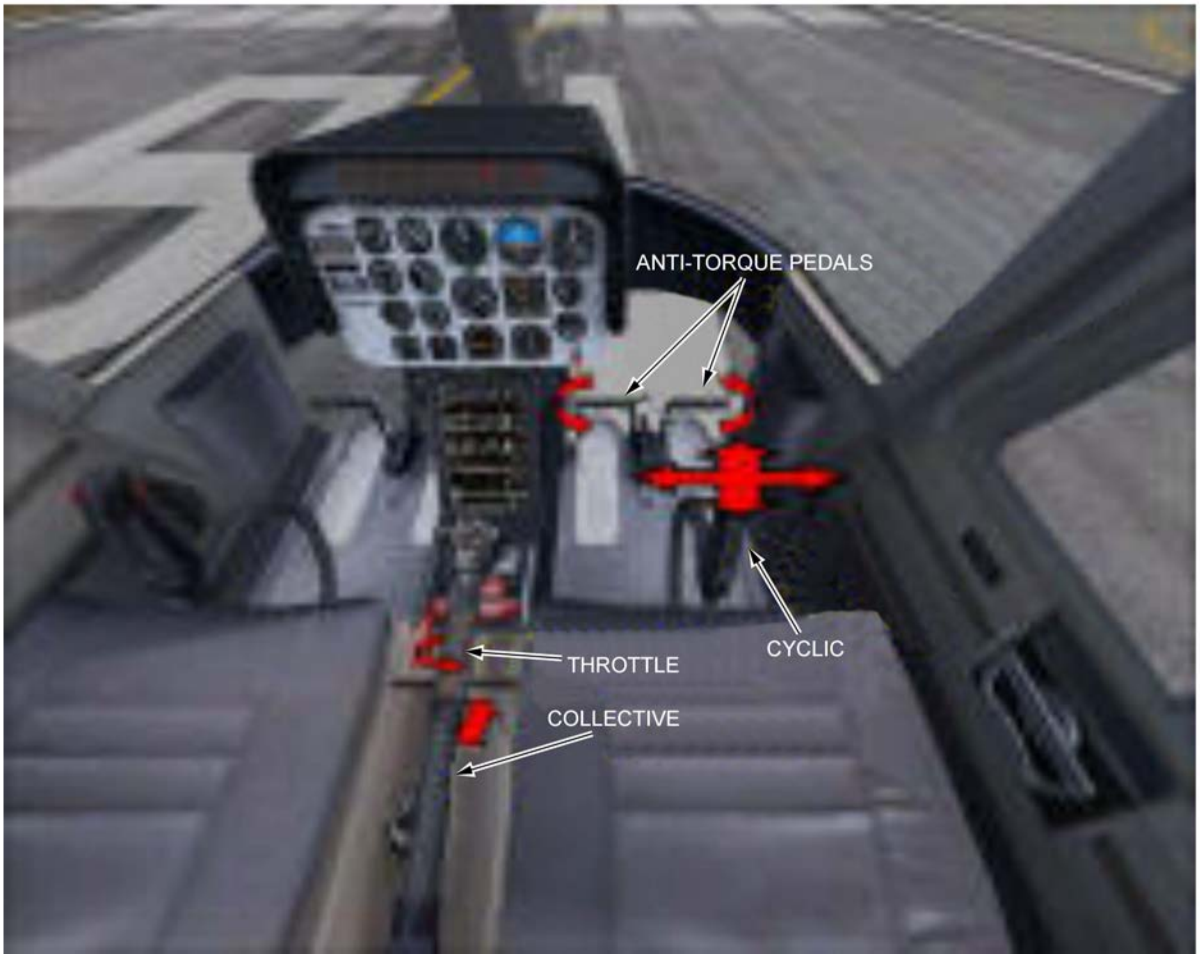
HELICOPTER CONTROL INPUTS



AVSIM Online, by S. Cartwright, 2004, Helicopter Tutorial, Copyright 2004 by AVSIM Online. Retrieved April 8, 2008, from http://www.avsim.com/pages/0604/heli/helitutorial.htm

Figure 12M-1 Helicopter Control Inputs

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CHAPTER 13

PO 336 – IDENTIFY METEOROLOGICAL CONDITIONS

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M336.01 – DESCRIBE PROPERTIES OF THE ATMOSPHERE

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a slide of the divisions of the atmosphere located at Annex A.

Bring resources needed for demonstration in TP 2.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the cadet to the properties of the atmosphere.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described properties of the atmosphere.

IMPORTANCE

It is important for cadets to describe properties of the atmosphere to enhance their understanding of how weather conditions are created.

Teaching Point 1	**Describe the Composition of the Atmosphere**
Time: 5 min	Method: Interactive Lecture

COMPOSITION OF THE ATMOSPHERE

The atmosphere is composed of a mixture of invisible gases. These gases make up the majority of the atmosphere. There are also small particles of dust and debris in the lower levels of the atmosphere.

The Breakdown of the Major Gases

At altitudes of up to 250 000 feet above sea level (ASL), the atmosphere is composed primarily of nitrogen, oxygen, argon, carbon dioxide, hydrogen, water vapour, and several other gases. Each of these gases comprises a certain percentage of the atmosphere.

- **Nitrogen.** Nitrogen is the most abundant gas by percentage of the atmosphere at 78 percent.
- **Oxygen.** Oxygen is the second most abundant gas by percentage of the atmosphere at 21 percent.
- **Other.** The rest of the gases make up approximately 1 percent of the atmosphere.

The Importance of Water Vapour

Water vapour is found only in the lower layers of the atmosphere. The amount of water in the atmosphere is never constant, but it is the most important of the gases from the standpoint of weather. It can change from a gas into water droplets or ice crystals and is responsible for the formation of clouds.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How much of the atmosphere is composed of nitrogen?

Q2. How much of the atmosphere is composed of oxygen?

Q3. From the standpoint of weather, which gas is the most important?

ANTICIPATED ANSWERS

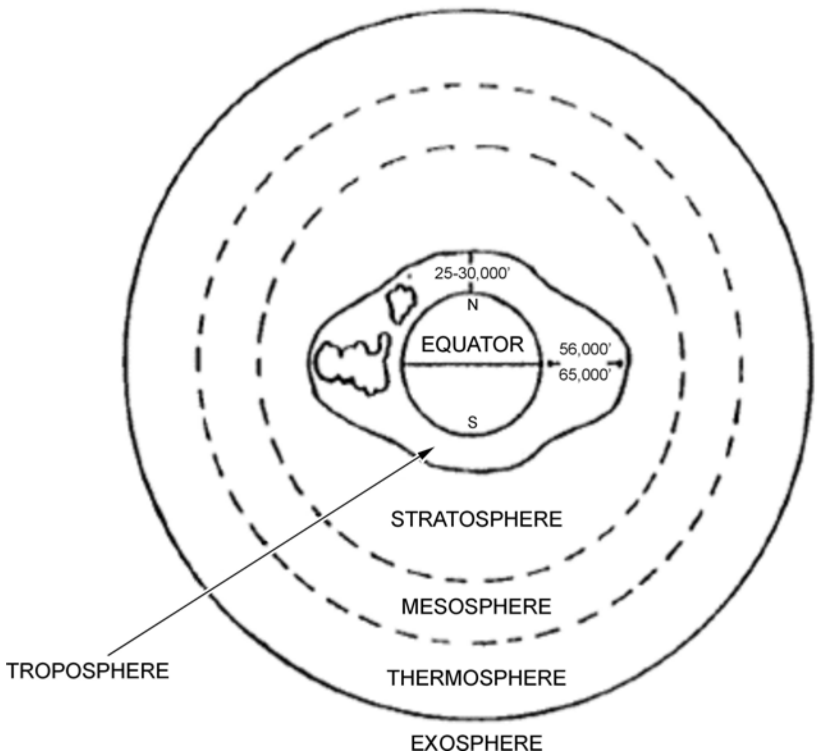
A1. 78 percent.

A2. 21 percent.

A3. Water vapour.

Teaching Point 2	**Illustrate the Divisions of the Atmosphere**
Time: 10 min	Method: Interactive Lecture

DIVISIONS OF THE ATMOSPHERE



A. F. MacDonald and I. L. Peppler, From the Ground Up, Aviation Publishers Co. Limited (p. 123)

Figure 13-1-1 The Four Layers of the Atmosphere

The atmosphere is divided into four distinct layers which surround the earth for many hundreds of miles. These layers are the:

- troposphere,
- stratosphere,
- mesospehere, and
- thermosphere.

The exosphere is not actually a layer of the atmosphere; it is actually the first vestiges of outer space.

Show the slide located at Annex A.

Illustrate each layer of the atmosphere using the tennis ball or small globe and the clear plastic bowls. Place the tennis ball on a table, and as you introduce a new layer of the atmosphere, place a plastic bowl over the tennis ball.

The Troposphere

The troposphere is the lowest layer of the atmosphere. The troposphere starts at ground level and extends to varying heights ASL (see Figure 13-1-1). Within the troposphere air pressure, density and temperature decrease with altitude. Temperature will drop to a low of -56 degrees Celsius. Most weather occurs in this layer of the atmosphere due to the presence of water vapour as well as strong vertical currents caused by terrestrial radiation. Terrestrial radiation causes the troposphere to extend to varying altitudes. There is more radiation at the equator than at the poles.

The phenomenon known as the jet stream exists in the upper parts of the troposphere.

The top of the troposphere is known as the tropopause, which acts as a boundary between the troposphere and the stratosphere.

The Stratosphere

The stratosphere extends 50 000 feet upwards from the tropopause. The pressure continues to decrease in the stratosphere. The temperature will gradually rise to 0 degrees Celsius. It is in the stratosphere that the bulk of the ozone layer exists. This prevents the more harmful solar radiation from reaching the earth's surface, which explains the rise in temperature.

The top of the stratosphere is called the stratopause, which acts as a boundary between the stratosphere and the mesosphere.

The Mesosphere

The mesosphere is characterized by a decrease in temperature. The temperature will reach a low of -100 degrees Celsius at 275 000 feet ASL. It is in the mesosphere that meteorites will usually burn up.

The top of the mesosphere is known as the mesopause, which acts as a boundary between the mesosphere and the thermosphere.

The Thermosphere

The highest of the four layers, the thermosphere is so named due to its intense temperatures. This is the first layer to be affected by solar radiation and what few oxygen molecules there are in this layer will absorb a high amount of that radiation. The actual temperature will vary depending on solar activity, but it can exceed 15 000 degrees Celsius.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Name the four layers of the atmosphere.

Q2. In which layer does most weather occur?

Q3. In which layer is the ozone layer found?

ANTICIPATED ANSWERS

A1. Troposphere, stratosphere, mesosphere, and thermosphere.

A2. The troposphere.

A3. The stratosphere.

Teaching Point 3	Explain International Civil Aviation Organization (ICAO) Standard Atmosphere
Time: 5 min	Method: Interactive Lecture

ICAO STANDARD ATMOSPHERE

The decrease in temperature, pressure and density with altitude is not constant, but varies with local conditions. For the purposes of aviation, it is required that an international standard be set. Different regions have different standards.

The Basis of ICAO Standards in North America

The ICAO standard for North America is based on the summer and winter averages for 40 degrees north latitude. These averages include air pressure, air density and air temperature.

The Assumptions for Standard Atmosphere in North America

ICAO standards for North America assume the following conditions:

- the air is a perfectly dry gas;
- a mean sea level pressure of 29.92 inches of mercury;
- a mean sea level temperature of 15 degrees Celsius; and
- temperature decreases with altitude at a rate of 1.98 degrees Celsius per 1 000 feet.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Why is there an international standard atmosphere?

Q2. What is the basis for ICAO standard atmosphere in North America?

Q3. What are the four assumptions used in the ICAO standard atmosphere for North America?

ANTICIPATED ANSWERS

A1. The decrease in temperature, pressure and density with altitude is not constant, but varies with local conditions.

A2. The ICAO standard for North America is based on the summer and winter averages for 40 degrees north latitude.

A3. ICAO standards for North America assume the following conditions:

- the air is a perfectly dry gas;
- a mean sea level pressure of 29.92 inches of mercury;
- a mean sea level temperature of 15 degrees Celsius; and
- the rate at which temperature decreases with altitude is 1.98 degrees Celsius per 1 000 feet.

Teaching Point 4 | **Explain the Properties of the Atmosphere**

Time: 5 min | Method: Interactive Lecture

PROPERTIES OF THE ATMOSPHERE

The properties of the atmosphere allow for various weather conditions. There are three principle properties:

- **Mobility.** This property is the ability of the air to move from one place to another. This is especially important as it explains why an air mass that forms over the arctic may affect places in the south.
- **Capacity for Expansion.** The most important of the three properties. Air is forced to rise for various reasons. As the air pressure decreases, the air will expand and cool. This cooling may be enough for condensation to occur and clouds to form, creating precipitation.
- **Capacity for Compression.** The opposite of expansion, compression occurs when the air has cooled and becomes denser. The air will sink, decreasing in volume and increasing in temperature.

Factors Affecting the Properties of the Atmosphere

There are three factors which affect the properties of the atmosphere: temperature, density and pressure. Temperature changes air density which creates the vertical movement of the air, causing expansion and compression. The vertical movement creates pressure differences, which causes mobility across the surface as the air moves horizontally to fill gaps left by air that has moved vertically.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What are the three properties of the atmosphere?

Q2. Which is the most important property of the atmosphere?

Q3. What are the three factors affecting the properties of the atmosphere?

ANTICIPATED ANSWERS

A1. Mobility, capacity for expansion and capacity for compression.

A2. Capacity for expansion.

A3. Temperature, density and pressure.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Name the four layers of the atmosphere.

Q2. Why is there an international standard atmosphere?

Q3. Which is the most important property of the atmosphere?

ANTICIPATED ANSWERS

A1. Troposphere, stratosphere, mesosphere, and thermosphere.

A2. The decrease in temperature, pressure, and density with altitude is not constant, but varies with local conditions.

A3. Capacity for expansion.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Understanding why weather occurs will allow the cadet to anticipate what could happen to the flying conditions in the near future. This will be useful for all areas of life from flight planning to deciding whether or not to take an umbrella.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M336.02 – EXPLAIN THE FORMATION OF CLOUDS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Annexes B to I.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the concepts of cloud formation.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have explained the formation of clouds.

IMPORTANCE

It is important for cadets to know how clouds form as it will enhance their knowledge of meteorology and their ability to predict weather.

Teaching Point 1	**Explain Cloud Classification**
Time: 5 min	Method: Interactive Lecture

CLOUD CLASSIFICATION

Clouds are classified based on type of formation and cloud height.

Types of Formation

There are two main types of cloud formations:

Show slide of Annex B.

- **Cumulus.** Cumulus clouds are formed by air that is unstable. They are cottony or puffy, and are seen mostly during warmer seasons. Cumulus clouds may develop into storm clouds.

"Victoria Weather", by UVic, School-Based Weather Station Network.
Retrieved November 1, 2007, from http://www.victoriaweather.ca/clouds

Figure 13-2-1 Cumulus Cloud

- **Stratus.** Stratus clouds are formed in air that is stable. They are flat and can be seen year round, but are associated with colder temperatures.

Show slide of Annex C.

"Victoria Weather", by UVic, School-Based Weather Station Network.
Retrieved November 1, 2007, from http://www.victoriaweather.ca/clouds

Figure 13-2-2 Stratus Cloud

Cloud Height

Clouds are also classified based on their height above ground level (AGL). There are four main categories:

- **Low Clouds.** The bases of low clouds range from the surface to a height of 6 500 feet AGL. Low clouds are composed of water droplets and sometimes ice crystals. Low clouds use the word stratus as either a prefix (eg, stratocumulus) or a suffix (eg, nimbostratus).
- **Middle Clouds.** The bases of middle clouds range from 6 500 to 23 000 feet AGL. They are composed of ice crystals or water droplets, which may be at temperatures above 0 degrees Celsius. Middle clouds use the prefix of "alto" (eg, altocumulus).
- **High Clouds.** The bases of high clouds range from 16 500 to 45 000 feet, with an average of 25 000 feet in the temperate regions of the earth. High clouds are composed of ice crystals. High clouds use the prefix of "cirrus" or "cirro" (eg, cirrocumulus).
- **Clouds of Vertical Development.** The base of these clouds may be as low as 1 500 feet AGL and may rise as high as the lower reaches of the stratosphere. They may appear as isolated clouds or may be seen embedded in layers of clouds. Clouds of vertical development are associated with thunderstorms and other phenomena which occur during the summer months.

Show slide of Annex D.

The following chart includes a brief description of the more common cloud types.

Cloud Name	Cloud Family	Cloud Description
Cirrus	High	High, thin, wispy clouds blown by high winds into long streamers. Cirrus clouds usually move across the sky from west to east. They generally indicate pleasant weather.
Cirrocumulus	High	Appear as small, round white puffs. The small ripples in the cirrocumulus sometimes resemble the scales of a fish. A sky with cirrocumulus clouds is sometimes referred to as a "mackerel sky."
Altocumulus	Middle	Appear as grey, puffy masses, sometimes in parallel waves or bands. The appearance of these clouds on a warm, humid summer morning often means thunderstorms will occur by late afternoon.
Altostratus	Middle	A grey or blue-grey layer cloud that typically covers the entire sky. In the thinner areas of the cloud, the sun may be dimly visible as a round disk. This cloud appears lighter than stratus clouds.
Stratus	Low	Uniform grey layer cloud that often covers the entire sky. They resemble fog that does not reach the ground. Usually no precipitation falls from stratus clouds, but sometimes they may drizzle.
Nimbostratus	Low	Dark grey layer clouds associated with continuously falling rain or snow. They often produce precipitation that is usually light to moderate.
Stratocumulus	Low	A series of rounded masses that form a layer cloud. This type of cloud is usually thin enough for the sky to be seen through breaks.
Cumulus	Vertical Development	Puffy clouds, which are thick, round, and lumpy. They sometimes look like pieces of floating cotton. They usually have flat bases and round tops.
Cumulonimbus	Vertical Development	Thunderstorm clouds that form if cumulus clouds continue to build. Violent vertical air currents, hail, lightning, and thunder are associated with the cumulonimbus clouds.

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 13-2-3 Common Clouds

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How are clouds classified?

Q2. What are the two types of cloud formations?

Q3. What are the four categories of cloud height?

ANTICIPATED ANSWERS

A1. By type of formation and height.

A2. Cumulus and stratus.

A3. Low clouds, middle clouds, high clouds and clouds of vertical development.

Teaching Point 2	**Explain Air Stability**
Time: 5 min	Method: Interactive Lecture

AIR STABILITY

At the surface, the normal flow of air is horizontal. Disturbances may occur, which will cause vertical currents of air to develop. This is normally caused by a change in temperature. If the air that is displaced resists the change, then it is said to be stable. If it does not resist the change then it is unstable. When air rises, it expands and cools.

Stable Air. If a mass of rising air is cooler than the air that it comes in contact with, then it will sink back to its original position. Stable air may have the following affects on flight characteristics:

- poor low-level visibility (fog may occur),
- stratus type cloud,
- steady precipitation,
- steady winds, which can change greatly with height, and
- smooth flying conditions.

Unstable Air. If a mass of rising air is still warmer than the new air around it, then the air mass will continue to rise. Unstable air may have the following affects on flight characteristics:

- good visibility (except in precipitation),
- cumulus type cloud,
- showery precipitation,
- gusty winds, and
- moderate to severe turbulence.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What may create vertical currents?

Q2. What is stable air?

Q3. What is unstable air?

ANTICIPATED ANSWERS

A1. A change in temperature.

A2. When a mass of rising air is cooler than the air that it comes in contact with, then it will sink back to its original position.

A3. When a mass of rising air is warmer than the new air around it, then the air mass will continue to rise.

Teaching Point 3 **Explain Lifting Agents**

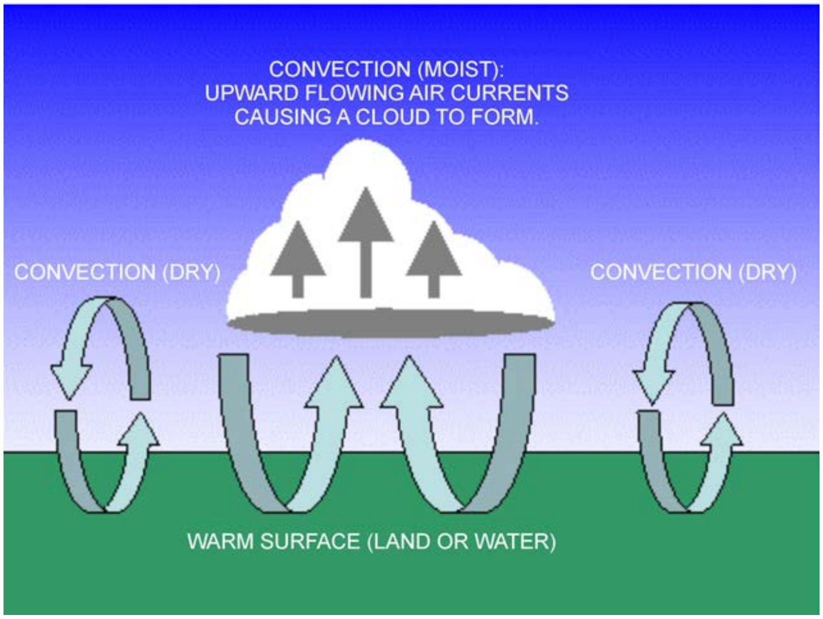
Time: 10 min Method: Interactive Lecture

LIFTING AGENTS

Rising currents of air affect many weather conditions. There are five conditions that provide the lift required to initiate rising currents of air.

Show slides of Annexes E to I as applicable.

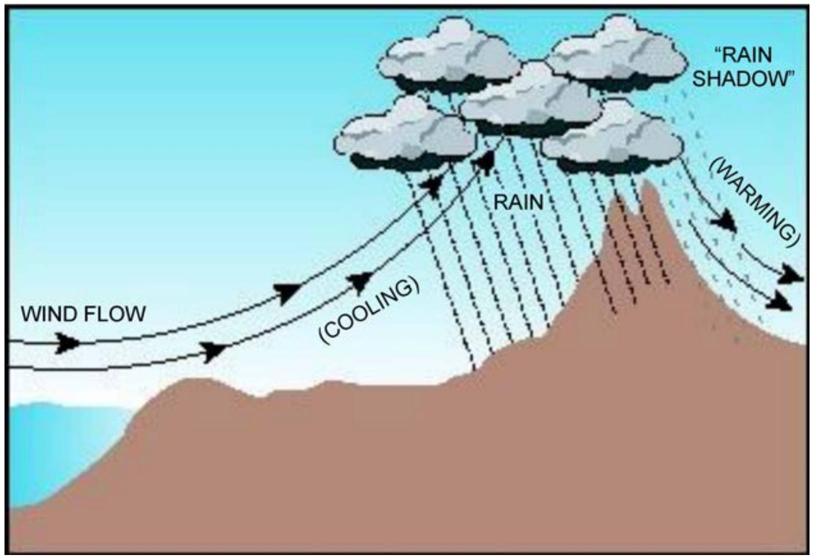
Convection. The air is heated through contact with the earth's surface. As the sun heats the surface of the earth, the air in contact with the surface warms up, rises, and expands. Convection may also occur when air moves over a warmer surface and is heated by advection.



WeatherQuestions.com, 2007, What is Convection. Copyright 2007 by WeatherStreet. Retrieved March 17, 2008, from http://www.weatherquestions.com/What_is_convection.htm

Figure 13-2-4 Convection

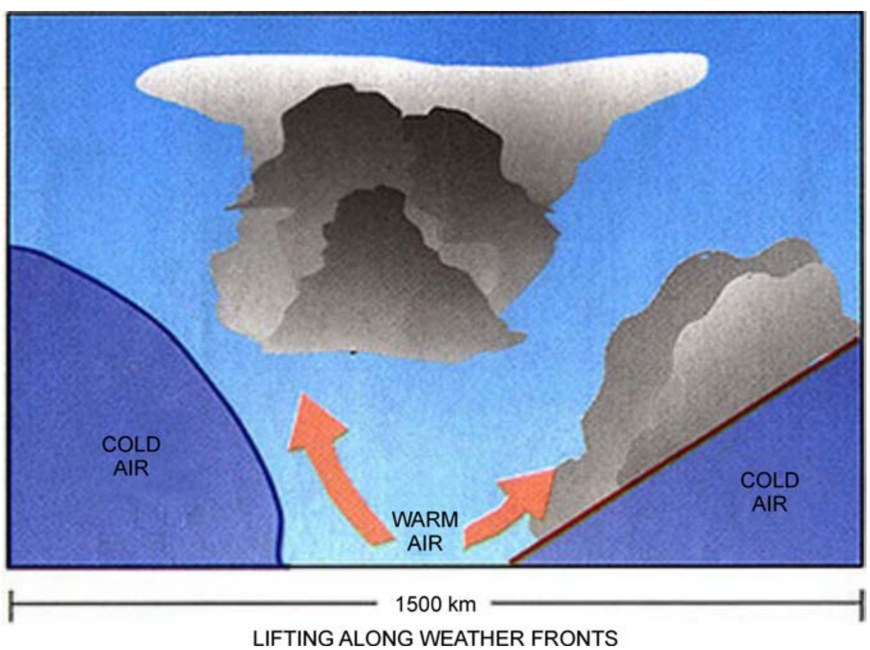
Orographic Lift. Orographic lift occurs when the sloping terrain forces the air upward. This process can be exaggerated if the air mass is already.



Water Encyclopedia, by G. H. Taylor, 2007, Water as a Climate Moderator. Copyright 2007 by Advameg. Retrieved March 17, 2008, from http://www.waterencyclopedia.com/Ce-Cr/Climate-Moderator-Water-as-a.html

Figure 13-2-5 Orographic Lift

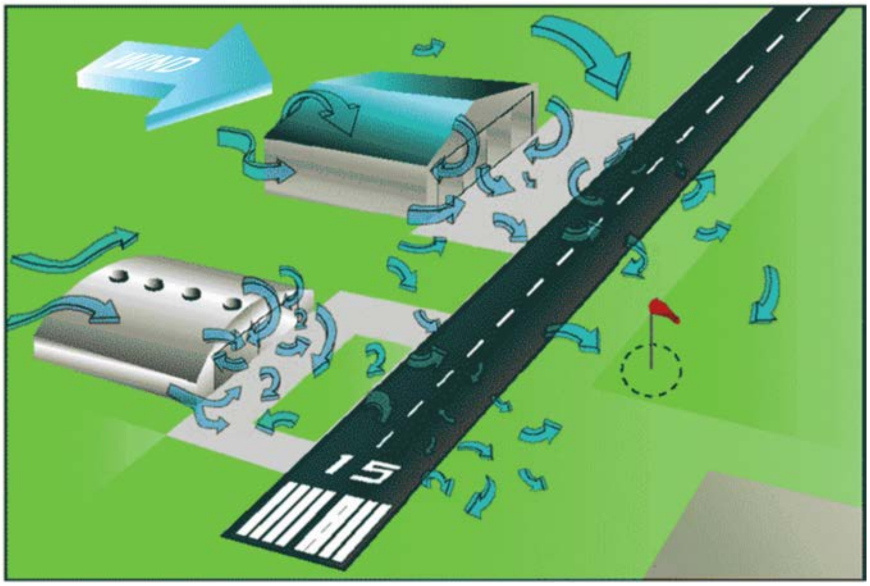
Frontal Lift. When different air masses meet, the warmer air is forced upwards by the denser cold air. This process may be exaggerated if the warm air mass becomes unstable.



Federation of American Scientists, by N. M. Short, Sr, 2007, Atmospheric Circulation: Weather Systems. Copyright 2007by FAS. Retrieved March 17, 2008, from http://www.fas.org/irp/imint/docs/rst/Sect14/Sect14_1c.html

Figure 13-2-6 Frontal Lift

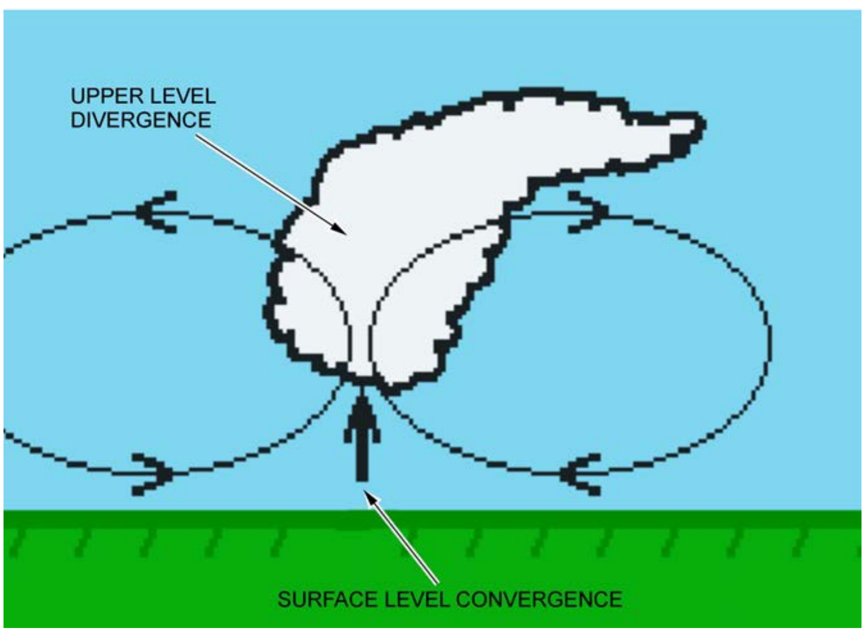
Mechanical Turbulence. Air moving over the ground may be affected by terrain that is not as pronounced as mountains. Forests, buildings, large ditches and quarries also affect the air through friction. This friction causes eddies, which are usually confined to the first few thousand feet of the troposphere. This process may be exaggerated if the air mass becomes or is already unstable.



Free Online Private Pilot Ground School, 2006, Aviation Weather–Principles. Copyright 2006. Retrieved March 17, 2008, from http://www.free-online-private-pilot-ground-school.com/Aviation-Weather-Principles.html

Figure 13-2-7 Mechanical Turbulence: Man-Made

Convergence. In a low pressure system, the wind blows toward the centre of the system. The excess air that collects here is forced upward to higher altitudes.



The Weather Doctor, by K. C. Heidron, PhD, 2002, What Goes Up: Part 3 Convergence and Divergence. Retrieved March 17, 2008, from http://www.islandnet.com/~see/weather/elements/whatgoesup3.htm

Figure 13-2-8 Convergence

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Explain how convection (as a source of lift) occurs.

Q2. Explain orographic lift.

Q3. Explain frontal lift.

ANTICIPATED ANSWERS

A1. Convection is caused by heating of the air that is in contact with the surface of the earth.

A2. Orographic lift occurs when the sloping terrain forces the air upward.

A3. When different air masses meet, the warmer air is forced upward by the denser cold air. This process may be exaggerated if the warm air mass becomes unstable.

Teaching Point 4	**Describe Cloud Formation**
Time: 5 min	Method: Interactive Lecture

CLOUD FORMATION

Clouds are formed by the lifting agents and air stability.

Clouds are formed in two ways. Either the temperature drops to the saturation point of the air or the temperature is constant but the amount of water in the air increases.

Relating Lifting Agents to Air Stability

Each of the lifting agents described have an effect on, or is affected by, air stability. Convection, for example, is normally associated with unstable air since heat causes the convection, and is also a source of instability in the air.

Another example would be orographic lift, which is usually associated with stable air. After the air has been forced up by the terrain, it cools and becomes dense. The effect is similar to positive stability in an airplane.

Relating Air Stability to Types of Formation

Air stability will have a direct affect on cloud formation. Clouds created in stable air will form as stratus-type clouds. Clouds formed in unstable air will form as cumulus-type clouds.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What are the two ways in which a cloud forms?

Q2. How does orographic lift relate to air stability?

Q3. What cloud type will form in stable air?

ANTICIPATED ANSWERS

A1. Either the temperature drops to the saturation point of the air or the temperature is constant but the amount of water in the air increases.

A2. After the air has been forced up by the terrain, it cools and becomes dense. The effect is similar to positive stability in an airplane.

A3. Clouds created in stable air will form as stratus-type clouds.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the two types of cloud formation?

Q2. Define unstable air.

Q3. What cloud type will form in unstable air?

ANTICIPATED ANSWERS

A1. Cumulus and stratus.

A2. When a mass of rising air is warmer than the new air around it, then the air mass will continue to rise.

A3. Clouds created in unstable air will form as cumulus-type clouds.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Knowing how a cloud is formed will help predict the weather conditions that may exist. Conversely, knowing the weather conditions will assist in determining what clouds will form later in the day, and it may be possible to predict what the weather for the day will be.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-044 CFACM 2-700 Air Command. (2001). *Air Command Weather Manual*. Ottawa, ON: Department of National Defence.

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M336.03 – EXPLAIN THE EFFECTS OF AIR PRESSURE ON WEATHER

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Annexes J to O.

Photocopy handouts of Annex P for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the cadets to the effects of air pressure.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have explained the effects of air pressure on weather.

IMPORTANCE

It is important for cadets to explain the effects of air pressure on weather in order to appreciate patterns of weather and the movement of air.

Teaching Point 1 **Explain the Polar Front Theory**

Time: 10 min Method: Interactive Lecture

Certain terms used in this document are meant to be relative; they may not necessarily have a fixed value. For example, low pressure system does not necessarily mean that the pressure of the air is lower than mean sea level. It means that the air pressure in that system is lower than the air pressure around the system.

POLAR FRONT THEORY

The Polar Front theory was conceived by Norwegian meteorologists, who claimed that the interaction between the consistently high pressure area over the Arctic (and Antarctic) and the relatively lower pressure areas over the lower latitudes may provide force to the movement of air.

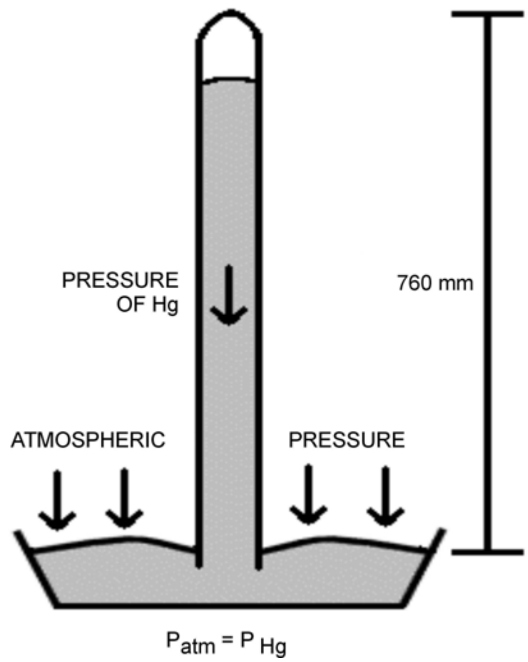
Definition of Atmospheric Pressure

Show slide of Annex J.

Atmospheric Pressure. The pressure of the atmosphere at any point due to the weight of the overlying air. Pressure at the surface of the earth is normally measured using a mercury barometer and is expressed in mm of mercury (mm Hg) or inches of mercury ("Hg). The barometer is essentially an upside-down graduated, test tube that is partially immersed in a bowl of mercury. As the pressure of the air over the bowl increases, the mercury is forced further up the test tube, providing a higher reading.

Pressure is a force and, in meteorological work, it is common to use hectopascals (hPa) to measure pressure. One hectopascal is 1 000 dynes (a unit of force) of force exerted on a 1 cm^2 area.

The average pressure of the atmosphere at sea level is normally expressed as 760 mm Hg (29.92 "Hg), which is the same as 1013.2 hPa. Public radio and television weather broadcasts (such as the Weather Network or Environment Canada) will express pressure in kilopascals (kPa). One kPa is equal to 10 hPa, so that 1013.2 hPa would be equal 101.32 kPa.



Chemistry Tutorial Notes, Department of Chemistry, Texas A&M University, 2006, Properties of Gases, Copyright 2006 by Texas A&M University. Retrieved April 4, 2008 from http://www.chem.tamu.edu/class/majors/tutorialnotefiles/pressure.htm

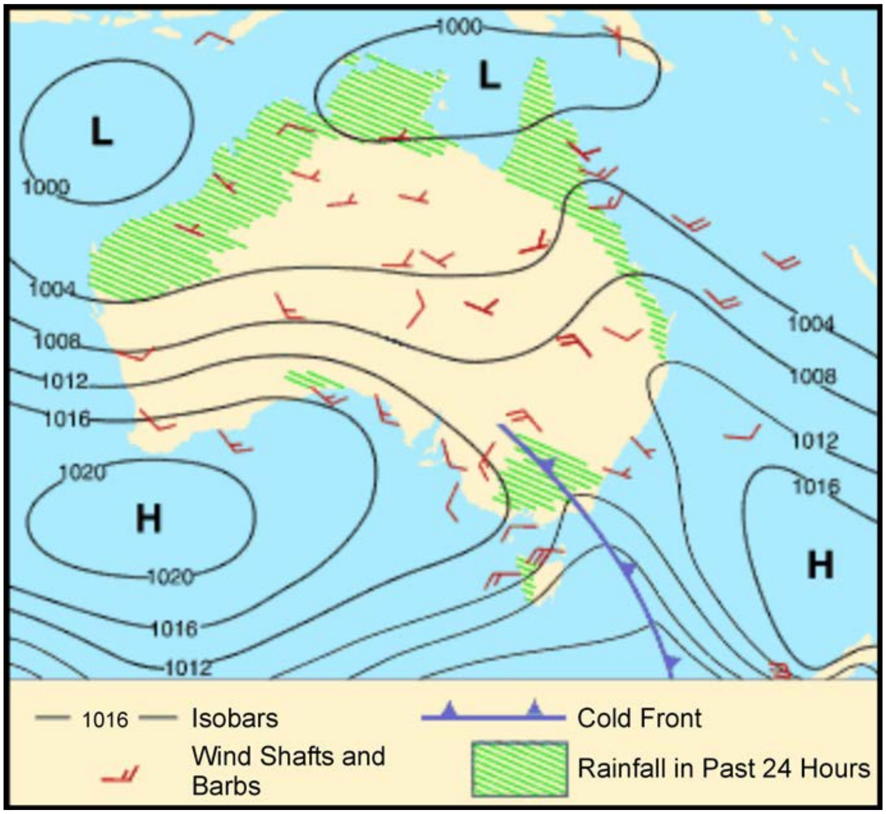
Figure 13-3-1 Barometer

Pressure Systems

There are pressure reading stations all over North America. Each station will send its readings to a main forecasting office, which will plot the information on a weather map.

Show slide of Annex K.

- **Isobars.** Areas of like pressure are joined by lines called isobars (from Greek *isos* [same] and *baros* [weight]). On a weather map, isobars will look similar to contour lines found on a topographical map. The isobars form roughly concentric circles, each circle being four hPa different than the circles before and after it. Groups of isobars will indicate areas of relatively high pressure, or relatively low pressure.



Australian Government, Bureau of Meteorlogy, 2008, Air Masses and Weather Maps, Copyright 2008 by Commonwealth of Australia, Bureau of Meteorology. Retrieved April 7, 2008 from http://www.bom.gov.au/info/ftweather/page_7.shtml

Figure 13-3-2 Isobars on a Weather Map

- **Low Pressure Areas.** Low pressure areas (often called lows, cyclones, or depressions) are areas of relatively lower pressure, with the lowest pressure in the centre. Lows will normally move in an easterly direction at an average rate of 800 km per day during the summer and 1 100 km per day in the winter. Lows are associated with thunderstorms and tornadoes, and do not stay in one place for very long. In the northern hemisphere, air moves around a low pressure in a counter-clockwise direction.
- **High Pressure Areas.** High pressure areas (often called anti-cyclones) are areas of relatively higher pressure, with the highest pressure in the centre. Winds are usually light and variable. High pressure areas move very slowly, sometimes staying stationary for days at a time. In the northern hemisphere, air moves around a high in a clockwise direction.

An Air Mass Over the Polar Regions

Polar air is typically cold and dry.

An Air Mass Over the Equatorial Regions

The air over the equator is tropical, therefore warm and moist.

Movement at the Polar Front

The transition zone between the polar air and the equatorial air is known as the polar front. Due to the differences in the properties of the two air masses, many depressions (low pressure areas) form along the polar front. The cold air moves from north-east to south-west in the northern hemisphere, while the warm air moves in the opposite direction. The result is constant instability as the cold air bulges south and the warm air bulges north. The cold air moves faster than the warm air and eventually envelopes it.

The movement of the air at the polar front is thought to be a cause for the circulation of air in the troposphere.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a hectopascal?

Q2. Which direction does the air move around a low pressure in the northern hemisphere?

Q3. What is the transition zone between the polar air and the tropical air known as?

ANTICIPATED ANSWERS

A1. One hectopascal is 1 000 dynes of force exerted on a 1 cm^2 area.

A2. Counter-clockwise.

A3. Polar front.

Teaching Point 2	**Explain That the Properties (eg, Pressure) of an Air Mass are Taken From the Area Over Which it Forms**
Time: 5 min	Method: Interactive Lecture

PROPERTIES OF AN AIR MASS

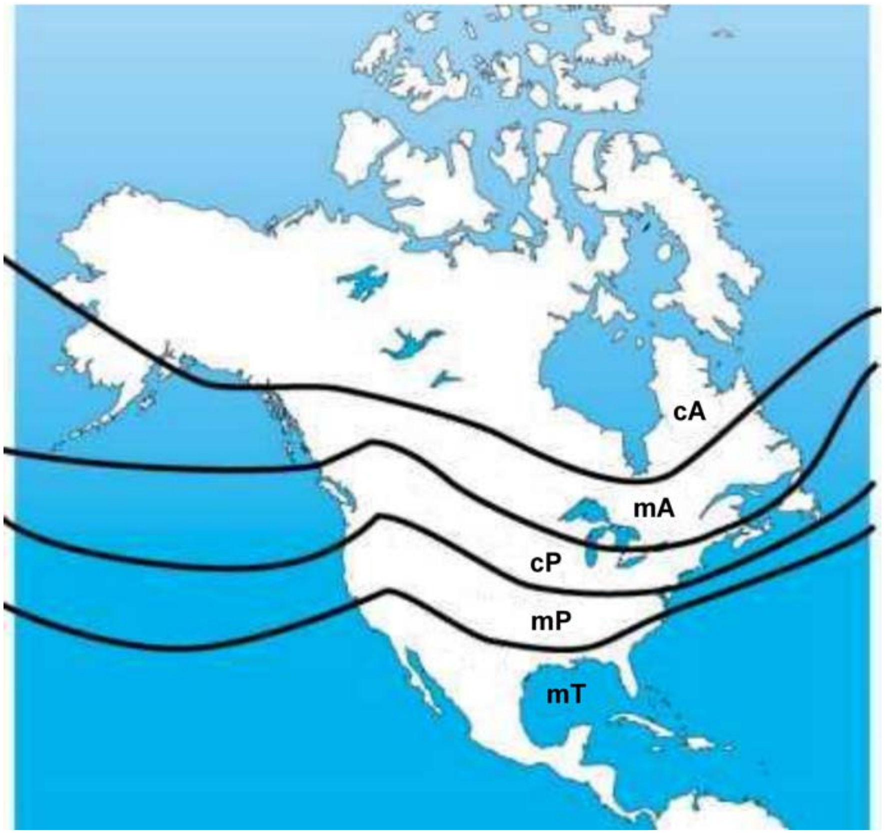
Weather forecasts used to be based solely on the existence and movement of pressure systems. Meteorologists currently base their predictions on the properties of air masses, of which pressure is only one factor.

An air mass may be defined as a large section of the troposphere with uniform properties of temperature and moisture along the horizontal plane. This means that if a horizontal cross-section was taken of an air mass, one would see layers within the air mass where the temperature and the amount of moisture would be the same throughout.

An air mass will take on the properties of the surface over which it has formed. An air mass, which has formed over the Arctic would be cold and dry, while one, which formed over the Gulf of Mexico would be warm and moist.

Air masses may be described as:

- **Continental Air Mass.** Since the air mass formed over land, this will be a dry air mass.
- **Maritime Air Mass.** Since the air mass formed over water, this will be a moist air mass.
- **Arctic Air Mass.** Since the air mass formed over the Arctic, this will be a cold air mass.
- **Polar Air Mass.** Since the air mass formed over the Polar region, this will be a cool air mass.
- **Tropical Air Mass.** Since the air mass formed over the Tropical region, this will be a warm air mass.



Meteorological Service of Canada, 2004, Frontal Systems, Copyright 2004 by Environment Canada. Retrieved April 7, 2008 from http://www.qc.ec.gc.ca/meteo/Documentation/Front_e.html

Figure 13-3-3 North American Air Masses

Show slide of Annex L.

These types of air masses are usually combined to describe the properties of temperature and moisture. For example, over Atlantic Canada one might find a maritime polar air mass, which will be cool and moist. Meanwhile prairie winters usually see continental polar or continental arctic, which will be either cool and dry or cold and dry. The five air masses in North America indicated in Figure 13-3-3 include:

- Continental Arctic (cA),
- Maritime Arctic (mA),
- Continental Polar (cP),
- Maritime Polar (mP), and
- Maritime Tropical (mT).

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the definition of an air mass?

Q2. Where does an air mass obtain its properties from?

Q3. What are five air masses in North America?

ANTICIPATED ANSWERS

A1. An air mass may be defined as a large section of the troposphere with uniform properties of temperature and moisture along the horizontal plane.

A2. An air mass will take on the properties of the surface over which it has formed.

A3. Continental air mass, maritime air mass, arctic air mass, polar air mass, and tropical air mass.

Teaching Point 3	Explain the Creation of Wind
Time: 5 min	Method: Interactive Lecture

WIND

Wind is a major factor in flight planning and flight characteristics. Pilots must constantly be aware of the direction and speed of wind during all parts of the flight, but especially during the landing sequence.

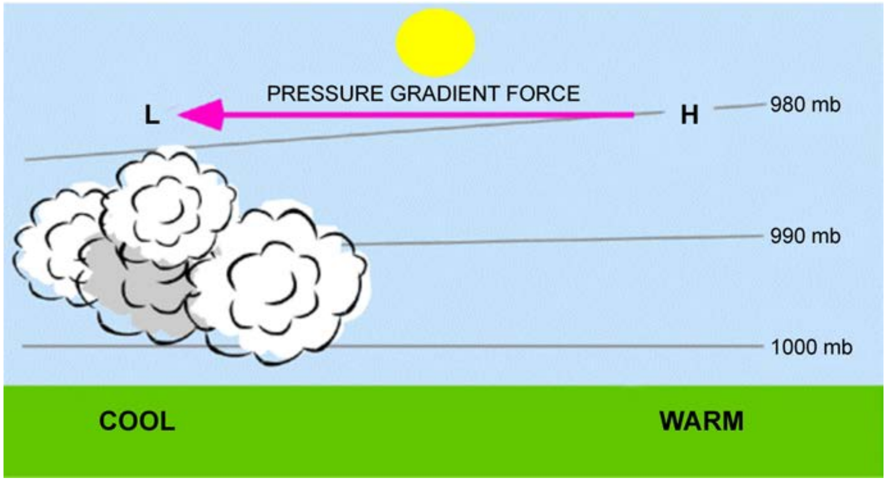
The Definition of Wind

Wind. The horizontal movement of air within the atmosphere. Wind normally moves parallel to the isobars of a pressure system. Since isobars are not straight lines, this means that the wind direction will vary at different locations along the pressure system. Wind also moves in different directions based on whether the pressure is a low or high system.

Show slide of Annex M.

Pressure Gradient

The pressure gradient is the rate of change of pressure over a given distance measured at right angles to the isobars. If the isobars are very close together, the rate of change will be steep and the wind speed will be strong. If the isobars are far apart, the rate of change will be shallow and the wind speed will be weak.



PhysicalGeography.net, Dr. M. Pidwirny, University of British Columbia Okanagan, 2007, Introduction to the Atmosphere, Copyright 2007 by M. Pidwirny. Retrieved April 7, 2008 from http://www.physicalgeography.net/fundamentals/7o.html

Figure 13-3-4 Pressure Gradient

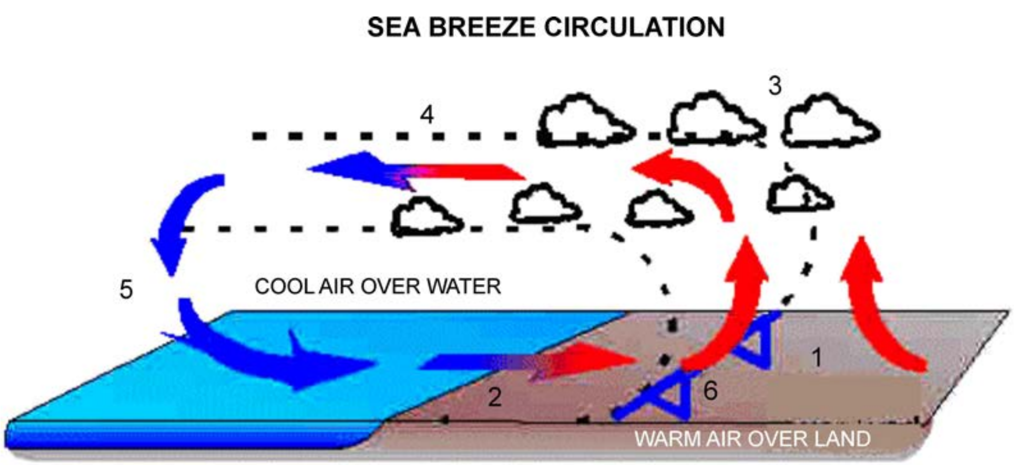
Land and Sea Breezes

Land and sea breezes are caused by the differences in temperature over land and water.

Show slides of Annexes N and O.

Note that the term breeze is used here as a technical term and has no bearing on wind strength.

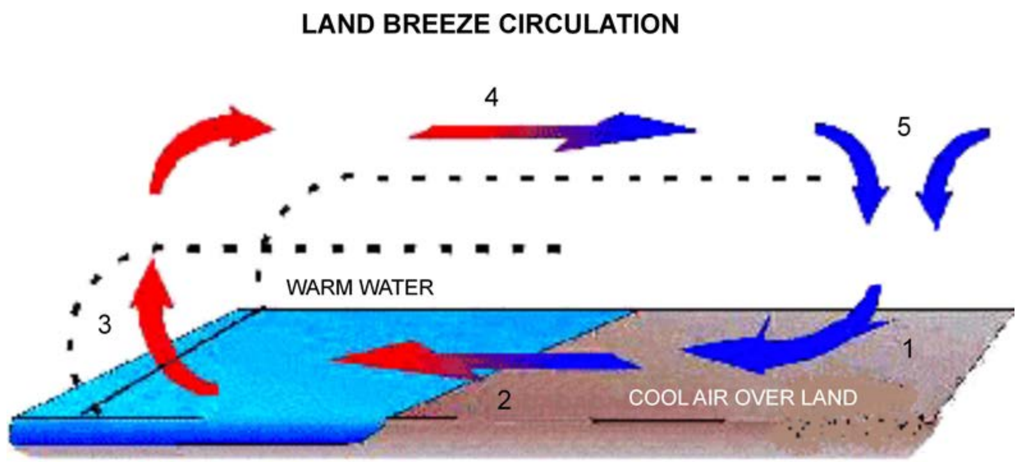
The sea breeze occurs during the day when the land heats up more rapidly than the water. This creates a lower pressure area over the land. The pressure gradient caused by this change is usually steep enough to create a wind from the water.



The Weather Doctor, K. C. Heidron, PhD, 1993, Sea and Land Breezes, Copyright 1998 by K. C. Heidron PhD. Retrieved April 7, 2008 from http://www.islandnet.com/~see/weather/elements/seabrz.htm

Figure 13-3-5 Sea Breeze

The land breeze occurs at night when the land cools down faster than the water. This creates a higher pressure over the land. The pressure gradient now moves the air from the land to the water.



The Weather Doctor, K. C. Heidron, PhD, 1993, Sea and Land Breezes, Copyright 1998 by K. C. Heidron PhD. Retrieved April 7, 2008 from http://www.islandnet.com/~see/weather/elements/seabrz.htm

Figure 13-3-6 Land Breeze

Land and sea breezes are local and affect a small area only.

Diurnal Variation

Surface winds are generally stronger during the day than at night. This is due to the heating processes, which occur during the day, creating vertical currents and pressure gradients. At night, when the heating processes cease, the vertical currents diminish and the pressure gradients become shallower.

Coriolis Force

As air moves from a high pressure system to a low pressure system, the air will not flow directly from one to the other. The rotation of the earth causes a deflection to the right (in the northern hemisphere). This force is known as Coriolis Force. Coriolis Force also explains why air moves clockwise around a high, and counter-clockwise around a low pressure system.

Veering and Backing

Veering is a change in wind direction clockwise relative to the cardinal points of a compass while backing is a change in wind direction counter-clockwise. For example, when the wind veers it will increase in direction from 090 degrees to 100 degrees; when it backs it will decrease in direction from 100 degrees to 090 degrees.

Veering and backing normally occur with changes in altitude. An increase in altitude will normally see a veer in wind direction and an increase in wind speed. A decrease in altitude will normally see a backing in wind direction and a decrease in wind speed. These changes are due to an increase in friction with the surface of the earth in the lower altitudes, and a decrease is friction in the higher altitudes.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Define pressure gradient.

Q2. Why do sea breezes occur?

Q3. What is veering?

ANTICIPATED ANSWERS

A1. Pressure gradient is the rate of change of pressure over a given distance measured at right angles to the isobars.

A2. Sea breezes occur during the day when the land heats up more rapidly than the water, creating a lower pressure over the land.

A3. Veering is a change in wind direction clockwise relative to the cardinal points of a compass.

Teaching Point 4	**Explain the Relationship Between Pressure Systems, and Wind Strength and Direction**
Time: 5 min	Method: Interactive Lecture

RELATIONSHIP BETWEEN PRESSURE SYSTEMS AND WIND

Pressure and wind are interrelated, with one being the cause of the other.

Low Pressure Areas

Low pressure areas are the cause of all air movement as described by the Polar Front theory. Wind blows in a counter-clockwise direction around the low, and inwards to the centre of the system. Wind tends to be strong in a low as the pressure gradient is relatively steep causing the system to move fast over the ground. Low pressure systems are generally associated with brief periods of poor weather, as the inward flow of air acts as a vacuum.

High Pressure Areas

The wind in a high pressure areas blows in a clockwise direction around the high and outwards from the centre of the system. Wind tends to be weak in a high as the pressure gradient is normally relatively shallow causing the system to move slowly over the ground. High pressure systems are usually associated with fair weather, as the outward flow of air acts as a shield against bad weather.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What direction does the wind blow around a low pressure system in the northern hemisphere?

Q2. What direction does the wind blow around a high pressure system in the northern hemisphere?

ANTICIPATED ANSWERS

A1. Counter-clockwise and inwards.

A2. Clockwise and outwards.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is the transition zone between the polar air and the tropical air known as?

Q2. What is the definition of an air mass?

Q3. Why do sea breezes occur?

ANTICIPATED ANSWERS

A1. Polar front.

A2. An air mass may be defined as a large section of the troposphere with uniform properties of temperature and moisture along the horizontal plane.

A3. Sea breezes occur during the day when the land heats up more rapidly than the water, creating a lower pressure over the land.

Distribute handout of Annex P.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Air pressure has a significant affect on weather around the world. Low pressure systems create movement of air, which circulates the air masses around the world. The air masses are the source of the actual weather conditions that we are exposed to.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO M336.04 – EXPLAIN THE EFFECTS OF HUMIDITY AND TEMPERATURE ON WEATHER

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Gather the resources required for the in-class activity in TP 3.

Create slides of Annex Q.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1, 2, 4, and 5 to introduce temperature, humidity and precipitation to the cadets.

An in-class activity was chosen for TP 3 as an interactive way to provoke thought about temperature and humidity.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to explain the effects of temperature and humidity on weather.

IMPORTANCE

It is important for cadets to be able to explain the effects of temperature and humidity on weather as it will allow the cadet to make more informed decisions about activities in the field, in aviation or whether to wear a raincoat.

Teaching Point 1	**Explain Humidity**
Time: 10 min	Method: Interactive Lecture

HUMIDITY

Humidity is a representation of the moisture or water vapour, which is present in an air mass. While water vapour is a small percentage of the overall atmosphere, it is the only gas which can change into a solid or a liquid in ordinary atmospheric conditions. It is this characteristic which causes most weather to develop.

The moisture in an air mass originates from a body of water over which the air mass forms or passes. This body of water may be a pond or an ocean. The size of the body of water determines how much water is available for the air mass to collect, while the rate of evaporation will determine how much of that water is collected by the air mass. Water may exist in the atmosphere in two forms: invisible (gaseous) or visible (water droplets [liquid] or ice crystals [solid]).

Condensation

Condensation is a process by which a gas changes into a liquid by becoming denser. This is usually caused by a cooling process. The air is cooled to a certain temperature at which the water vapour will condense into water.

Sublimation

Sublimation is a process by which a gas changes into a solid without first becoming a liquid. This is usually caused by freezing. Sublimation occurs whenever snow, ice or hail fall from the sky. This process usually occurs in the winter, but may occur during exceptional summer storms.

Dew Point

Dew point is the temperature to which unsaturated air must be cooled, at a constant pressure, in order to become saturated. The temperature and dew point are responsible for the creation of clouds and precipitation. If the difference between the temperature and the dew point is small, then the air is considered to be nearly saturated and a small drop in temperature will see the formation of clouds or precipitation.

Relative Humidity

Relative humidity is the ratio of the actual amount of water present in the air compared to the amount of water which the same volume of air would hold if it were saturated. Temperature and pressure must remain the same, otherwise the relative humidity will change. Saturated air will have a relative humidity of 100 percent, while perfectly dry air will have a relative humidity of zero percent.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Define condensation.

Q2. Define dew point.

Q3. Define relative humidity.

ANTICIPATED ANSWERS

A1. Condensation is a process by which a gas changes into a liquid by becoming denser.

A2. Dew point is the temperature to which unsaturated air must be cooled, at a constant pressure, in order to become saturated.

A3. Relative humidity is the ratio of the actual amount of water present in the air compared to the amount of water which the same volume of air would hold if it were saturated.

Teaching Point 2	**Explain Temperature**
Time: 15 min	Method: Interactive Lecture

TEMPERATURE

Temperature represents the amount of heat in a given object, such as the human body or air. Temperature is measured using a thermometer. In aviation weather reports, temperature is normally expressed in degrees Celsius.

The Source

The source of the energy which warms the earth and its atmosphere is the sun. Solar radiation is transmitted to the earth and its atmosphere. Some of the solar radiation is absorbed by the stratosphere, while the rest passes through to be absorbed by the earth's surface. The earth then radiates heat into the troposphere through terrestrial radiation. It is terrestrial radiation that heats the troposphere, and is why the further one gets from the surface of the earth, the lower the temperature will be in the troposphere.

The atmosphere is heated from below not from above.

Diurnal Variation

During the day, the solar radiation exceeds the terrestrial radiation and the surface of the earth becomes warmer. At night, solar radiation ceases, and the terrestrial radiation causes the surface of the earth to cool. This is called diurnal variation and causes the heating and cooling of the atmosphere.

Seasonal Variation

The axis around which the earth rotates is tilted compared to the plane of orbit around the sun. The result is that the amount of solar radiation that strikes the surface of the earth varies from season to season. In the northern hemisphere, the months of June, July, and August are warm, while the months of December, January, and February are cold.

The Heating Process

Air is a poor conductor of heat. The following are four processes which assist in getting warm air into the higher levels of the atmosphere:

- **Convection.** Air over a warm surface becomes buoyant and rises, allowing cooler air to move into the vacant location. This vertical current of air distributes the heat to the higher levels.
- **Advection.** Horizontal movement of cool air over a warm surface allows the cool air to be heated from below.
- **Turbulence.** Turbulence created as the result of friction with the surface of the earth causes a mixing process which moves the heated air to other areas of the atmosphere.
- **Compression.** There are instances where air masses are forced down, such as air moving down the leeward side of a mountain. The air pressure increases as the air mass moves further down, compressing the air mass. This compression forces the particles together, creating heat. This phenomenon is also called subsidence.

The Cooling Process

Since the atmosphere is heated from below, the temperature usually decreases with altitude. The rate of temperature change is known as a lapse rate. The lapse rate is only a guideline as there is a variation in air masses and cooling processes. The following are three main cooling processes:

- **Radiation Cooling.** At night the temperature of the earth decreases with terrestrial radiation and cools the air in contact with the ground. Radiation cooling only affects the lower few thousand feet of the atmosphere.
- **Advection Cooling.** Air from a warm region moves over a cold region and cools the air.
- **Adiabatic Process.** As air is warmed it will begin to rise and as it rises it will expand and cool. In a rising current of air, the temperature decreases at a rate that is entirely independent of the surrounding, non-rising air.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How is the atmosphere heated?

Q2. Identify the four heating processes.

Q3. Identify the three cooling processes.

ANTICIPATED ANSWERS

A1. The atmosphere is heated from below not from above.

A2. Convection, advection, turbulence, and compression.

A3. Radiation cooling, advection cooling, and adiabatic process.

Teaching Point 3	**Describe the Effects of Temperature on Relative Humidity**
Time: 10 min	Method: In-Class Activity

THE EFFECTS OF TEMPERATURE ON RELATIVE HUMIDITY

Temperature will affect the relative humidity of an air mass by changing the volume of the air mass.

As the temperature of the air mass increases, the air mass will expand increasing the volume of the mass. The result is that the relative humidity will decrease, as the air mass has a higher capacity for water. This assumes that there is no change in the amount of water in the air mass.

As the temperature of the air mass decreases, the air mass will contract, decreasing the volume of the mass. The result is that the relative humidity will increase, as the air mass has a lower capacity for water. This assumes that there is no change in the amount of water in the air mass.

ACTIVITY

OBJECTIVE

The objective of this activity is to illustrate the effects of temperature on relative humidity.

RESOURCES

- Water,
- Paper towel,
- One small plastic cup per cadet, and
- One large plastic cup per cadet.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute one small cup and one large cup to each cadet.
2. Fill each small cup three quarters full of water. This will represent an air mass with a relative humidity of 75 percent.
3. Have the cadet pour the water from the small cup into the large cup. The large cup represents the results of increasing the temperature of the air mass.
4. Have the cadets estimate the percentage of the large cup which now contains water.
5. Fill the large cup of water to 80 percent. This will represent the continued evaporation of water from all sources into the air mass.
6. Have the cadets pour the large cup into the small cup. This will represent the results of cooling the air mass to the dew point. The water that does not fit into the small cup is the precipitation.
7. Have the cadets clean up the water.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the relative humidity activity will serve as the confirmation of this TP.

Teaching Point 4	**Explain the Effects of Temperature and Humidity on Weather**
Time: 5 min	Method: Interactive Lecture

THE EFFECTS OF TEMPERATURE AND HUMIDITY ON WEATHER

Temperature and humidity have a major effect on the weather. Together they will determine cloud formation and precipitation.

Dew Point

The temperature of the air mass will change during the heating and cooling processes. As the temperature nears the dew point, the air will become more saturated. This increases the relative humidity and allows clouds to form.

Relative Humidity

As the relative humidity increases, the weight of the air mass also increases. When the dew point is reached, the air will become saturated, and clouds will form. Once the air mass has reached 100 percent relative humidity, any addition of water or drop in temperature will cause precipitation.

Precipitation

Precipitation may be solid or liquid, depending on the temperature of the air mass. Snow will occur if the air mass has a temperature below freezing. Rain will occur in an air mass which has a temperature above freezing. The temperature in the air mass will change with altitude, so that the water may freeze at higher levels of the air mass. Frozen precipitation such as hail and even snow has been seen in the summer months.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is the effect of dew point on weather?

Q2. How does relative humidity affect the creation of precipitation?

Q3. How is it possible for hail or snow to occur in the summer months?

ANTICIPATED ANSWERS

A1. As the temperature nears the dew point, the air will become more saturated.

A2. Once the air mass has reached 100 percent relative humidity, any addition of water or drop in temperature will cause precipitation.

A3. The temperature in the air mass will change with altitude, so water may freeze at higher levels of the air mass.

Teaching Point 5	**Explain Types of Precipitation**
Time: 10 min	Method: Interactive Lecture

TYPES OF PRECIPITATION

Show slides of figures located at Annex Q.

There are seven main categories of precipitation listed by the World Meteorological Organization (WMO). Each one is created depending on temperature and cloud type. Types of precipitation include:

- **Drizzle.** Precipitation in the form of small water droplets which appear to float. In temperatures near freezing, water droplets may freeze on contact with objects. This is known as freezing drizzle.

- **Rain.** Precipitation in the form of large water droplets. Freezing rain will occur when water droplets, which have retained their liquid form in freezing conditions, make contact with an object and freeze.
- **Hail.** Formed in clouds, which have strong vertical currents (such as thunderstorms), hail is the result of a water droplet which has been prevented from exiting the cloud by the vertical currents, until it has reached a particular mass. The stronger the vertical currents, the larger the hailstones. Softball-sized hailstones have been seen in the Prairies and tropical areas, where large thunderstorms commonly occur. The hailstone in Figure 13-4-1 has a circumference of 47.63 cm (18.75 inches) and weighs almost 1 kg (2 pounds).

UCAR Communications, Staff Notes Monthly, 2003, One Hail of a Storm, Copyright 2003 by University of Carolina. Retrieved April 2, 2008, from http://www.ucar.edu/communications/staffnotes/0308/hail.html

Figure 13-4-1 Hailstone

- **Snow Pellets.** If the water region where the cloud is receiving water from is shallow, then the droplet will not form the hard shell that a hailstone would have. The pellet falls as a soft pellet of snow.

Climber.org, by S. Eckert, 2006. Graupel–Snow Pellets, Lighter and Smaller Than Hail, Copyright 2006 by Climber.org. Retrieved April 2, 2008, from http://www.climber.org/TripReports/2006/1473.html

Figure 13-4-2 Snow Pellets

- **Snow.** Snow is the result of sublimation. Flakes are an agglomeration of ice crystals and are usually in the shape of a hexagon or star.

Neatorama, 2007, Snow-donut. Copyright 2007 by Neatorama. Retrieved April 2, 2008, from http://www.neatorama.cachefly.net/images/2007-03/snow-donut.jpg

Figure 13-4-3 Snow Doughnut

- **Ice Prisms.** Created in stable air masses at very low temperatures. Ice prisms are tiny ice crystals in the form of needles. They can form with or without clouds. Sometimes confused with ice fog.

Ohio Weather Library, by B. Plonka, 2008, Unusual Weather. Copyright 2008 by Ohio Weather Library. Retrieved April 2, 2008, from http://www.owlinc.org/unusualweatherpg7.html

Figure 13-4-4 Ice Prisms

- **Ice Pellets.** Ice pellets are raindrops, which are frozen before contacting an object (as opposed to freezing rain, which freezes after contact with an object). They generally rebound after striking the ground.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What are the seven types of precipitation?

Q2. What process creates snow?

Q3. What is the difference between ice pellets and freezing rain?

ANTICIPATED ANSWERS

A1. Drizzle, rain, hail, snow pellets, snow, ice prisms and ice pellets.

A2. Sublimation.

A3. Ice pellets freeze before contacting an object while freezing rain freezes after contact.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Define dew point.

Q2. Explain how the atmosphere is heated.

Q3. Explain the effect of dew point on weather.

ANTICIPATED ANSWERS

A1. Dew point is the temperature to which unsaturated air must be cooled, at a constant pressure, in order for it to become saturated.

A2. The atmosphere is heated from below not from above.

A3. As the temperature nears the dew point, the air will become more saturated.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Weather is an amazing aspect of nature, which has a great impact on how we live our lives. Being aware of what causes weather will assist cadets in making decisions about outdoors activities.

INSTRUCTOR NOTES/REMARKS

Video resources are available for purchase through flight training centres or aviation supply websites. These videos may be used to augment instruction.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C336.01 – READ AN AVIATION ROUTINE WEATHER REPORT (METAR)

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Gather sample METARs from the NavCanada aviation weather website.

Create a slide of Annex R.

Photocopy Annex S for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to introduce the cadets to a METAR.

An in-class activity was chosen for TP 3 as an interactive way for the cadets to practice reading a METAR.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have read a METAR.

IMPORTANCE

It is important for cadets to read a METAR as it will enable them to determine weather conditions for flying in the local area.

Teaching Point 1	**Describe a METAR**
Time: 10 min	Method: Interactive Lecture

Weather is a major factor in aviation. Pilots must constantly watch the weather around them as weather will effect the way an aircraft operates. In particular, pilots must review the weather prior to going flying to decide whether it is safe to fly.

Show the slide of examples located at Annex R.

DEFINITION

METAR is the name given to the international meteorological code used in aviation routine weather reports. These reports describe the existing weather conditions at a specific time and location. In other words, the METAR is a snapshot of the current weather; it is not a forecast.

FREQUENCY OF REPORTS

Normally, METAR observations are taken and disseminated on an hourly basis. METARs are only valid for the time that they are issued, not for the hour in between reports. METARS are normally issued every hour, on the hour as weather does not normally change much in an hour.

SPECIAL WEATHER REPORTS (SPECI)

There are times when the weather may change drastically in a short period of time. When this happens a SPECI is issued. SPECIs can be issued at any time. They will normally follow the last METAR issued and in sequence from oldest to newest as more SPECIs are issued. SPECIs use the same code as a METAR, but will start with SPECI.

WHERE METARS ARE AVAILABLE

METARs can be found at several locations. The three most common locations are:

- NavCanada’s aviation weather website,
- a Flight Services Station (FSS),
- a Flight Information Centre (normally accessed by phone).

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What does a METAR describe?

Q2. How often is a METAR observation normally issued?

Q3. Why is a SPECI issued?

ANTICIPATED ANSWERS

A1. The existing weather conditions at a specific time and location.

A2. METARS are normally issued every hour, on the hour.

A3. When the weather may change drastically in a short period of time.

Teaching Point 2 | **Review Terminology Used in METARs**

Time: 25 min | Method: Interactive Lecture

TERMINOLOGY USED IN METARS

Indicate on the slide of Annex R each of the following groupings as they are covered.

METAR is a code used in aviation weather reporting. This code is based on the World Meteorological Organization's (WMO) standards and conventions. A METAR is organized into sections with each section always showing in the same order.

Report Type

The report name is given in the first line of the text. The name will show as either METAR or SPECI.

Station Indicator

Each weather reporting station in Canada is assigned a four letter identifier, starting with the letter C. The remaining three letters are an abbreviation of the reporting station, where the first letter identifies what type of station it is.

An example would be CYOW for the reporting station at Ottawa/MacDonald-Cartier International Airport. The C means the station is Canadian, the Y means the station is co-located with an airport, and OW is the airport identifier.

Date and Time of Observation

The date and time of the observation are given in a six-digit grouping, based on universal coordinated time (UTC). The first two digits signify the day of the current month, while the last four digits signify the time of the day. The official time of the observation is given for all METAR reports that do not deviate more than 10 minutes from the top of the hour. SPECIs will have the time reported to the exact minute.

For example, a METAR will show as: 091000Z, which means that the observation was taken on the ninth day of the month at 1000 hrs UTC (or within 10 minutes of that hour).

For example, a SPECI will show as: 091036Z, which means that a significant change in weather was observed on the ninth day of the month at 1036 hrs UTC.

Report Modifier

This field may contain two possible codes: AUTO or CCA. AUTO indicates that the report is primarily based on observations from an automated weather observation station (AWOS). CCA is used to indicate corrected reports, where the first correction is CCA, the second is CCB, and so on. Both AUTO and CCA may be found in the same report.

Wind

This group reports the two-minute average wind direction and speed. Direction is always three digits, given degrees true but rounded off to the nearest 10 degrees. Speed is normally two digits, and is given in knots (nautical miles per hour or kt). A reading of 00000 kt indicates calm winds.

For example, 35016 will read as: winds are 350 degrees true (rounded off) at 16 kts.

If gust conditions exist, the direction and speed will be followed by a G and the maximum gust strength. A gust must be 5 knots stronger than the 10-minute average wind speed.

For example, 35016G25 will read as: winds are 350 degrees true at 16 kts gusting to 25 kts.

Prevailing Visibility

Prevailing visibility is the average visibility at the reporting station. The prevailing visibility is reported in statute miles (sm) or fractions of a statute mile.

Runway Visual Range

This is only included if the prevailing visibility is less than 1 sm, or the runway visual range is less than 6 000 feet. This group will start with an R, then the runway number (eg, 06) and position (eg, L for left, R for right, C for centre), followed by the runway visual range in hundreds of feet. This is based on a 10-minute average.

For example, R06L/1000V2400FT/U will read as: the minimum runway visual range for runway 06 left is 1 000 feet and the maximum is 2 400 feet with an upward trend.

Present Weather

This section indicates the current weather phenomena at the reporting station. This may include precipitation, obscuration, or other phenomena. This section will include all phenomena that exist, varying the length of the section between reports.

Each phenomenon is represented by a code, which may be two to nine characters in length. Each code may include one or both of the following prefixes:

- **Intensity.** (-) indicates light, (+) indicates heavy, and no symbol indicates moderate.
- **Proximity.** Used primarily with precipitation or tornadoes, VC will precede certain phenomena meaning that they are in the vicinity (5 sm) of the station, but not actually at the station.

Distribute the handout located at Annex S.

For example, VCFZRABLSN+SNVA would translate to: In the vicinity of the airport there is freezing rain, blowing snow, heavy snow, and volcanic ash.

The abbreviations used for present weather are a mixture of English and French root words. FZ comes from freezing, while BR comes from brumé (mist), and FU comes from fumée (smoke).

Sky Conditions

This group reports the sky condition for layers aloft. The group will include how much of the sky is covered measured in oktas (eighth of the sky) and the height of the clouds in hundreds of feet above ground level (AGL). The sky cover is represented by an abbreviation related to how many oktas of the sky are covered.

- SKC = sky clear, no cloud present.
- FEW = few, greater than zero to two eighths cloud cover.
- SCT = scattered, three eighths to four eighths cloud cover.
- BKN = broken, five eighths to less than eight eighths cloud cover.
- OVC = overcast, eight eighths cloud cover.
- CLR = clear, clear below 10 000 feet AGL.

Cloud height is represented by a three digit number, which when multiplied by one hundred equals the actual height AGL. There will be one entry for every layer of cloud.

For example, SCT025 would translate to: scattered cloud at 2 500 feet AGL.

Temperature and Dewpoint

This group reports the air temperature and dewpoint temperature, rounded to the nearest whole degree Celsius. A negative value will be preceded by (M). A (/) will separate the two values.

Altimeter Setting

This group reports the altimeter setting at the reporting station in inches of mercury. The group starts with (A), which will be followed by four digits, which directly relate to the actual value of the altimeter setting. Place a decimal after the second digit in order to read this group.

For example, A3006 would translate to: altimeter setting is 30.06 inches of mercury.

Remarks

This group will usually include cloud types in each layer as well as opacity, general weather remarks, and sea level pressure measured in hectopascals. The sea level pressure will always be the last entry in a METAR, prefaced by SLP. Sea level pressure is translated by either adding a 9 or a 10 in front of the value given. The goal is to make the number as close to 1 000 as possible.

For example, SLP 123 would translate to: sea level pressure is 1012.3 hPa.

For example, SLP 998 would translate to: sea level pressure is 999.8 hPa.

SLP actually represents the station pressure or the theoretical sea level pressure at the reporting station.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How are date and time expressed in a METAR?

Q2. What does the present weather section indicate?

Q3. What is the last entry of a METAR?

ANTICIPATED ANSWERS

A1. The date and time of the observation are given in a six-digit grouping, based on universal coordinated time (UTC).

A2. This section indicates the current weather phenomena at the reporting station.

A3. The sea level pressure will always be the last entry in a METAR.

Teaching Point 3	**Demonstrate and Have the Cadets Read a METAR**
Time: 15 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadets to read a METAR.

RESOURCES

Five or six examples of METARs.

ACTIVITY LAYOUT

Arrange the classroom to enable both individual and small-group work.

ACTIVITY INSTRUCTIONS

1. Project a sample METAR and demonstrate reading it.
2. Distribute examples of METARs.
3. Have the cadets work in pairs to decipher a METAR in three minutes.
4. Correct the cadets' work.
5. Have the cadets work in pairs to decipher a second METAR in two minutes.
6. Correct the cadets' work.
7. Repeat Steps 5. and 6. as often as possible until examples are exhausted.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the METAR reading activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in reading METAR will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Reading a METAR is a skill which can be transferred to many other outdoor activities. The code used may also be found in aviation forecasts, which cover larger areas. This can be used for camping trips, trip planning and checking to see if your flight the next morning will be delayed.

INSTRUCTOR NOTES/REMARKS

Recent METARs can be found at http://www.flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais &NoSession=NS_Inconnu?Page=forecast-observation&TypeDoc=html. Click on the METAR/TAF icon and then enter the airport name or identifier.

REFERENCES

C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

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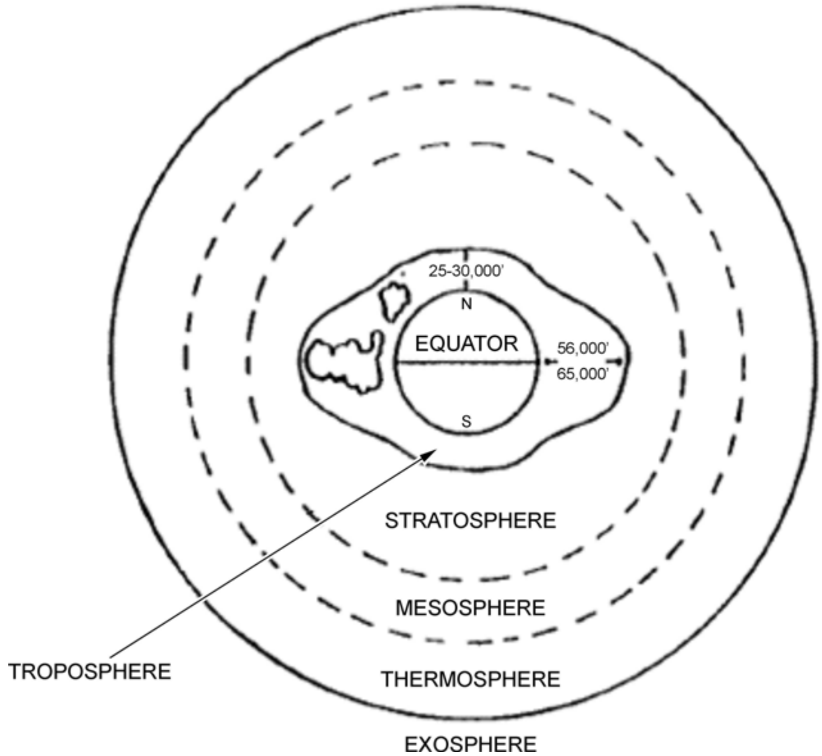
DIVISIONS OF THE ATMOSPHERE



A. F. MacDonald and I. L. Peppler, From the Ground Up, Aviation Publishers Co. Limited (p. 123)

Figure 13A-1 The Four Layers of the Atmosphere

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CUMULUS CLOUD

"Victoria Weather", by UVic, School-Based Weather Station Network. Retrieved November 1, 2007, from http://www.victoriaweather.ca/clouds

Figure 13B-1 Cumulus Cloud

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STRATUS CLOUD

“Victoria Weather”, by UVic, School-Based Weather Station Network. Retrieved November 1, 2007, from http://www.victoriaweather.ca/clouds

Figure 13C-1 Stratus Cloud

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COMMON CLOUDS

Cloud Name	Cloud Family	Cloud Description
Cirrus	High	High, thin, wispy clouds blown by high winds into long streamers. Cirrus clouds usually move across the sky from west to east. They generally indicate pleasant weather.
Cirrocumulus	High	Appears as small, round white puffs. The small ripples in the cirrocumulus sometimes resemble the scales of a fish. A sky with cirrocumulus clouds is sometimes referred to as a “mackerel sky”.
Altocumulus	Middle	Appear as grey, puffy masses, sometimes in parallel waves or bands. The appearance of these clouds on a warm, humid summer morning often means thunderstorms will occur by late afternoon.
Altostratus	Middle	A grey or blue-grey layer cloud that typically covers the entire sky. In the thinner areas of the cloud, the sun may be dimly visible as a round disk. This cloud appears lighter than stratus clouds.
Stratus	Low	Uniform grey layer cloud that often covers the entire sky. They resemble fog that does not reach the ground. Usually no precipitation falls from stratus clouds, but sometimes they may drizzle.
Nimbostratus	Low	Dark grey layer clouds associated with continuously falling rain or snow. They often produce precipitation that is usually light to moderate.
Stratocumulus	Low	A series of round mass that form a layer cloud. This type of cloud is usually thin enough for the sky to be seen through breaks.
Cumulus	Vertical Development	Puffy clouds, which are thick, round, and lumpy. They sometimes look like pieces of floating cotton. They usually have flat bases and round tops.
Cumulonimbus	Vertical Development	Thunderstorm clouds that form if cumulus clouds continue to build. Violent vertical air currents, hail, lightning, and thunder are associated with the cumulonimbus clouds.

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 13D-1 Common Clouds

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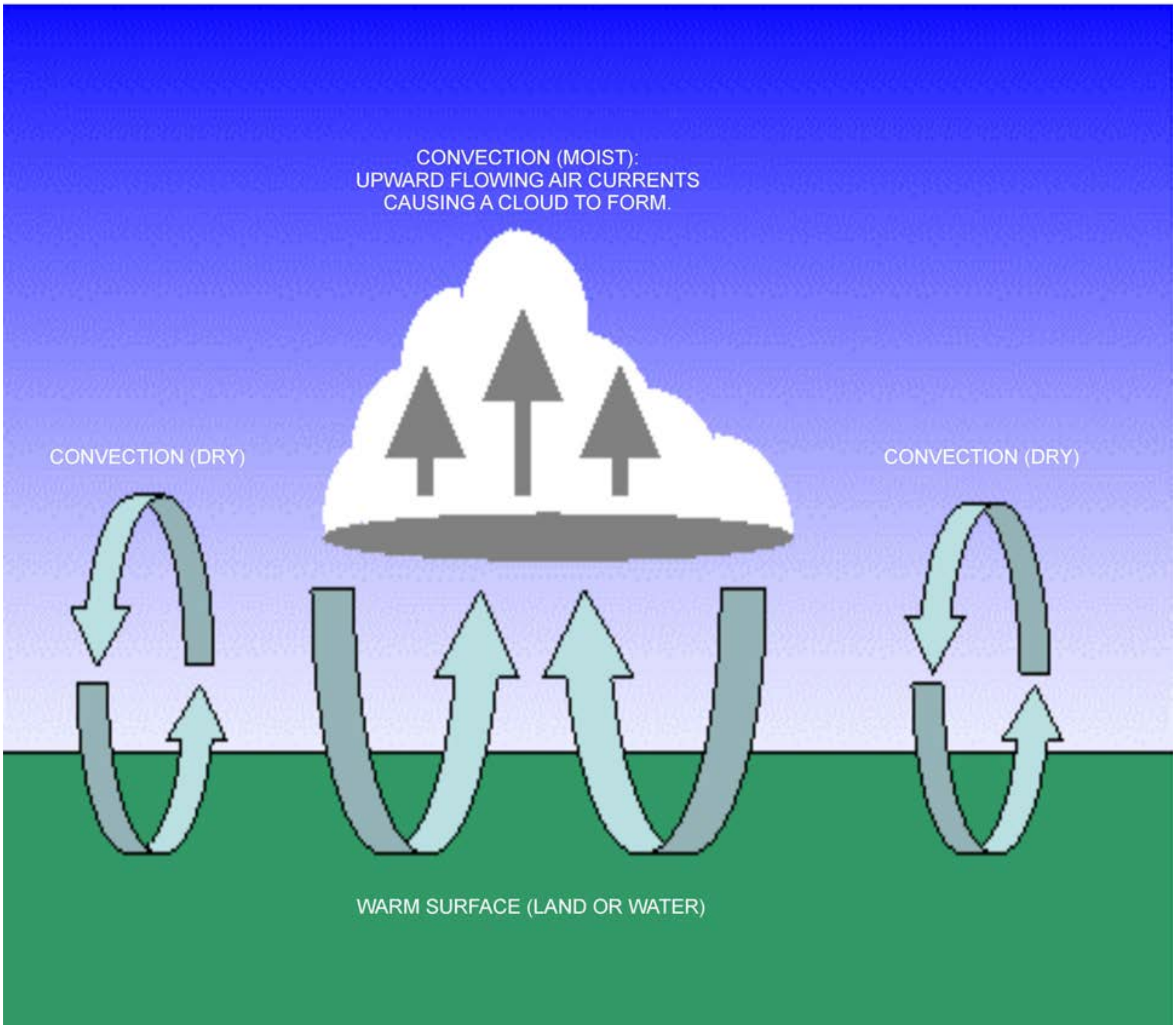
CONVECTION



WeatherQuestions.com, 2007, What is Convection. Copyright 2007 by WeatherStreet. Retrieved March 17, 2008, from http://www.weatherquestions.com/What_is_convection.htm

Figure 13E-1 Convection

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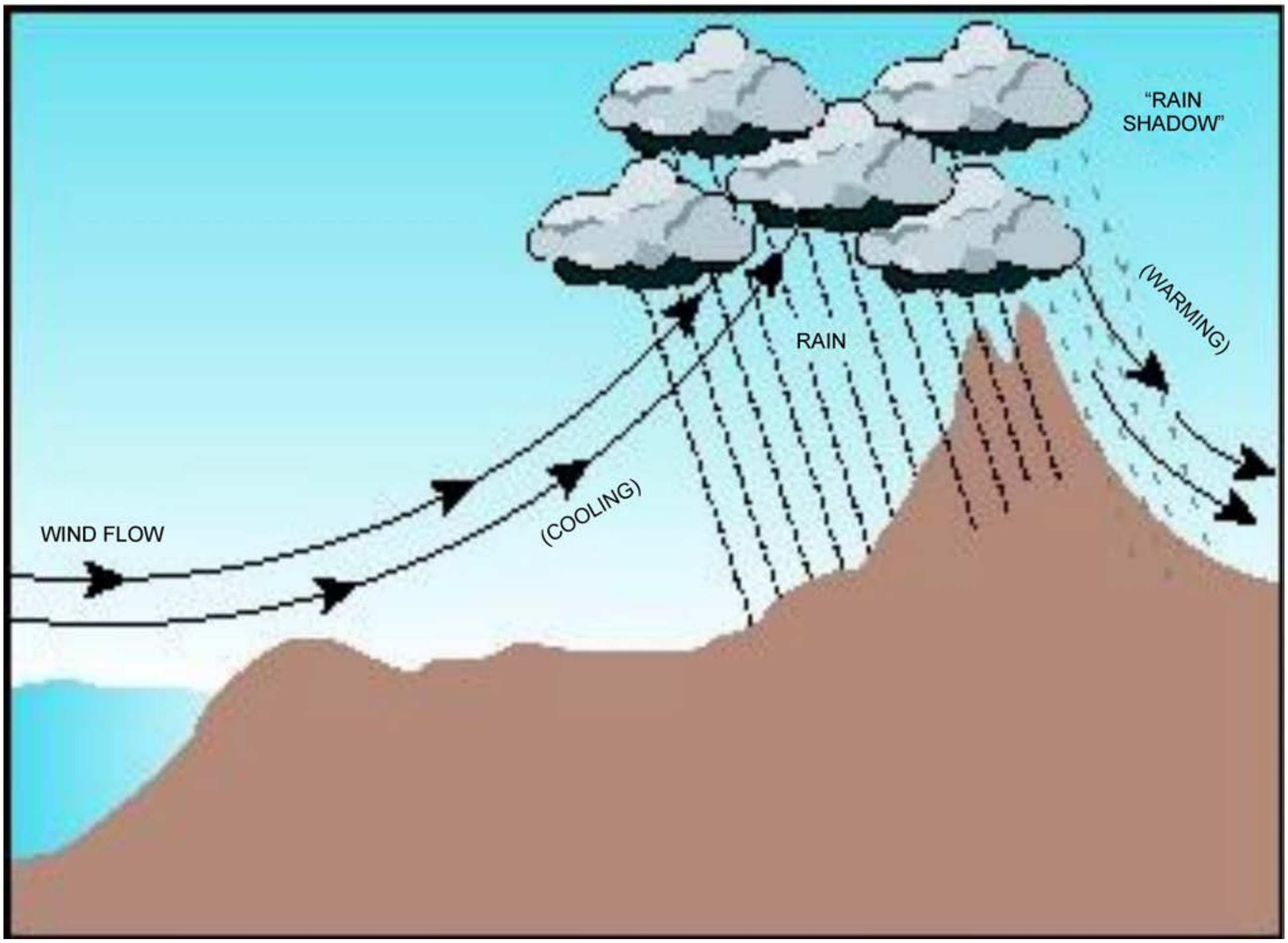
OROGRAPHIC LIFT



Water Encyclopedia, by G. H. Taylor, 2007, Water as a Climate Moderator. Copyright 2007by Advameg. Retrieved March 17, 2008, from http://www.waterencyclopedia.com/Ce-Cr/Climate-Moderator-Water-as-a.html

Figure 13F-1 Orographic Lift

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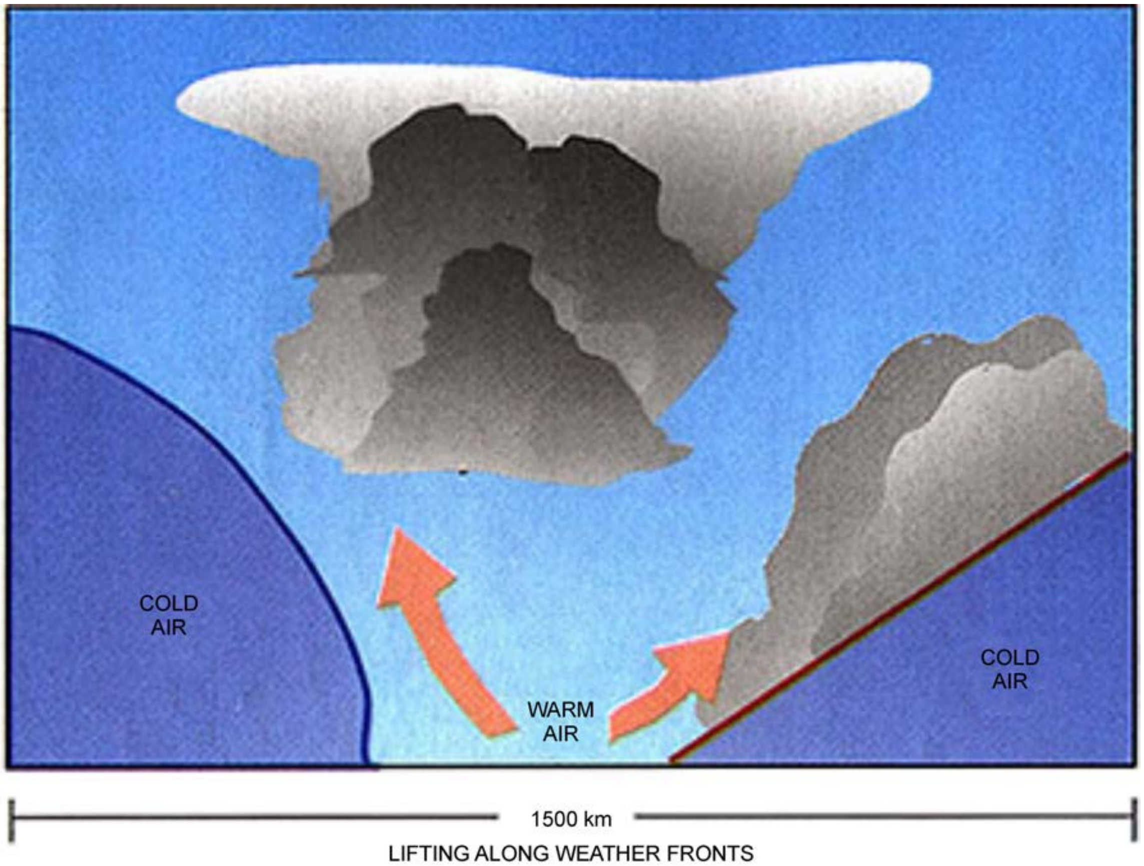
FRONTAL LIFT



Federation of American Scientists, by N. M. Short, Sr, 2007, Atmospheric Circulation: Weather Systems. Copyright 2007 by FAS. Retrieved March 17, 2008, from http://www.fas.org/irp/imint/docs/rst/Sect14/Sect14_1c.html

Figure 13G-1 Frontal Lift

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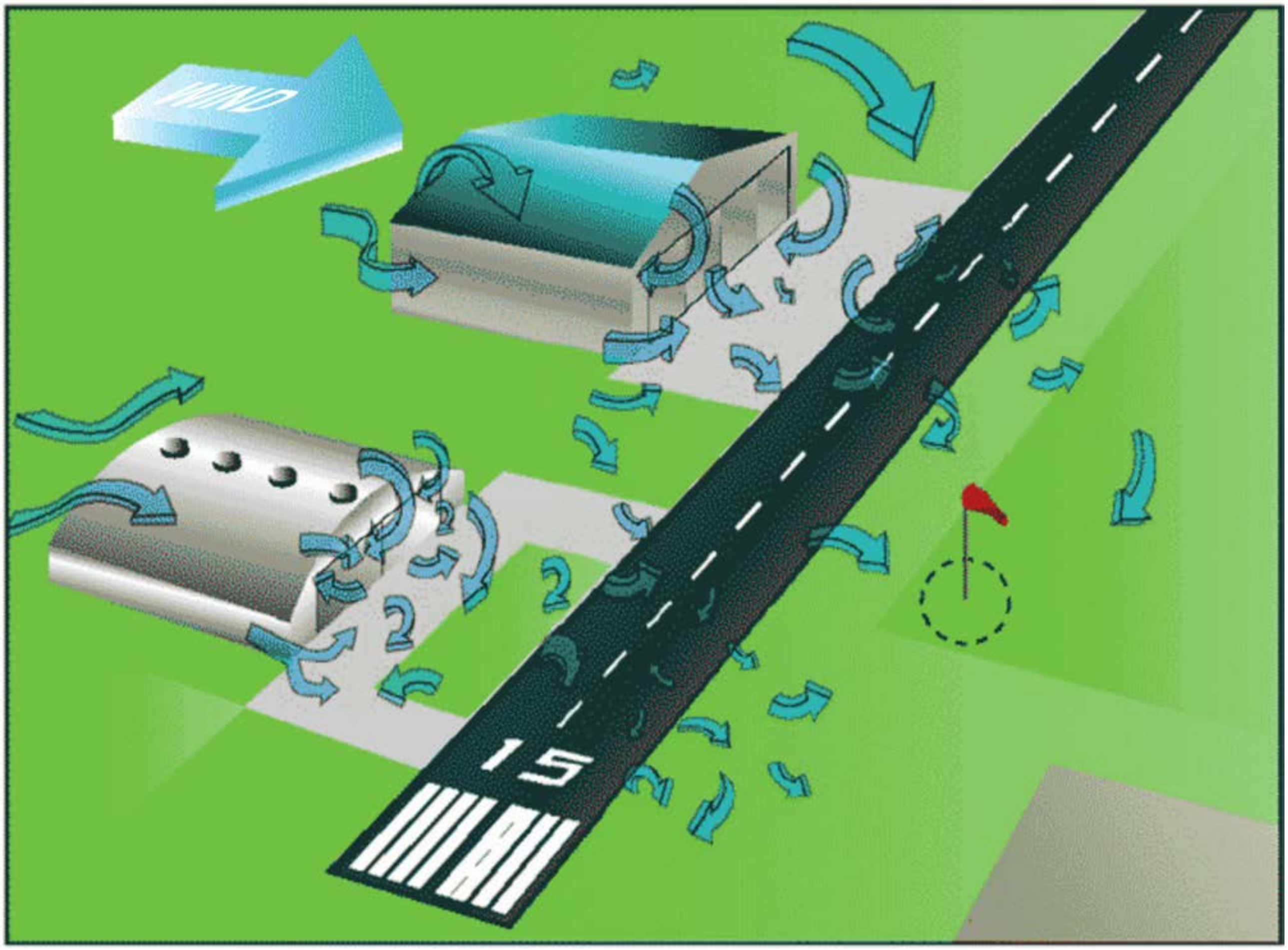
MECHANICAL TURBULENCE: MAN-MADE



Free Online Private Pilot Ground School, 2006, Aviation Weather–Principles. Copyright 2006. Retrieved March 17, 2008, from http://www.free-online-private-pilot-ground-school.com/Aviation-Weather-Principles.html

Figure 13H-1 Mechanical Turbulence: Man-Made

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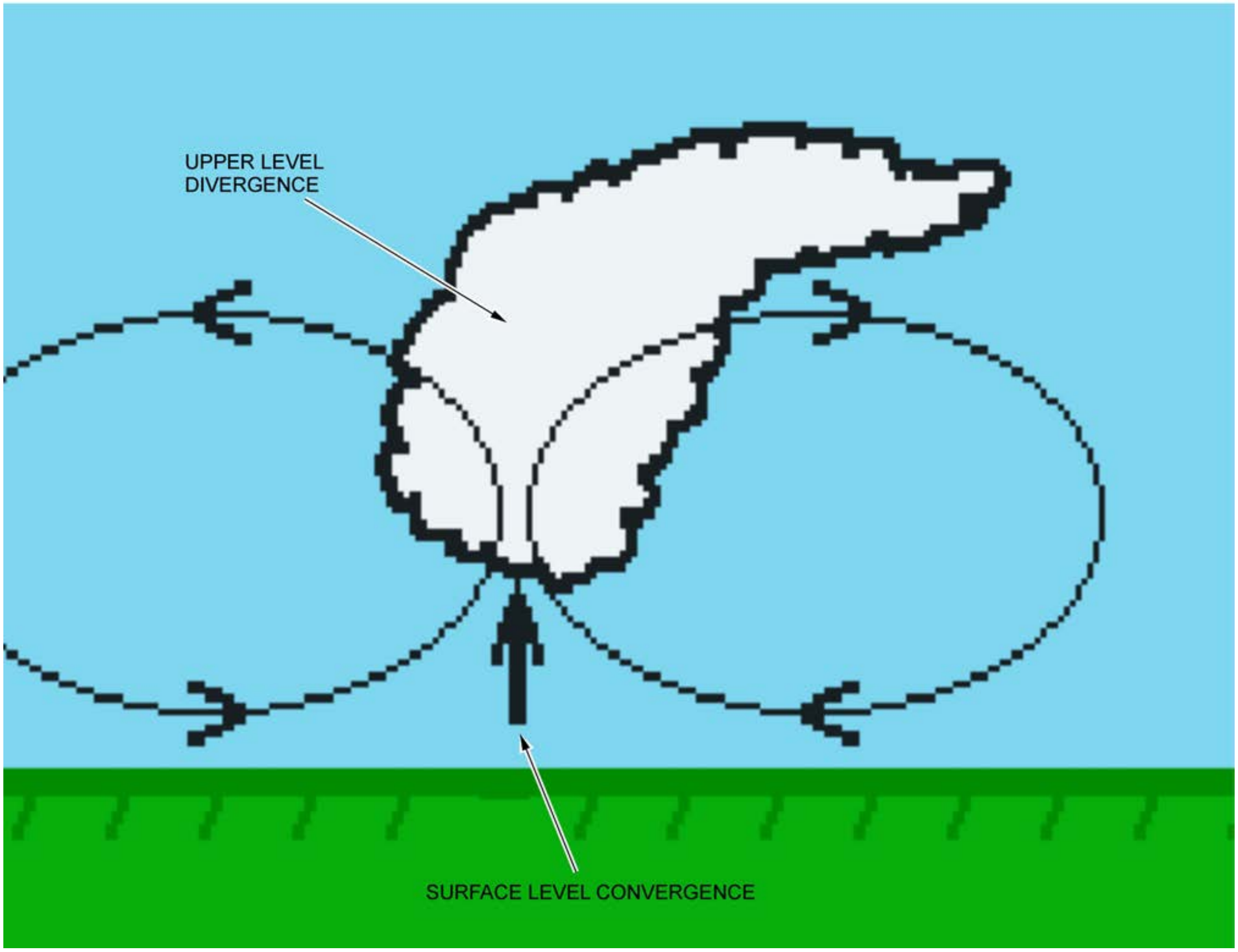
CONVERGENCE



The Weather Doctor, by K. C. Heidron, PhD, 2002, What Goes Up: Part 3 Convergence and Divergence. Retrieved March 17, 2008, from http://www.islandnet.com/~see/weather/elements/whatgoesup3.htm

Figure 13I-1 Convergence

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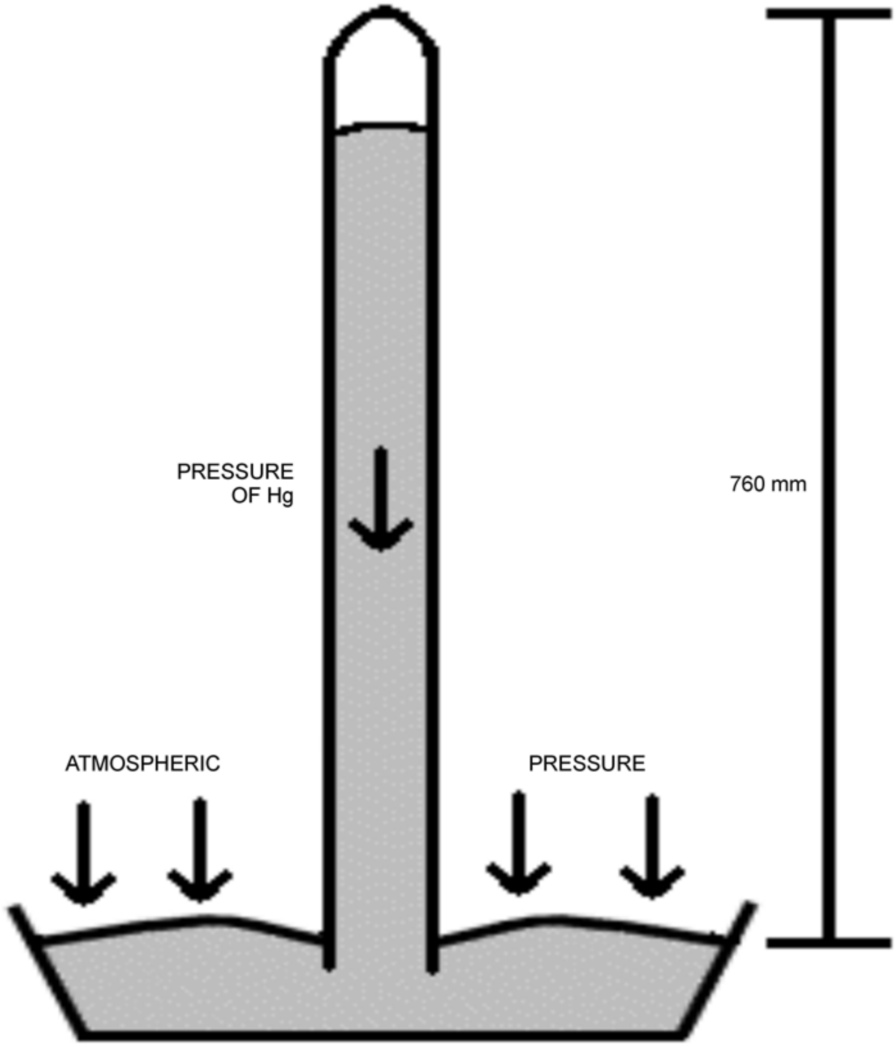
BAROMETER



$P_{atm} = P_{Hg}$

Chemistry Tutorial Notes, Department of Chemistry, Texas A&M University, 2006, Properties of Gases, Copyright 2006 by Texas A&M University. Retrieved April 4, 2008 from http://www.chem.tamu.edu/class/majors/tutorialnotefiles/pressure.htm

Figure 13J-1 Barometer

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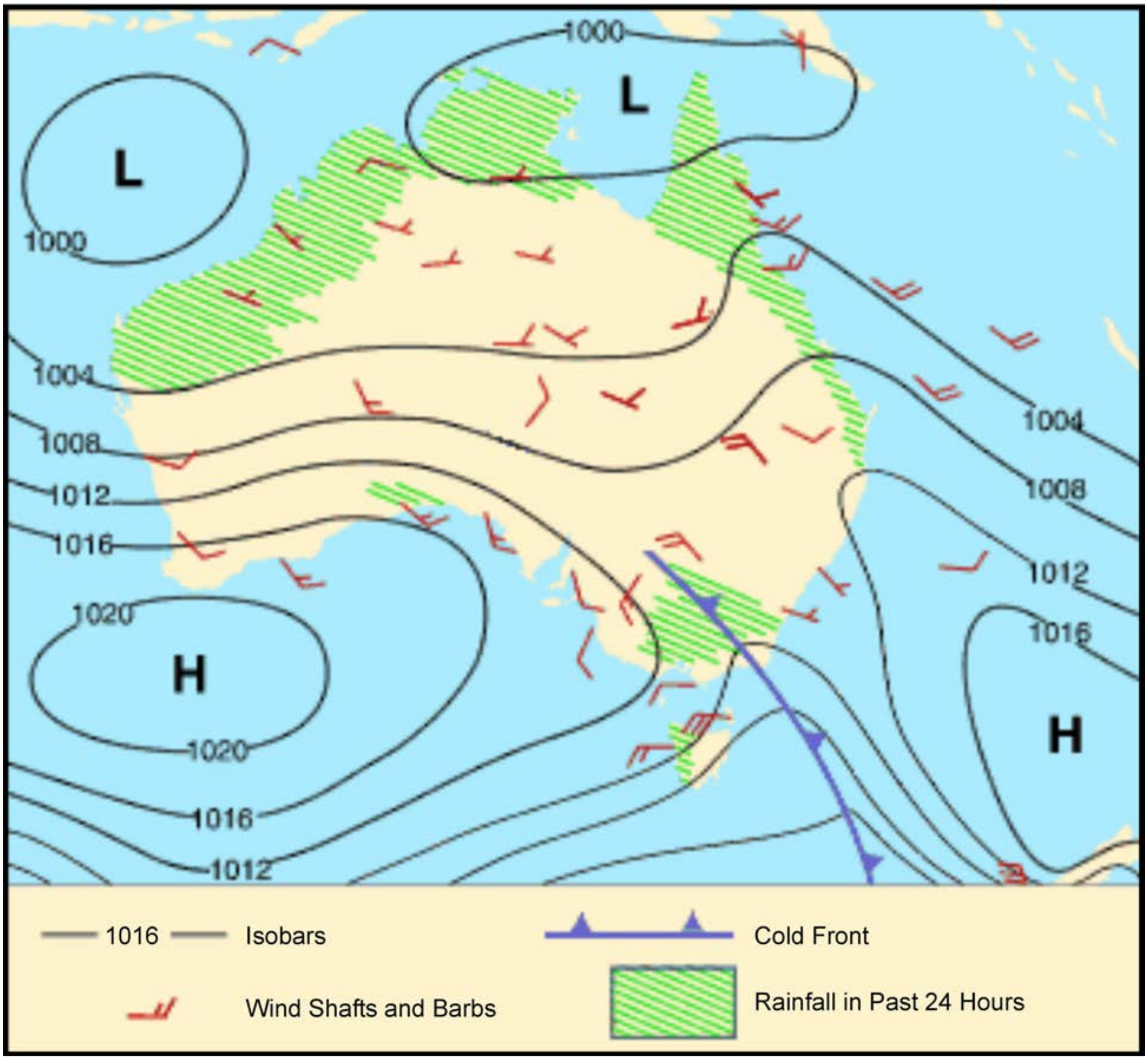
ISOBARS ON A WEATHER MAP



Australian Government, Bureau of Meteorology, 2008, Air Masses and Weather Maps, Copyright 2008 by Commonwealth of Australia, Bureau of Meteorology. Retrieved April 7, 2008 from http://www.bom.gov.au/info/ftweather/page_7.shtml

Figure 13K-1 Isobars on a Weather Map

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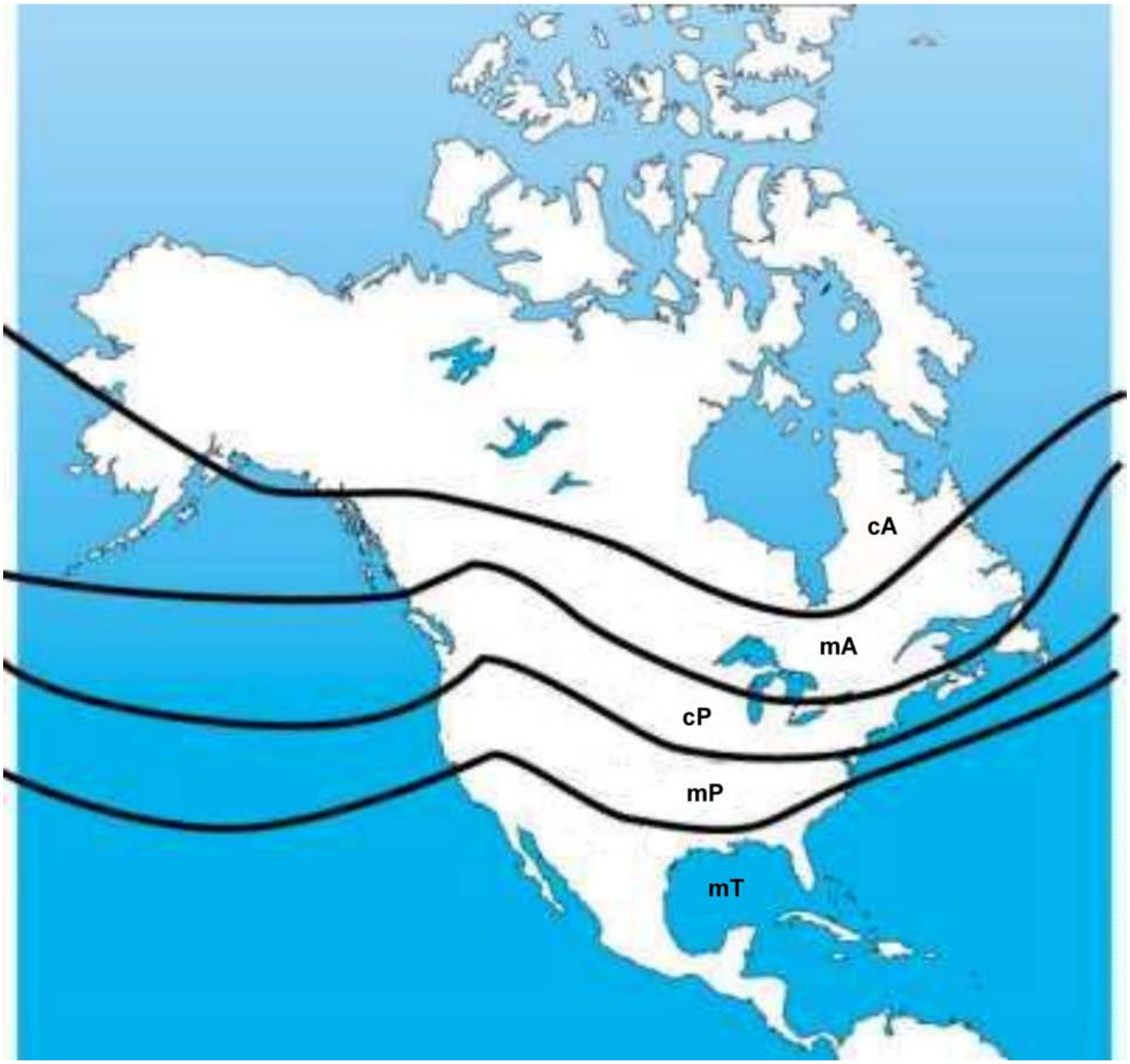
NORTH AMERICAN AIR MASSES



Meteorological Service of Canada, 2004, Frontal Systems, Copyright 2004 by Environment Canada. Retrieved April 7, 2008 from http://www.qc.ec.gc.ca/meteo/Documentation/Front_e.html

Figure 13L-1 North American Air Masses

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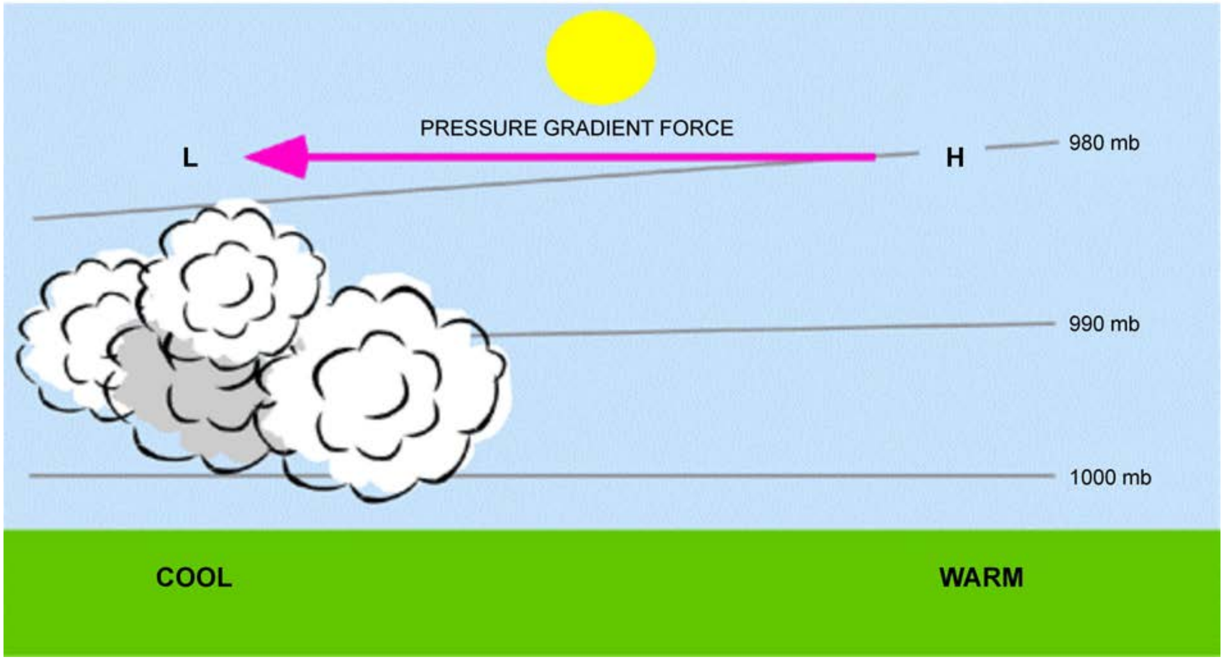
PRESSURE GRADIENT



PhysicalGeography.net, Dr. M. Pidwirny, University of British Columbia Okanagan, 2007, Introduction to the Atmosphere, Copyright 2007 by M. Pidwirny. Retrieved April 7, 2008 from http://www.physicalgeography.net/fundamentals/7o.html

Figure 13M-1 Pressure Gradient

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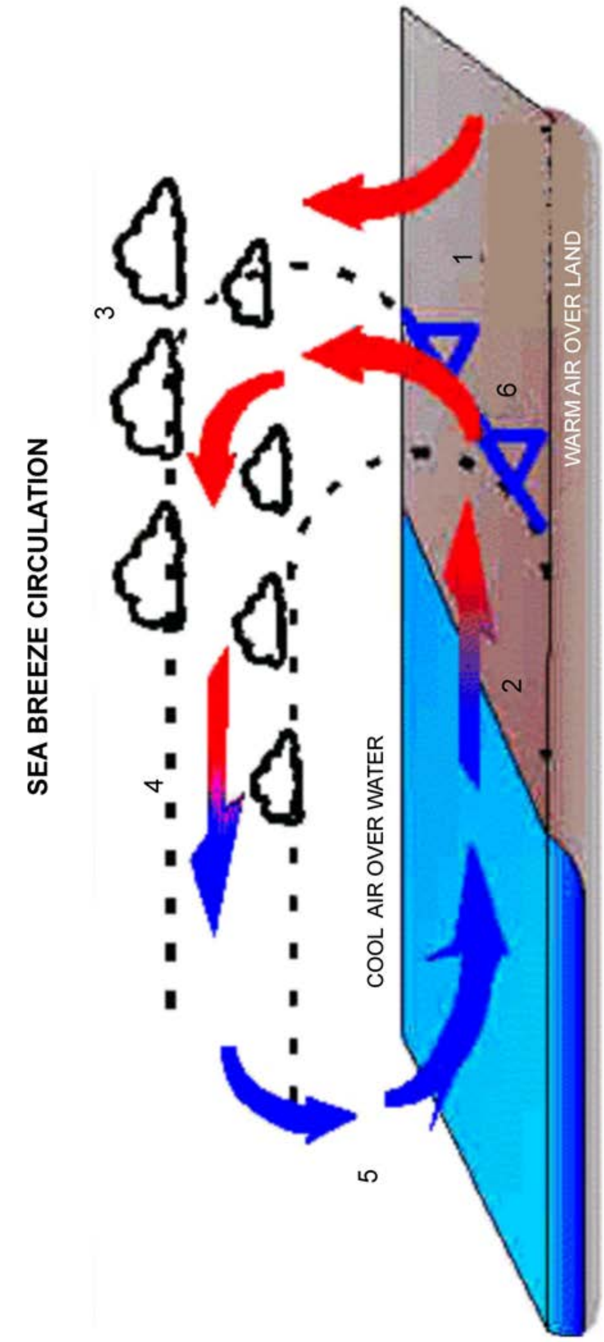
SEA BREEZE



The Weather Doctor, K. C. Heidron, PhD, 1993, Sea and Land Breezes, Copyright 1998 by K. C. Heidron PhD. Retrieved April 7, 2008 from http://www.islandnet.com/~see/weather/elements/seabrz.htm

Figure 13N-1 Sea Breeze

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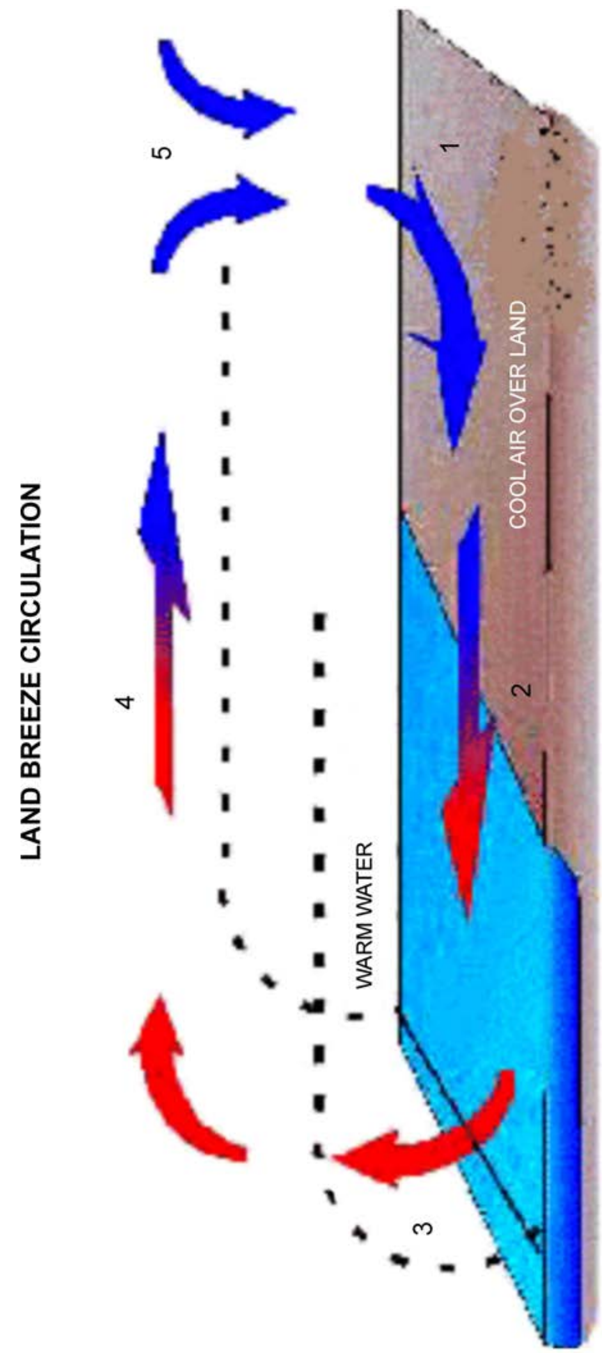
LAND BREEZE



The Weather Doctor, K. C. Heidron, PhD, 1993, Sea and Land Breezes, Copyright 1998 by K. C. Heidron PhD. Retrieved April 7, 2008 from http://www.islandnet.com/~see/weather/elements/seabrz.htm

Figure 13O-1 Land Breeze

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DEFINITIONS

Atmospheric Pressure. The pressure of the atmosphere at any point due to the weight of the overlying air.

Isobars. Areas of like pressure are joined by lines called isobars (from Greek *isos* [same] and *baros* [weight]).

Low Pressure Areas. Low pressure areas (often called lows, cyclones, or depressions) are areas of relatively lower pressure, with the lowest pressure in the centre.

High Pressure Areas. High pressure areas (often called anti-cyclones) are areas of relatively higher pressure, with the highest pressure in the centre.

Continental Air Mass. Air mass will be dry as it formed over land.

Maritime Air Mass. Air mass will be moist as it formed over water.

Arctic Air Mass. Air mass will be cold as it formed over the Arctic.

Polar Air Mass. Air mass will be cool as it formed over the Polar region.

Tropical Air Mass. Air mass will be warm as it formed over the Tropical region.

Wind. The horizontal movement of air within the atmosphere.

Pressure Gradient. The rate of change of pressure over a given distance measured at right angles to the isobars.

Sea Breeze. Occurs during the day when the land heats up more rapidly than the water.

Land Breeze. Occurs at night when the land cools down faster than the water.

Diurnal Variation. This is due to the heating processes which occur during the day, creating vertical currents and pressure gradients. At night, when the heating processes cease, the vertical currents diminish and the pressure gradients become shallower.

Coriolis Force. The rotation of the earth causes a deflection to the right (in the northern hemisphere). Coriolis Force also explains why air moves clockwise around a high, and counter-clockwise around a low pressure system.

Veering and Backing. Veering is a change in wind direction clockwise relative to the cardinal points of a compass while backing is a change in wind direction counter-clockwise caused by friction with the earth’s surface.

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TYPES OF PRECIPITATION

UCAR Communications, Staff Notes Monthly, 2003, One Hail of a Storm, Copyright 2003 by University of Carolina. Retrieved April 2, 2008, from http://www.ucar.edu/communications/staffnotes/0308/hail.html

Figure 13Q-1 Hailstone

Climber.org, by S. Eckert, 2006, Graupel–Snow Pellets, Lighter and Smaller Than Hail, Copyright 2006 by Climber.org. Retrieved April 2, 2008, from http://www.climber.org/TripReports/2006/1473.html

Figure 13Q-2 Snow Pellets

Neatorama, 2007, Snow-donut. Copyright 2007 by Neatorama. Retrieved April 2, 2008, from http://www.neatorama.cachefly.net/images/2007-03/snow-donut.jpg

Figure 13Q-3 Snow Doughnut

Ohio Weather Library, B. Plonka, 2008. Unusual Weather. Copyright 2008 by Ohio Weather Library. Retrieved April 2, 2008 from http://www.owlinc.org/unusualweatherpg7.html

Figure 13Q-4 Ice Prisms

SAMPLE METAR AND SPECI

METAR CYHZ 111700Z 28009G16KT 15SM FEW250 00/M11 A2990 RMK CS0 SLP134=

METAR CYHZ 111800Z 29015KT 15SM FEW250 01/M10 A2989 RMK CI0 SLP128=

METAR CYHZ 111900Z 30008KT 15SM FEW250 02/M12 A2987 RMK CI0 SLP123=

SPECI CYYJ 111744Z CCA 23019G24KT 20SM -SHRA BKN014 BKN030 BKN120 09/07 RMK SC5SC1AC1=

SPECI CYYJ 111744Z 23019G24KT 20SM -RA BKN014 BKN030 BKN120 09/07 RMK SC5SC1AC1=

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WORLD METEOROLOGICAL ORGANIZATION CODE FOR PRESENT WEATHER

QUALIFIER					WEATHER PHENOMENA			
INTENSITY or PROXIMITY 1	**DESCRIPTOR 2**		**PRECIPITATION 3**		**OBSCURATION 4**		**OTHER 5**	
Note: Precipitation intensity refers to all forms combined.	**MI**	Shallow	**DZ**	Drizzle	**BR**	Mist (Vis ≥ 5/8 SM)	**PO**	Dust/sand Whirls (Dust Devils)
	BC	Patches	**RA**	Rain	**FG**	Fog (Vis < 5/8 SM)	**SQ**	Squalls
	PR	Partial	**SN**	Snow	**FU**	Smoke (Vis ≤ 6 SM)	**+FC**	Tornado or Waterspout
	DR	Drifting	**SG**	Snow Grains				
- Light	**BL**	Blowing	**IC**	Ice Crystals (Vis = 6 SM)	**DU**	Dust (Vis ≤ 6 SM)	**FC**	Funnel Cloud
	SH	Shower(s)						
Moderate (no qualifier)	**TS**	Thunderstorm	**PL**	Ice Pellets	**SA**	Sand (Vis ≤ 6 SM)	**SS**	Sandstorm (Vis < 5/8 SM) (+SS Vis < 516 SM)
			GR	Hail				
+Heavy	**FZ**	Freezing	**GS**	Snow Pellets	**HZ**	Haze (Vis ≤ 6 SM)	**DS**	Dust storm (Vis < 5/8 SM) (+DS Vis < 516 SM)
VC In the vicinity			**UP**	Unknown precipitation (AWOS only)	**VA**	Volcanic Ash (with any visibility)		

Transport Canada, Aeronautical Information Manual, Transport Canada (p. 145)

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CHAPTER 14

PO 337 – DEMONSTRATE AIR NAVIGATION SKILLS

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M337.01 – MEASURE DISTANCE ALONG A ROUTE

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a slide of the terms located at Annex A.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to introduce basic air navigation terms and types of air navigation.

Demonstration and performance was chosen for TP 3 as it allows the instructor to explain and demonstrate measuring distances while providing an opportunity for the cadet to practice this skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have measured distance along a route.

IMPORTANCE

It is important for cadets to learn to measure distance along a route since it is an important skill in all types of navigation. Cadets may travel and being able to determine the distance between points is important. A cadet who continues with flight training will use this skill during flight planning.

Teaching Point 1 | **Define Air Navigation Terms**

Time: 5 min | Method: Interactive Lecture

AIR NAVIGATION TERMS

Show the slide of the terms located at Annex A.

There are several key terms that must be understood.

Graticule. A three-dimensional geometrical pattern of intersecting circles. Envision the black lines on a basketball, or a globe with only the black lines.

Latitude. Parallels of latitude are imaginary circles on the earth's surface, which lie parallel to the equator. Latitude measures 90 degrees north and 90 degrees south of the equator. Parallels of latitude make up half of the earth's graticule. Latitude is measured in degrees (°), minutes ('), and seconds (").

Longitude. Meridians of longitude are imaginary circles on the earth's surface, which intersect at the true or geographic poles, and join the poles of the earth together. Longitude measures 180 degrees west and 180 degrees east of the prime meridian (0 degrees), which passes through Greenwich, England. Meridians of longitude make up the other half of the earth's graticule. Longitude is measured in degrees (°), minutes ('), and seconds (").

Nautical Miles. A nautical mile (nm) is 6 080 feet and is the average length of one minute of latitude.

Statute Miles. A statute mile is 5 280 feet.

Scale. Scale on a map is the relationship between a unit of distance on the chart to the distance on the earth that the unit represents. For example, a scale of 1 : 250 means that one inch on the map is equal to 250 inches on the ground.

VNC. A visual flight rules (VFR) navigation chart (VNC) is a chart used primarily for visual navigation, at low altitudes (below 18 000 feet) and slower speeds (less than 300 knots). A VNC has a scale of 1 : 500 000, or one inch to eight miles.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a graticule?

Q2. How many nautical miles are in one minute of latitude?

Q3. How many feet are in a statute mile?

ANTICIPATED ANSWERS

A1. A three-dimensional geometrical pattern of intersecting circles.

A2. One.

A3. 5 280 feet.

Teaching Point 2	**Identify and Describe Types of Navigation**
Time: 5 min	Method: Interactive Lecture

TYPES OF NAVIGATION

There are several methods of navigation used by pilots to find their way from place to place. Four of the more common methods used include:

- pilotage,
- dead reckoning,
- inertial navigation, and
- satellite navigation.

Pilotage. This method of navigation is by reference to landmarks only. This is similar to orienteering.

Dead Reckoning. This method of navigation uses predetermined vectors of wind and true airspeed, precalculated heading and groundspeed, and estimated time of arrival. This is the most common method used by private pilots.

Inertial Navigation. This method of navigation is through use of gyroscopic equipment and electronic computers to provide a continuous display of position. This equipment is built into the aircraft.

Satellite Navigation. This method uses position and guidance systems, which transmit to and receive information from orbiting satellites. The global positioning system (GPS) is the most commonly used satellite system with many new aircraft having complex units built into the instrument panel.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is pilotage?

Q2. Which is the most common navigation method used by private pilots?

Q3. What is the most commonly used satellite navigation system?

ANTICIPATED ANSWERS

A1. This method is navigation by reference to landmarks only.

A2. Dead reckoning.

A3. GPS.

Teaching Point 3 **Demonstrate and Have the Cadet Determine the Distance Between Two Predetermined Points Along a Route**

Time: 15 min Method: Demonstration and Performance

MEASURING DISTANCE

International Civil Aviation Organization (ICAO) Ruler

The ICAO ruler is a simple straight edge with four measuring scales embossed into it. The scale used depends on the type of map and unit of measurement desired. For a VNC, the scale would be 1 : 500 000. Since all distances in aviation are given in nm, this is the measurement used when determining distance.

Place the ruler on the map, with the starting point at zero. Be sure to use the 1 : 500 000 side and the nm scale. Adjust the ruler so that the destination point is on the same edge as the start point, and measure across. The value found on the nm scale is the distance between the two points.

Map Scale

The distance can also be measured using the map scale. On the reverse side of the map legend there is a graduated scale for that map. It will show nm, statute miles, and km. Take a piece of paper and line it up on the map between the two points. Use a pencil to mark where the two points are on the paper. Line the paper up with the graduated scale, on the nm line, and determine the distance. If the distance on the map is greater than the graduated scale, simply mark off the end of the graduated scale on the paper, shift the paper down so that the new mark is set to zero and remeasure. Depending on the length of the route, some basic math may be required as the paper may have to be readjusted.

Remember that the distance between minutes of latitude is one nm. This means that if two points are directly north or south of each other, count up the number of minutes of latitude between them and this equals the distance.

ACTIVITY

OBJECTIVE

The objective of this activity is to determine the distance between two points along a route.

RESOURCES

- ICAO ruler,
- VNC,
- Pencil, and
- Eraser.

ACTIVITY LAYOUT

Desks are to be arranged so that cadets can work in pairs.

ACTIVITY INSTRUCTIONS

1. Distribute one VNC to each pair of cadets.

2. Distribute one ICAO ruler to each pair of cadets.
3. Using two predetermined points, demonstrate to the cadets how to use the ICAO ruler.
4. Provide the cadets with a second set of predetermined points.
5. Have the cadets measure the distance between these two points using the ICAO ruler.
6. Provide the cadets with two more sets of points and allow them to practice.
7. If time permits, demonstrate to the cadets how to measure the distance using the scale of the map.
8. Have the cadets use the scale of the map to determine the distances of the previously used sets of points. Confirm with the results of the ICAO ruler.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the measuring activity will serve as confirmation of this TP

END OF LESSON CONFIRMATION

The cadets' participation in the activity in TP 3 will serve as confirmation of this EO.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Measuring a distance along a route is very useful in aviation as well as other methods of travel. Being aware of scale and knowing how to use that information will ensure efficient trip planning.

INSTRUCTOR NOTES/REMARKS

VNCs and ICAO rulers can be ordered through the Area Cadet Officer (ACO), purchased at a local flight training centre, or ordered online at NavCanada (www.navcanada.ca).

EO C337.02 (Practice Air Navigation Skills, Section 4) may be conducted to provide extra practice of the skills learned in this EO.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

C3-139 (ISBN 0-7715511-5-0) Transport Canada. (1999). *Flight Training Manual: 4th Edition Revised*. Ottawa, ON: Transport Canada.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M337.02 – DETERMINE A POSITION ON A VISUAL FLIGHT RULES (VFR) NAVIGATIONAL CHART (VNC)

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a list of predetermined coordinates that correspond to airports on the VNC to be used in TP 3.

Create a list of locations to be used in TP 4.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to introduce basic air navigation terms.

Demonstration and performance was chosen for TPs 3 and 4 as it allows the instructor to explain and demonstrate determining positions and coordinates while providing an opportunity for the cadet to practice under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have determined a position on a VNC.

IMPORTANCE

It is important for cadets to be able to determine a position on a VNC as this is a transferable skill in any type of navigation which uses maps that have a graticule.

Teaching Point 1 | **Explain that the Earth is Divided Into Sections by an Imaginary Grid System Called a Graticule**

Time: 5 min | Method: Interactive Lecture

GRATICULE

A graticule is a three-dimensional geometrical pattern of intersecting circles. Envision the black lines on a basketball, or a globe with only the black lines. When applied to the earth, either on a globe or a map, we refer to these intersecting lines as parallels of latitude and meridians of longitude.

Parallels of Latitude

Parallels of latitude are a series of concentric circles, which measure north and south. The baseline for measuring is the equator, which is 0 degrees of latitude. As one travels away from the equator the degree of latitude becomes larger, to a maximum of 90 degrees north or south. The southern borders of Canada's Prairie Provinces lie on the 49th parallel of latitude, and are therefore at 49 degrees north latitude. Latitude is expressed in degrees (°), minutes ('), and seconds ("). Though the terms are similar, latitude is not a measurement of time and is actually related to distance. One minute of latitude is equal to one nautical mile (nm).

Meridians of Longitude

Meridians of longitude are a series of circles, which measure east and west. The baseline for measuring is the prime meridian, which runs north to south through Greenwich, England. The prime meridian is 0 degrees of longitude. As one travels away from the prime meridian the degree of longitude becomes larger, to a maximum of 180 degrees east or west. Many meridians of longitude pass through Canada, with one being made famous by the Tragically Hip song "Hundredth Meridian". Longitude is expressed in degrees (°), minutes ('), and seconds ("). Longitude is not a measurement of time, but there is a relationship between time and longitude.

The Equator

The equator is the only parallel of latitude, which divides the earth into two equal halves. It is expressed as 0 degrees of latitude and is the dividing line between the northern and southern hemispheres.

The Prime Meridian

The prime meridian is one half of a circle, which will divide the earth into two equal halves. The other half is the International Date Line. The prime meridian is expressed as 0 degrees of longitude, while the International Date Line is expressed as 180 degrees of longitude. Both lines divide the earth into the western and eastern hemispheres.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a graticule?

Q2. Which directions do parallels of latitude measure?

Q3. Which directions do meridians of longitude measure?

ANTICIPATED ANSWERS

A1. A graticule is a three-dimensional geometrical pattern of intersecting circles.

A2. Parallels of latitude measure north and south from the equator.

A3. Meridians of longitude measure east and west from the prime meridian.

Teaching Point 2	**Explain Geographical Coordinates**
Time: 5 min	Method: Interactive Lecture

GEOGRAPHICAL COORDINATES

The locations of cities, towns, and airports may be designated by their geographical coordinates. These coordinates express where a parallel of latitude intersects with a meridian of longitude. This is similar in principle to the X-and Y-axis on a graph.

Units of Measurement

Both latitude and longitude use the same units of measurement: degrees, minutes, and seconds. There are 60 seconds in a minute and 60 minutes in a degree. For latitude, this means that one degree is equal to 60 nm.

Sequencing

When expressing geographical coordinates, latitude is always shown first and longitude second. Whenever possible, coordinates should be given in the greatest detail. This means using degrees, minutes and seconds of latitude and longitude. The more precise the coordinates, the easier it will be to find a location.

Examples of coordinates include:

- Penticton Airport: N 49° 27' 47" W 119° 36' 08"
- Red Deer Airport: N 52° 10' 43" W 113° 53' 35"
- St. Jean Airport: N 45° 17' 40" W 73° 16' 52"
- Debert Airport: N 45° 25' 07" W 63° 27' 28"

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are geographical coordinates used for?

Q2. How are geographical coordinates expressed?

Q3. What is an example of a coordinate?

ANTICIPATED ANSWERS

A1. Designating the location of cities, towns, and airports.

A2. Latitude is always shown first, longitude second.

A3. Answers may vary. Use examples in TP 2 as a guide.

Teaching Point 3 | **Given a Set of Coordinates, Demonstrate and Have the Cadet Determine the Location of an Airport**

Time: 10 min | Method: Demonstration and Performance

ACTIVITY

OBJECTIVE

The objective of this activity is to determine the location of an airport using coordinates.

RESOURCES

- Paper,
- Tape or adhesive putty,
- VNC, and
- Predetermined sets of coordinates for airports.

ACTIVITY LAYOUT

Arrange the classroom so that each pair may work with a VNC.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Write three sets of coordinates on the whiteboard and cover them with paper.
3. Distribute one VNC to each pair of cadets.
4. Uncover the first set of coordinates, and demonstrate how to find the airport.
5. Have the cadets find the airport at those coordinates. Assist as necessary.
6. Uncover the second set of coordinates and repeat step five.
7. Uncover the third set of coordinates and repeat step five.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets’ participation in the locating an airport activity will serve as confirmation of this TP.

Teaching Point 4 | **Demonstrate and Have the Cadet Determine the Coordinates of a Given Location on a Map**

Time: 5 min | Method: Demonstration and Performance

ACTIVITY

OBJECTIVE

The objective of this activity is to determine the coordinates of a given location on a map.

RESOURCES

- Paper,
- Tape or adhesive putty,
- VNC, and
- Predetermined locations on a map.

ACTIVITY LAYOUT

Arrange the classroom so that each pair may work with a VNC.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Write two locations on the whiteboard and cover with paper.
3. Distribute one VNC to each pair of cadets.
4. Choose a location on the map and demonstrate how to determine the coordinates.
5. Uncover the first location. Assist cadets by giving them general directions (eg, trace a line with their fingers northeast of city X).
6. Have the cadets determine the coordinates of that location. Assist as necessary.
7. Uncover the second set of coordinates and repeat step five and six.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets’ participation in the determining coordinates activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in the activities in TPs 3 and 4 will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW Chapter 3, Annex B, Aviation Subjects – Combined Assessment PC.

CLOSING STATEMENT

Determining a location on a map is a very useful skill that cadets may use throughout life, not just in aviation. This skill can transfer to survival, outdoor sports, or travel of any kind.

INSTRUCTOR NOTES/REMARKS

VNCs can be ordered through your Area Cadet Officer (ACO), purchased at a local flight training centre, or ordered online at NavCanada.

EO C337.02 (Practice Air Navigation Skills, Section 4) may be conducted to provide extra practice of the skills learned in this EO.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

C3-139 (ISBN 0-7715511-5-0) Transport Canada. (1999). *Flight Training Manual: 4th Edition Revised*. Ottawa, ON: Transport Canada.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C337.01 – OPERATE A RADIO FOR AVIATION TRANSMISSION

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create several scripts using the examples located at Annex B as a guide.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP 1 as an interactive way to review the phonetic alphabet.

Demonstration and performance was chosen for TPs 2 and 3 as it allows the instructor to explain and demonstrate operating a radio while providing an opportunity for the cadet to practice radio transmissions under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have operated a radio for aviation transmissions.

IMPORTANCE

It is important for cadets to be able to operate a radio for aviation transmissions as it will improve their verbal communication skills and add to their comprehension and enjoyment of familiarization flights.

Teaching Point 1 — **Review the Phonetic Alphabet and Numbers**

Time: 5 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to review the phonetic alphabet and numbers.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Write the phonetic alphabet and numbers on the whiteboard or flip chart.
2. Have each cadet spell out their first and last name using the phonetic alphabet.
3. Have each cadet count from 1 to 5 or from 5 to 10 using the phonetic numbers.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the phonetics activity will serve as confirmation of TP 1.

Teaching Point 2 — **Explain, Demonstrate and Have the Cadet Practice Operating a Radio to Communicate the Arrival of an Aircraft**

Time: 10 min — Method: Demonstration and Performance

Arrival messages are transmitted in order to communicate intentions, clearances and instructions. An airport can be a busy place, with many aircraft arriving and departing in short spans of time. This can cause confusion if proper communication is not practiced.

There are normally four parts to a radio message, including:

1. the call-up,
2. the reply,
3. the message, and
4. the acknowledgement or ending.

All parts of the message should be clear, concise and in phonetics where appropriate.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to demonstrate and have the cadet perform operating a radio to communicate the arrival of an aircraft.

RESOURCES

- Hand-held radio, and
- Script of phrases.

ACTIVITY LAYOUT

Arrange the classroom to facilitate small group work over a short distance.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute one radio and a script located at Annex B, page 14B-1 to each cadet.
3. Demonstrate the four parts of a radio message that communicate the arrival of an aircraft.
4. Have the cadets practice operating a radio to communicate the arrival of an aircraft.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the radio activity for communicating the arrival of an aircraft activity will serve as the confirmation of this TP.

Teaching Point 3	**Explain, Demonstrate and Have the Cadet Practice Operating a Radio to Communicate the Departure of an Aircraft**
Time: 10 min	Method: Demonstration and Performance

Departure messages are transmitted in order to communicate intentions, clearances and instructions.

All parts of the message should be clear, concise and in phonetics where appropriate.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to demonstrate and have the cadet perform operating a radio to communicate the departure of an aircraft.

RESOURCES

- Hand-held radio, and
- Script of phrases.

ACTIVITY LAYOUT

Arrange the classroom to facilitate small group work over a small distance.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute one radio and a script located at Annex B, page 14B-2 to each cadet.
3. Demonstrate the four parts of a radio message that communicate the departure of an aircraft.
4. Have the cadets practice operating a radio to communicate the departure of an aircraft.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the operation of a radio for communicating the departure of an aircraft activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the operation of a radio for aviation transmission activities will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Proper communication over the radio is essential. Some messages may contain a large amount of information that must be transmitted in a brief message. This skill will assist in developing effective verbal communication while using a radio.

INSTRUCTOR NOTES/REMARKS

Depending on available resources, this EO may be conducted on the familiarization flying day in cooperation with the Technical Training Establishment (TTE).

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

C3-182 *Study Guide for the Radiotelephone Operator's Restricted Certificate (Aeronautical)*. (1990). Retrieved October 23, 2007, from http://www.ic.gc.ca/epic/site/smt-gst.nsf/en/sf01397e.html.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C337.02 – PRACTICE AIR NAVIGATION SKILLS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Develop a list of points and coordinates for airports to be used in TP 1.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson so that the cadets may further develop skills learned in EO M337.01 (Measure Distance Along a Route, Section 1) and EO M337.02 (Determine a Position on a Visual Flight Rules [VFR] Navigational Chart [VNC], Section 2).

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have practiced air navigation skills.

IMPORTANCE

It is important for cadets to practice air navigation skills as each cadet may find an opportunity to use these skills in any trip planning, whether aviation based or not.

Teaching Point 1 | **Practice Air Navigation Skills**

Time: 25 min | Method: Practical Activity

The following activities are designed to be conducted concurrently. Some cadets may need to practice measuring distance along a route, while others may need to practice determining position on a Visual Flight Rules (VFR) Navigation Chart (VNC). Determine which cadets need practice with which skill, and then divide the cadets accordingly. Cadets working on different activities may share the same map to lessen the strain on resources.

ACTIVITY

OBJECTIVE

The objective of this activity is to practice measuring distance along a route.

RESOURCES

- Predetermined points,
- VNC,
- International Civil Aviation Organization (ICAO) Ruler,
- Pencil, and
- Eraser.

ACTIVITY LAYOUT

The classroom should be arranged to facilitate individual and group work, depending on the skill level of each cadet.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs based on the activity that they will participate in. Two cadets working on different activities may be paired up to use the same map if needed.
2. Distribute one VNC and one ICAO ruler to each pair of cadets.
3. Using two predetermined points, demonstrate to the cadets how to use the ICAO ruler.
4. Provide the cadets with a second set of predetermined points.
5. Have the cadets measure the distance between these two points using the ICAO ruler.
6. Provide the cadets with two more sets of points and allow them to practice.
7. If time permits, demonstrate to the cadets how to measure the distance using the scale of the map.
8. Have the cadets use the scale of the map to determine the distances of the previously used sets of points. Cross-check with the results of the ICAO ruler.

SAFETY

N/A.

ACTIVITY

OBJECTIVE

The objective of this activity is to practice determining position on a VNC.

RESOURCES

- Paper,
- Tape or adhesive putty,
- VNC, and
- Predetermined sets of coordinates for airports.

ACTIVITY LAYOUT

The classroom should be arranged to facilitate individual and group work, depending on the skill level of each cadet.

ACTIVITY INSTRUCTIONS

1. Write three sets of coordinates on the whiteboard and cover with paper.
2. Divide the cadets into pairs based on the activity that they will participate in. Two cadets working on different activities may be paired up to use the same map if needed.
3. Distribute one VNC to each pair of cadets. Cadets who wish to work independently may still share a map.
4. Uncover the first set of coordinates.
5. Have the cadets find the airport at those coordinates. Assist as necessary.
6. Uncover the second set of coordinates and repeat step four.
7. Uncover the third set of coordinates and repeat step four.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activities in TP 1 will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' practicing measuring distance along a route and determining position on a VNC will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Measuring distance and determining position on a map are transferable skills to any other method of travel.

INSTRUCTOR NOTES/REMARKS

This EO is designed to complement EO M337.01 (Measure Distance Along a Route, Section 1) and EO M337.02 (Determine a Position on a Visual Flight Rules [VFR] Navigational Chart [VNC], Section 2) as extra time to practice the skills.

REFERENCES

N/A.

AIR NAVIGATION TERMS

Graticule. A three-dimensional geometrical pattern of intersecting circles. Envision the black lines on a basketball, or a globe with only the black lines.

Latitude. Parallels of latitude are imaginary circles on the earth's surface, which lie parallel to the equator. Latitude measures 90 degrees north and 90 degrees south of the equator. Parallels of latitude make up half of the earth's graticule. Latitude is measured in degrees (°), minutes ('), and seconds (").

Longitude. Meridians of longitude are imaginary circles on the earth's surface, which intersect at the true or geographic poles, and join the poles of the earth together. Longitude measures 180 degrees west and 180 degrees east of the prime meridian (0 degrees), which passes through Greenwich, England. Meridians of longitude make up the other half of the earth's graticule. Longitude is measured in degrees (°), minutes ('), and seconds (").

Nautical Miles. A nautical mile (nm) is 6 080 feet and is the average length of one minute of latitude.

Statute Miles. A statute mile is 5 280 feet.

Scale. Scale on a map is the relationship between a unit of distance on the chart to the distance on the earth that the unit represents. For example, a scale of 1 : 250 means that one inch on the map is equal to 250 inches on the ground.

VNC. A visual flight rules (VFR) navigation chart (VNC) is a chart used primarily for visual navigation, at low altitudes (below 18 000 feet) and slower speeds (less than 300 knots). A VNC has a scale of 1 : 500 000, or one inch to eight miles.

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EXAMPLES OF ARRIVAL AND DEPARTURE COMMUNICATIONS

Arrival

1.	The call-up:	Schefferville Radio This is Piper Foxtrot Alfa Bravo Charlie Over
2.	The reply:	Piper Foxtrot Alfa Bravo Charlie This is Schefferville Radio Go ahead Over
3.	The message:	Schefferville Radio This is Piper Foxtrot Alfa Bravo Charlie Four miles at one thousand Landing Schefferville Over
		Piper Foxtrot Alfa Bravo Charlie This is Schefferville Radio Roger Wind – one six zero at one five Altimeter – two niner niner seven Over
4.	The acknowledgement:	Schefferville Radio This is Piper Foxtrot Alfa Bravo Charlie Roger

Departure

1.	The call-up:	Schefferville Radio This is Piper Foxtrot Alfa Bravo Charlie Over
2.	The reply:	Piper Foxtrot Alfa Bravo Charlie This is Schefferville Radio Go ahead Over
3.	The message:	Schefferville Radio This is Piper Foxtrot Alfa Bravo Charlie Holding short of runway Tree Tree on Alfa Ready for takeoff Over
		Piper Foxtrot Alfa Bravo Charlie This is Schefferville Radio Proceed at your discretion Wind – three two zero at one zero Over
4.	The acknowledgement:	Schefferville Radio Piper Foxtrot Alfa Bravo Charlie Roger

CHAPTER 15

PO 340 – IDENTIFY ASPECTS OF SPACE EXPLORATION

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M340.01 – IDENTIFY CANADIAN ASTRONAUTS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Choose two astronauts to be the focus of this lesson.

Retrieve current information about the chosen astronauts from the annexes and update with information from the reference.

Create a slide of each astronaut’s photograph.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to Canadian astronauts, to generate interest in Canada’s space program, and to emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified Canadian astronauts.

IMPORTANCE

It is important for cadets to identify Canadian astronauts so that they can become familiar with the Canadian space program. The hard work that astronauts perform will illustrate the Air Force motto: Per Ardua ad Astra, as well as the rewards that can be achieved by men and women who accept the challenge of the stars.

Teaching Point 1 **Identify Canadian Astronauts**

Time: 10 min Method: Interactive Lecture

Training of Canada's astronauts began in 1983 and Canada's first astronaut, Marc Garneau, visited space in October 1984, when, among many other mission accomplishments, the Canada Experiment (CANEX) payload performed important experiments. Those early CANEX experiments were:

- Auroral Photography Experiment (APE),
- Radiation Monitoring Equipment (RME), and
- Thermoluminiscent Dosimeter (TLD).

Since that time both the astronaut cadre and Canada's space program have grown. Some astronauts have retired after brilliant careers and new members have joined the team. Some of Canada's astronauts include:

- Marc Garneau (Canada's first astronaut),
- Roberta Bondar (Canada's first woman astronaut),
- Steve MacLean,
- Chris Hadfield,
- Robert Thirsk,
- Bjarni Tryggvason,
- David Williams, and
- Julie Payette.

Show the cadets the slides of photographs located at Annexes A to H.

Using information retrieved from the reference, identify the Canadian astronaut who most recently made his or her first space journey.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. In what year did training of Canada's astronauts begin?

Q2. When did Canada's first astronaut visit space?

Q3. Who was Canada's first astronaut?

ANTICIPATED ANSWERS

A1. 1983.

A2. October 1984.

A3. Marc Garneau.

Teaching Point 2 — **Discuss the Professional and Personal Profiles of Two Canadian Astronauts**

Time: 15 min — Method: Interactive Lecture

Discuss the following information about the two chosen astronauts, using information located at the respective annexes or retrieved from the reference, to include:

a. missions undertaken,

b. place and date of birth,

c. education,

d. professional experience,

e. special honours, and

f. affiliations.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. In what missions did these astronauts take part?

Q2. What part did these astronauts play on these missions?

Q3. What education and experience did these astronauts bring to the missions?

ANTICIPATED ANSWERS

A1. As per lesson content in TP 2.

A2. As per lesson content in TP 2.

A3. As per lesson content in TP 2.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Which Canadian astronaut most recently made his or her first space journey?

Q2. Who was Canada’s first astronaut?

Q3. Who was Canada’s first woman astronaut?

ANTICIPATED ANSWERS

A1. As per lesson content in TP 1.

A2. Marc Garneau.

A3. Roberta Bondar.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Space missions have a short history and a vast future. Cadets can stay current with the space program by frequently visiting websites of the Canadian Space Agency (CSA), the US National Aeronautics and Space Administration (NASA) and websites of other organizations such as the European Space Agency (ESA).

INSTRUCTOR NOTES/REMARKS

The instructor shall obtain the latest biographical information for this EO. This material must be updated each year to reflect the Canadian Space Agency's recent activities.

A list shall be kept of astronauts that cadets have focused on to prevent repetition, since other lessons, such as EO C340.01 (Identify Canadian Astronauts, Section 3), may introduce other astronauts in the future.

REFERENCES

C3-238 Canadian Space Agency. (2008). *Canadian Space Agency*. Retrieved February 9, 2008, from http://www.space.gc.ca/asc/eng/default.asp.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M340.02 – DISCUSS THE HISTORY OF MANNED SPACE EXPLORATION

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of figures located at Annexes I to L.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets, generate interest, present background material, and clarify the history of manned space exploration.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have discussed the history of manned space exploration.

IMPORTANCE

It is important for cadets to learn about the history of manned space exploration because in the near future, space exploration will become increasingly significant as developing technologies and resource depletion move humanity's focus beyond earth.

Teaching Point 1	Discuss the Mercury Program
Time: 5 min	Method: Interactive Lecture

Show the cadets the early manned space exploration timeline located at Annex I.

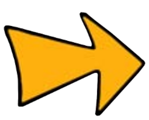
On May 5, 1961, America's first astronaut, Alan Shepard, blasted into space on a Redstone rocket. His history-making suborbital flight was in a one-man capsule named Freedom 7, which was only two metres long and less than two metres in diameter.

Show the cadets Figure 15I-1.

OBJECTIVES OF THE MERCURY PROGRAM

Specific studies and tests conducted by the US government and industry, culminating in 1958, indicated the feasibility of manned space flight. The objectives of the Mercury program, as stated at the time of project commencement in November 1958, were:

- place a manned spacecraft in orbital flight around the earth;
- investigate man's performance capabilities and his ability to function in the environment of space; and
- recover the man and the spacecraft safely.



The 1983 movie *The Right Stuff* is based on the story of the Mercury program.

HISTORY OF THE MERCURY PROGRAM

The US' first manned space flight project was successfully accomplished in less than five years, which saw more than 2 000 000 people from major government agencies and the aerospace industry combine their skills, initiative and experience into a national effort.

In this period, six manned space flights were accomplished as part of a 25-flight program. These manned space flights were accomplished with complete pilot safety and without change to the basic Mercury objectives.

It was shown that man could function ably as a pilot-engineer-experimenter without undesirable reactions or deteriorations of normal body functions for periods up to 34 hours of weightless flight. Directing this large and fast moving project required the development of a management structure and operating mode that satisfied the requirement to mould the many different entities into a workable structure.

Timeline of the Mercury Program

- October 1, 1958 National Aeronautics and Space Administration (NASA) created

- November 26, 1958 Mercury program announced
- December 4, 1959 Launch of Sam (a monkey) on Little Joe 2
- April 9, 1959 NASA names the seven Mercury astronauts
- January 21, 1960 Launch of Miss Sam (a monkey) on Little Joe IB
- January 31, 1961 Launch of Ham (a chimpanzee) on Mercury Redstone 2
- May 5, 1961 Launch of Alan Shepard in Freedom 7 (suborbital)
- July 21, 1961 Launch of Gus Grissom in Liberty 7 (suborbital)
- November 29, 1961 Launch of Enos (a chimpanzee) on Mercury Atlas 5 (orbital)
- January 3, 1962 Gemini program formally conceived
- February 20, 1962 Launch of John Glenn in Friendship 7, first American human orbital flight
- May 24, 1962 Launch of Scott Carpenter in Aurora 7
- October 3, 1962 Launch of Walter Schirra in Sigma 7
- May 15, 1963 Launch of Gordon Cooper in Faith 7, the final mission of the Mercury program

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Who was America's first astronaut to go into space?

Q2. Which movie portrays the Mercury program?

Q3. How many manned missions were there in the Mercury program?

ANTICIPATED ANSWERS

A1. Alan Shepard.

A2. *The Right Stuff*.

A3. Six.

Teaching Point 2	**Discuss the Gemini Program**
Time: 5 min	Method: Interactive Lecture

Show the cadets the early manned space exploration timeline located at Annex I.

OBJECTIVES OF THE GEMINI PROGRAM

The Gemini program was a necessary intermediate step between the Mercury program and the Apollo program. It had four objectives:

- to subject astronauts to long duration flights – a requirement for projected later trips to the moon or deeper space;

- to develop effective methods for rendezvous and docking with other orbiting vehicles and to manoeuvre the docked vehicles in space;
- to perfect methods of re-entry and landing spacecraft at a pre-selected ground landing point; and
- to gain additional information concerning the effects of weightlessness on crew members and to record the physiological reactions of crew members during longer duration flights.

HISTORY OF THE GEMINI PROGRAM

On May 25, 1961, three weeks after Mercury astronaut Alan Shepard became the first American in space, President John F. Kennedy announced the goal to send astronauts to the moon before the end of the decade. To facilitate this goal, NASA expanded the existing manned space flight program in December 1961 to include the development of a two-man spacecraft. The program was officially designated Gemini on January 3, 1962.

Gemini, to a large degree, was the work of a Canadian – James Arthur Chamberlin of Kamloops, British Columbia, a mechanical engineer educated at the University of Toronto. Having served as the chief engineer for the Mercury program, Chamberlin was selected to be Gemini's Project Manager.

Show the cadets Figure 15J-1.

Gemini was named after the third constellation of the Zodiac and its twin stars, Castor and Pollux, because of its two-man crew.

Show the cadets Figure 15J-2.

Gemini consisted of 12 flights, including two unmanned flight tests of the equipment:

- March 23, 1965 — Gemini III – First manned Gemini flight completed three orbits
- June 03–07, 1965 — Gemini IV – First American Extravehicular Activity (EVA)
- August 21–29, 1965 — Gemini V – First use of fuel cells for electrical power
- December 04–18, 1965 — Gemini VII – First rendezvous in space, with Gemini VI-A
- December 15–16, 1965 — Gemini VI-A – First rendezvous in space, with Gemini VII

Show the cadets Figure 15J-3.

- March 16, 1966 — Gemini VIII – First docking with another (unmanned) spacecraft by astronauts Neil Armstrong and David Scott
- June 03–06, 1966 — Gemini IX-A – Three rendezvous and two hours of EVA
- July 18–21, 1966 — Gemini X – Rendezvoused with target vehicle and EVA
- September 12–15, 1966 — Gemini XI – Gemini record altitude of 1 189.3 km
- November 11–15, 1966 — Gemini XII – Final Gemini flight: rendezvous, docking, EVA

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Who was the Gemini Project Manager?

Q2. How many astronauts were on a Gemini flight?

Q3. Which astronauts accomplished the first docking with another space vehicle?

ANTICIPATED ANSWERS

A1. James Arthur Chamberlin of Kamloops, British Columbia.

A2. Two.

A3. The Gemini crew of Neil Armstrong and David Scott.

Teaching Point 3	**Discuss the Apollo Program**
Time: 5 min	Method: Interactive Lecture

Show the cadets the early manned space exploration timeline located at Annex I.

July 20, 1969: "Houston, Tranquility Base here. The Eagle has landed." were the famous first words spoken from the moon.

OBJECTIVES OF THE APOLLO PROGRAM

The Apollo's program objectives went beyond landing Americans on the moon and returning them safely to earth. The objectives also included:

- establishing the technology to meet other national interests in space;
- achieving pre-eminence in space for the United States;
- carrying out a program of scientific exploration of the moon; and
- developing man's capability to work in the lunar environment.

HISTORY OF THE APOLLO PROGRAM

The Apollo program was the work of Owen E. Maynard of Sarnia, Ontario, chief of the systems engineering division in the Apollo Spacecraft Program Office. He was previously chief of the Lunar Module engineering office in the Apollo Program Office at the Manned Spacecraft Center in Houston. Maynard held an aeronautical engineering degree from the University of Toronto. His years at NASA were rewarded on July 20, 1969, when Apollo 11 commander Neil Armstrong stepped out of the lunar module (LM) and took one small step in the Sea of Tranquility, calling it a giant leap for mankind. Maynard remained in charge of Apollo systems engineering until he left NASA in 1970 following the successful achievement of Kennedy's lunar landing goal. Thereafter he returned to private industry.

Show the cadets Figure 15K-1.

The Apollo program used the Saturn family of launch vehicles. The command, service and lunar module made a small package, dwarfed at the top of the giant launch vehicle.

Show the cadets Figure 15K-2.

The command module (CM) was small for three men to spend 8 days, 3 hours and 18 minutes in it. On the *Apollo 11* journey of July, 1969, the three men were Neil Armstrong (commander), Michael Collins (CM pilot) and Edwin (Buzz) Aldrin Jr. (LM pilot).

Show the cadets Figure 15K-3.

Six of the Apollo missions, *Apollos 11, 12, and 14–17*, landed on the moon, studying soil mechanics, meteoroids, seismic activity, heat flow, lunar ranging, magnetic fields and solar wind.

Apollos 7 and 9 tested spacecraft in earth orbit; *Apollo 10* orbited the moon as the dress rehearsal for the first landing. An oxygen tank explosion forced *Apollo 13* to scrub its landing, but the can-do problem-solving of the crew and mission control – and Maynard's systems engineering group – turned the mission into what was called a successful failure.

The 1995 movie *Apollo 13* is based on the story of the 1970 mission to the moon.

Apollo Flight Summary

- October 1968 *Apollo 7* – Earth orbit
- December 1968 *Apollo 8* – Ten lunar orbits

- March 1969 *Apollo 9* – First manned flight of lunar module
- May 1969 *Apollo 10* – Dress rehearsal for Moon landing
- July 20 1969 *Apollo 11* – First lunar landing mission (on the Sea of Tranquility)
- November 1969 *Apollo 12* – Second lunar landing (on the Ocean of Storms)
- April 1970 *Apollo 13* – Mission aborted after an on-board explosion
- January 1971 *Apollo 14* – Third lunar landing (at Fra Mauro)
- July 1971 *Apollo 15* – Fourth lunar landing (in the Hadley Apennine region)
- April 1972 *Apollo 16* – Fifth lunar landing (on the Descartes highlands)
- December 1972 *Apollo 17* – Last lunar landing (on the Taurus Littrow highlands)

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Which family of launch vehicles were used for Project Apollo?

Q2. Who was chief of systems engineering for the Apollo Project?

Q3. What was the date of Apollo's first manned moon landing?

ANTICIPATED ANSWERS

A1. The Saturn family.

A2. Owen E. Maynard of Sarnia, Ontario.

A3. July 20, 1969.

Teaching Point 4	**Discuss the Russian Manned Space Program**
Time: 10 min	Method: Interactive Lecture

The Mir space station, which was shared by Russian cosmonauts and American astronauts, was a continuation of the Soviet space program. Construction of Mir began in 1986, before the Soviet Union was disbanded. Mir was preceded by many years of Soviet space development which included, among many other programs, the Vostok missions, the Soyuz missions and the Salyut space station.

VOSTOK

The Vostok program (Восто́к, translated as "East") was a Soviet human spaceflight project that succeeded in putting a person into earth's orbit for the first time.

Show the cadets Figure 15L-1.

Vostok manned record-breaking flights included:

- April 12, 1961 *Vostok-1* – First man in space (Yuri Gagarin)

- August 6, 1961 *Vostok-2* – First full day in space
- August 11, 1962 *Vostok-3* – First of two simultaneous manned spacecraft
- August 12, 1962 *Vostok-4* – Second of two simultaneous manned spacecraft
- June 14, 1963 *Vostok-5* – Longest solo orbital flight
- June 16, 1963 *Vostok-6* – First woman in space (Valentina Tereshkova)

SOYUZ

The Soyuz program (meaning “Union”) is a human spaceflight program that was initiated by the Soviet Union in the early 1960s. It was originally part of a moon landing program intended to put a Soviet cosmonaut on the moon. Both the Soyuz spacecraft and the Soyuz launch vehicle were part of this program, which later became the responsibility of the Russian Federal Space Agency.

The Soyuz program produced many experimental variants, but its development is commonly divided into three historical parts:

- Early era: *Soyuz-1 to Soyuz-9* (1966–1970),
- Salyut era: *Soyuz-10 to Soyuz T-14* (1971–1985), and
- Mir era: *Soyuz T-15 to Soyuz TM-30* (1986–2000).

Unlike the one-man Vostok spacecraft, the first three-seat Soyuz was able to conduct active manoeuvring, orbital rendezvous and docking. These features would all have been necessary for a flight around the moon or for a lunar expedition. In the early plans for circumlunar flight, the Soyuz was to be a three-part spacecraft assembled in the low-earth orbit from parts delivered by separate launch vehicles. This plan was later abandoned in favour of a two-launch and, later, a single-launch method.

In 1971, a three-seat Soyuz delivered two crews to the first Salyut space station. Disaster struck when the first Salyut crew returned from orbit. The sudden depressurization of the re-entry capsule killed all three cosmonauts. As a result of this tragedy, the designers introduced protective pressure suits, but at the expense of room for one crewmember. Two-seat Soyuz spacecraft then continued ferrying the crews to the Salyut and Almaz space stations.

SALYUT AND MIR SPACE STATIONS

First-Generation Salyut Stations (1964–1977)

First-generation Salyut space stations had one docking port and could not be resupplied or refuelled. The stations were launched unmanned and later occupied by crews. There were two types: Almaz military stations and Salyut civilian stations. To Western observers, both types were Salyut stations, including:

- 1971 *Salyut-1* – First space station (civilian)
- 1973 *Salyut-2* – First Almaz station (military, failure)
- 1974–75 *Salyut-3* – Almaz station (military)
- 1974–77 *Salyut-4* – Civilian space station
- 1976–77 *Salyut-5* – Last Almaz station (military)

Show the cadets Figures 15L-2 and 15L-3.

Second-Generation Stations (1977–1985)

Second-generation Russian space stations included:

- 1977–1982 *Salyut-6* – Civilian
- 1982–1991 *Salyut-7* – Civilian (last staffed in 1986)

With the second-generation stations, the Soviet space station program evolved from short-duration to long-duration stays. Visiting crews relieved the monotony of a long stay in space.

Salyut-6 Key Facts

Highlights of the *Salyut-6* era include:

- The station received 16 cosmonaut crews, including six long-duration crews. The longest stay time for a *Salyut-6* crew was 185 days. The first *Salyut-6* long-duration crew stayed in orbit for 96 days, beating the 84-day world record for space endurance established in 1974 by the last American Skylab crew.
- The station hosted cosmonauts from Hungary, Poland, Romania, Cuba, Mongolia, Vietnam and East Germany.
- Twelve freighter spacecraft delivered equipment, supplies and fuel.

Show the cadets Figure 15L-3 and 15L-4.

Salyut-7 Key Facts

Highlights of the *Salyut-7* era include:

- *Salyut-7*, a near twin of *Salyut-6*, was home to 10 cosmonaut crews, including six long-duration crews. The longest stay time was 237 days.
- Cosmonauts from France and India worked aboard the station, as did the first female Russian space traveller since 1963.
- Thirteen freighter spacecraft delivered equipment, supplies, and fuel to *Salyut-7*.
- Two experimental transport logistics spacecraft, Cosmos 1443 and Cosmos 1686, docked with *Salyut-7*. Cosmos 1686 was a transitional vehicle, a transport logistics spacecraft redesigned to serve as an experimental space station module.
- *Salyut-7* was abandoned in 1986 and re-entered earth's atmosphere, burning up over Argentina in February, 1991.

Mir

Mir was a third-generation Russian space station which, after 1992, was shared with the US.

Mir means peace and community in Russian. The Mir space station contributed to world peace by hosting international scientists and American astronauts. It also supported a community of humans in orbit and symbolized the commonwealth of the Russian people.

Mir was constructed in orbit by connecting different modules, each launched separately from 1986 – 1996. During the Shuttle-Mir Program, Russia's Mir combined its capabilities with America's space shuttles. The orbiting Mir provided a large and liveable scientific laboratory in space. The visiting space shuttles provided transportation and supplies, as well as temporary enlargements of living and working areas, creating history's largest spacecraft.

Show the cadets Figures 15L-5 and 15L-6.

Magnificent to behold through the windows of a space shuttle, *Mir* was as big as six school buses. Inside, it looked more like a cramped labyrinth, crowded with hoses, cables and scientific instruments – as well as articles of everyday life, such as photos, children's drawings, books and a guitar. *Mir* commonly housed three crew members, but it supported as many as six, for up to a month. Except for two short periods, *Mir* was continuously occupied until August 1999.

The journey of the 15-year-old Russian space station ended March 23, 2001, as *Mir* re-entered the Earth's atmosphere near Nadi, Fiji and fell into the South Pacific. Despite its inconveniences, many cosmonauts and astronauts grew to love *Mir*, comparing it to a living being with qualities, needs and eccentricities.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. Which Salyut space stations were considered to be second generation?

Q2. What does *Mir* mean in Russian?

Q3. Who were the first man and woman in space?

ANTICIPATED ANSWERS

A1. *Salyut-6* and *Salyut-7*.

A2. Peace and community.

A3. Yuri Gagarin and Valentina Tereshkova, respectively.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Who was America's first astronaut to go into space?

Q2. When did *Apollo 11* land on the moon?

Q3. Who was chief of systems engineering for the Apollo Project?

ANTICIPATED ANSWERS

A1. Alan Shepard.

A2. July 20, 1969.

A3. Owen E. Maynard of Sarnia, Ontario.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Space exploration has taken great courage and ingenuity on the part of many people. Space exploration and the space race have changed the world for the better through international cooperation and promoting technological advancement.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

(ISBN 978-0-75662-227-5) Graham, I. (2006). *Space Travel*. New York, NY: DK Publishing, Inc.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C340.01 – IDENTIFY CANADIAN ASTRONAUTS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Retrieve current information located at Annexes A to H in the instructional guide for EO M340.01 (Identify Canadian Astronauts, Section 1) or from the reference.

Create a slide of each astronaut's photograph from the same annexes.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to Canadian astronauts, to generate interest in Canada's space program, and to emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified Canadian astronauts.

IMPORTANCE

It is important for cadets to identify Canadian astronauts so that they can become familiar with the Canadian space program. The hard work that astronauts perform will illustrate the Air Force motto: *Per Ardua ad Astra*, as well as the rewards that can be achieved by men and women who accept the challenge of the stars.

Teaching Point 1	**Discuss the Professional and Personal Profiles of Canadian Astronauts**
Time: 50 min	Method: Interactive Lecture

Ensure that astronauts covered in EO M340.01 (Identify Canadian Astronauts, Section 1) are not included in this lesson.

Discuss the following information about the remaining astronauts, using the information located at the respective annexes in the instructional guide for EO M340.01 (Identify Canadian Astronauts, Section 1) or retrieved from the reference, to include:

a. missions undertaken,

b. place and date of birth,

c. education,

d. professional experience,

e. special honours, and

f. affiliations.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the interactive lecture will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. In what missions did these astronauts take part?

Q2. What role did these astronauts play on these missions?

Q3. What education and experience did these astronauts bring to the missions?

ANTICIPATED ANSWERS

A1. As per lesson content.

A2. As per lesson content.

A3. As per lesson content.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Space missions have a short history and a vast future. Cadets can stay current with the space program by frequently visiting websites of the Canadian Space Agency (CSA), the US National Aeronautics and Space Administration (NASA) and other organizations such as the European Space Agency (ESA).

INSTRUCTOR NOTES/REMARKS

The instructor shall obtain the latest biographical information for this EO. This material must be updated each year to reflect the Canadian Space Agency's recent activities.

A list shall be kept of astronauts that cadets have focused on to prevent repetition.

REFERENCES

C3-238 Canadian Space Agency. (2008). *Canadian Space Agency*. Retrieved February 9, 2008, from http://www.space.gc.ca/asc/eng/default.asp.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C340.02 – DISCUSS THE CANADIAN SPACE PROGRAM

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Annexes M and N.

Photocopy Annex O for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to the Canadian space program and to generate interest.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have discussed the Canadian space program.

IMPORTANCE

It is important for cadets to learn about the Canadian space program so they know that Canada participates in space exploration. The Canadian Space Agency (CSA) and its partners are leading the world in research involving space technologies. This information may also generate interest in the many scientific and technical careers involved in the exploration of space.

Teaching Point 1	**Describe Canada's Involvement in Space Technologies**
Time: 10 min	Method: Interactive Lecture

Show slide of Annex M.

CANADA'S INVOLVEMENT IN SPACE TECHNOLOGIES

The CSA headquarters is located at the John H. Chapman Space Centre in Saint-Hubert, Que. Canada is involved in many aspects of space exploration. Canadian scientists and researchers are particularly interested with the development and testing of space technologies.

Canadian Space Agency, 2008, Canadian Space Agency Logo. Retrieved April 14, 2008, from http://upload.wikimedia.org/wikipedia/en/0/01/Canadian_Space_Agency_logo.png

Figure 15-4-1 CSA Logo

The David Florida Laboratory (DFL)

The David Florida Laboratory is Canada's world-class spacecraft assembly, integration and testing centre. Named in honour of one of Canada's pioneers in space research, C. David Florida, it is located west of Ottawa, Ont. The laboratory is maintained by the CSA. On a fee-for-service basis, the DFL is available for use by Canadian and foreign aerospace and telecommunication companies and organizations for testing hardware to be used in space. Since its creation in September 1972, DFL has made substantial contributions to satellite communications and remote sensing in Canada and continues to play an essential role in our space program.

The Canadian Analogue Research Network (CARN)

CARN is the organization that uses Canadian sites for field studies. These analogue sites approximate conditions that may exist or have existed on Mars and other planetary bodies such as the moon and the Solar System's icy moons.

They provide a unique opportunity to investigate geological and biological processes and hypothesize about planetary bodies. Analogue sites can be used to develop and test specific technology and to understand how to explore and live on other planets. The following are the first three CARN sites selected in 2005:

- Haughton-Mars Project Research Station, Devon Island, Nunavut, 75° 22' N, 89° 41' W;

- McGill Artic Research Station, Axel Heiberg Island, Nunavut, 79° 26’ N, 90° 46’ W; and
- Pavilion Lake, B.C., 50° 51’ N, 121° 44’ W.

It is envisioned that CARN will expand in future years with the inclusion of other selected sites.

Partnerships With the CSA

The CSA, formed in 1989, has many partners including international space agencies, industry, post-secondary researchers and educational projects.

One example of the CSA’s partnership with international space agencies is the CSA’s participation in the International Space Station (ISS). These partners include space agencies from Europe, Japan, Russia and the United States. All of these agencies have sent astronauts to the ISS and they each have ground crews and researchers that support each element of the project.

Industrial partners with the CSA include various Canadian technology companies. MD Robotics is one partner best known for developing and building the first Canadarm. MD Robotics is the prime contractor for the Mobile Servicing System, a sophisticated robotic system critical to assembly, maintenance and servicing of the ISS.

Another technology partner is EMS Technologies, Canada, Ltd. They are a leading provider of wireless, satellite and broadband communication products. EMS Technologies hardware has flown on more than 200 spacecraft.

Many partners of the CSA come from academic institutions. Most of these institutions have a space technology research faculty and their students may be granted money from the CSA to conduct their studies. These schools include the University of British Columbia and the University of Toronto.

The CSA takes great pride in their partnership with educational projects. CSA has a Youth Outreach Group which develops and organizes special educational projects for teachers and youth. CSA believes that students in primary and secondary schools are Canada’s next generation of space explorers and researchers. Some of these students are given opportunities to pursue their studies and begin a career in science and technology.

For more information on the CSA and its Youth Outreach Group, access their website at www.space.gc.ca.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Where is DFL located?

Q2. Analogue sites are used to develop what?

Q3. List some CSA international partners.

ANTICIPATED ANSWERS

A1. It is located west of Ottawa, Ont.

A2. Analogue sites can be used to develop and test specific space technology.

A3. Space agencies from Europe, Japan, Russia and the United States.

Teaching Point 2	**Describe CSA Missions**
Time: 15 min	Method: Interactive Lecture

CSA MISSIONS

CSA has participated in many space missions with its partners. Canadian astronauts or Canadian technology has gone into space with agencies from the United States, Russia, Europe and Japan. There are four basic types of CSA missions.

Telecommunications

Canada is the second largest country on earth and finding ways to communicate over great distances is a challenge. Telecommunication satellites are the most economical way to connect Canadian communities. Being able to keep all places in the country connected with advanced telecommunication services assists every Canadian in competing in the global marketplace. These telecommunication satellites assist search and rescue teams, provide ships and aircraft with geopositioning information, and connect instructors with classrooms across the country.

Ask cadets to list instances where they have probably used telecommunication satellites (eg, long distance cell phone conversations, satellite TV, etc).

Canada's most famous telecommunication satellites are the ANIK series, which were launched in the 1980s, 1990s and as recently as 2004.

Earth Observation

Ask cadets to list ideas about what satellites are seeing when they look at the earth.

Canada's earth-observation initiatives enhance our understanding of the planet and its environment. By observing the earth from space, essential information about oceans, ice, land environments and the atmosphere is gathered. Earth-observation satellites collect data that assist scientists monitoring and protecting the environment and managing resources. Some earth-observation satellites gather data that is used by the government to ensure the safety and security of Canadians. Satellite imagery and expertise is also used for global humanitarian efforts. Some examples of earth-observation satellites include:

Radarsat-1. Launched in 1995, Radarsat-1 provides the world with an operational radar satellite system capable of the timely delivery of large amounts of data. Radarsat-1 quickly acquires images of the earth day or night, in all weather conditions and through cloud cover, smoke and haze.

Envisat. Launched in 2002, Envisat collects specific data for the scientific community in order to better understand climatic processes. Data is collected on ocean-atmosphere heat exchange, interaction between the atmosphere and land or ice surfaces and the composition of the atmosphere and its associated chemical processes. This data helps scientists improve climate models.

Cloudsat. Launched in 2006, Cloudsat gathers new data and improve our knowledge of clouds and their effect on climate. Traditional satellites studying the atmosphere can portray the cloud surface accurately, but are limited to a two-dimensional representation of cloud cover. No data has been available on cloud thickness that would help determine the volume and quantity of water, snow, or ice that clouds contain. Cloudsat was developed by National Aeronautics and Space Administration (NASA) in partnership with the CSA.

Radarsat-2. Launched in 2007, Radarsat-2 is Canada's next generation commercial satellite and offers powerful technical advancements. Radarsat-2 has higher resolution cameras and better discrimination of surface types than Radarsat-1. Radarsat-2 will enhance marine surveillance, ice monitoring, disaster management, environmental monitoring, resource management and mapping in Canada and around the world.

Space Exploration

The CSA is involved with exploring space. Canadian astronauts have been on many missions in various space shuttles and continue to investigate the solar system one small step at a time.

Have the cadets name Canadian astronauts.

Canada is renowned for the exceptional instruments in its science satellites. Some of these satellites collect data that will expand our understanding of the origin, formation, structure and evolution of celestial bodies and the universe.

Another example of the CSA exploring space is the use of Canadian technology in various Martian missions. A Canadian weather station was delivered to an arctic region on Mars in 2008. The instruments measure pressure and temperature, and assess local climate patterns as well as dust, clouds and fog in the lower atmosphere.

Canadians are developing integrated communications networks that will be needed to run a successful international mission on Mars. This will enable Canadians to play a key communications role in future manned exploration to the Red Planet and beyond.

The CSA is supporting a study that focuses on the development of biological air filters for maintaining air quality in a closed system. This research may be used for life support systems and will be crucial for any long duration space exploration missions.

Space Medicine

Show slide of Annex N.

Space medicine combines many medical specialties to examine the effects of spaceflight on humans and prevent problems associated with living in a unique, isolated, and extreme environment like space. The CSA has a medical department called the Operational Space Medicine (OSM) Group. It is responsible for the health and safety of Canadian astronauts. Studies have shown that the longer an astronaut remains in space, the more changes will take place in the body. While in space many of these changes tend not to be problematic. It is on their return to earth where the effects of living in space are felt. Some examples of effects may be reduced blood volume, diminished reflexes, loss of bone mass and radiation-induced health problems. OSM group is studying many of these changes to try to overcome them in order to send astronauts on longer flights.

Canadian Space Agency, 2008, Operational Space Medicine Logo. Retrieved April 14, 2008, from http://www.space.gc.ca/asc/eng/astronauts/osm_crest.asp

Figure 15-4-2 OSM Logo

> Ask cadets if they think that space medicine will help people on earth and how that will happen.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why are telecommunication satellites so important to the CSA?

Q2. How can earth-observation satellites assist scientists monitoring and protecting the environment and managing resources?

Q3. Name the CSAs medical group.

ANTICIPATED ANSWERS

A1. Telecommunication satellites are the most economical way to connect Canadian communities.

A2. By collecting data.

A3. OSM Group.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Where are the three CARN sites in Canada?

Q2. What are the four basic types of missions that CSA participates in?

Q3. Where was a Canadian weather station delivered in 2008?

ANTICIPATED ANSWERS

A1. Devon Island, Nunavut, Axel Heiberg Island, Nunavut, and Pavilion Lake, B.C.

A2. Telecommunications, earth observation, space exploration and space medicine.

A3. To an arctic region on Mars.

Distribute Annex O to each cadet.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Even without any domestic launch capabilities of our own, Canadians have made a large impact on space exploration. There are many scientific and technical careers involved in the exploration of space and the CSA and its partners are leading the world in research involving space technologies.

INSTRUCTOR NOTES/REMARKS

This material must be updated each year to reflect CSA progress.

REFERENCES

C3-238 Canadian Space Agency. (2008). *Canadian Space Agency*. Retrieved February 9, 2008, from http://www.space.gc.ca/asc/eng/default.asp.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C340.03 – DISCUSS UNMANNED SPACE EXPLORATION

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of figures located at Annexes P to S.

Photocopy the handout of page 15Q-4 for each cadet.

Photocopy the *Moons* video worksheet located at page 15S-1.

Cue the video *Moons*.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to unmanned space exploration, generate interest, and emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have discussed unmanned space exploration.

IMPORTANCE

It is important for cadets to learn about unmanned space exploration because it will become increasingly significant as developing technologies and resource depletion move humanity's focus beyond Earth.

Teaching Point 1 — **Describe the History of Earth Satellites**

Time: 15 min — Method: Interactive Lecture

DEVELOPMENT OF LAUNCH CAPABILITY

To achieve a low earth orbit an object must accelerate to 8 000 m/s. This was first done in 1957 by two liquid-propellant rockets: the Soviet R-7 and America's Jupiter-C.

In 1898, Konstantin Tsiolkovsky (1857–1935), proposed the idea of space exploration by rocket. In 1903, Tsiolkovsky suggested the use of liquid propellants for rockets in order to achieve greater range. For his ideas, careful research and great vision, Tsiolkovsky has been called the father of modern astronautics.

> **Astronautics.** The science of space travel.

Early in the 20th century, an American, Robert Goddard (1882–1945), conducted practical experiments in rocketry with solid-propellant rockets.

> In 1919, Goddard published a pamphlet, *A Method of Reaching Extreme Altitudes*. This was a mathematical analysis of what is today called the meteorological sounding rocket.

Goddard became convinced that a rocket could be better propelled by liquid fuel than by solid fuel. Fuel and oxygen tanks, turbines and combustion chambers would be needed. Goddard achieved the first successful flight with a liquid-propellant rocket on March 16, 1926. The rocket flew for only two and a half seconds, climbed 12.5 m and landed 56 m away in a cabbage patch. Goddard's gasoline rocket was the forerunner of modern rocketry.

Goddard's experiments in liquid-propellant rockets continued for many years. His rockets became bigger, flew higher and carried more cargo. For his achievements, Robert Goddard has been called the father of modern rocketry.

> Show the cadets Figures 15P-1 and 15P-2. Point out the major components of the liquid-fuelled rocket in Figure 15P-1 corresponding to the parts listed in Figure 15P-2.

SOVIET SPUTNIK MISSION

On October 4, 1957, just 12 years after Goddard's death, the world was stunned by the news of an Earth-orbiting artificial satellite launched by the Soviet Union. Sputnik-1 was the first successful entry in a race for space. Sputnik-1 was a very simple machine. Its mission was to orbit and send repetitive radio signals.

> Show the cadets Figures 15P-3 and 15P-4.

The Soviet scientists and engineers launched Sputnik-1 into a low earth orbit by the use of a modified R-7 two-stage rocket. It was the first entirely successful R-7 flight. The R-7 was developed by the military as a means of delivering warhead payloads across vast distances. Such a vehicle was perceived to be necessary for national defence.

Show the cadets Figures 15P-5 and 15P-6.

UNITED STATES' EXPLORER MISSION

A few months after the launch of Sputnik-1 the United States followed with a satellite of its own, Explorer-1, designed and built by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology. This satellite was launched into orbit by the US Army on January 31, 1958, using a Jupiter-C rocket, which was also developed with warheads in mind. In addition to a radio transmitter, Explorer-1 had a scientific instrumentation package designed and built by Dr. James Van Allen of the State University of Iowa. The instruments were designed to measure the intensity of cosmic radiation in space.

The discovery of the Van Allen Belts by the Explorer satellites was considered to be one of the outstanding discoveries of the International Geophysical Year (1958).

The Jupiter-C launcher was a three-stage rocket. Before the successful launch of Explorer-1, the Jupiter-C was used to loft payloads to various altitudes.

Show the cadets the flight history of Jupiter-C located at Annex P. Point out the work that preceded the successful launch of Explorer-1.

More Jupiter-C history can be found at website http://history.nasa.gov/sputnik/expinfo.html

The three-stage Jupiter-C, with Explorer-1 mounted on top, was over 21 m (71 feet) high.

Show the cadets Figures 15P-7 and 15P-8.

Nine months after the launch of Explorer-1, in October 1958, the United States formally organized its space program by creating the National Aeronautics and Space Administration (NASA). NASA became a civilian agency with the goal of peaceful exploration of space for the benefit of all humankind.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Who has been called the father of modern astronautics?

Q2. Who has been called the father of modern rocketry?

Q3. When was NASA created?

ANTICIPATED ANSWERS

A1. Konstantin Tsiolkovsky has been called the father of modern astronautics.

A2. Robert Goddard has been called the father of modern rocketry.

A3. October 1958.

Teaching Point 2	**Describe the Twin Voyager Spacecraft**
Time: 20 min	Method: Interactive Lecture

THE TWIN VOYAGER SPACECRAFT

The twin spacecraft Voyager-1 and Voyager-2 were launched by NASA in the summer of 1977 from Cape Canaveral, Florida. The Voyagers were to conduct close-up studies of Jupiter, Saturn, Saturn's rings and the larger moons of the two planets. To accomplish their two-planet mission, the spacecraft were built to last five years. As the mission went on, and with the successful achievement of all its objectives, the additional flybys of the two outermost giant planets, Uranus and Neptune, also proved possible.

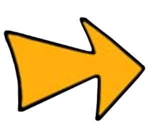
The Planetary Voyage

As the spacecraft flew across the solar system their two-planet mission became four. Their five-year lifetimes stretched to 12 and then to 30 years.

The Voyager mission was designed to take advantage of a rare geometric arrangement of the outer planets in the late 1970s and the 1980s, which allowed for a four-planet tour with minimum propellant and time.

Eventually, Voyager-1 and Voyager-2 would explore all four outer planets of the solar system, 48 of their moons and the unique systems of rings and magnetic fields those planets possess. Had the Voyager mission ended after the Jupiter and Saturn flybys, it still would have provided the material to rewrite astronomy textbooks. Having doubled their itineraries, the Voyagers returned information over the years that has revolutionized the science of planetary astronomy, helping to resolve key questions while raising new ones about the origin and evolution of the planets in our solar system.

Show the cadets Figure 15Q-1.



The layout of Jupiter, Saturn, Uranus and Neptune shown in Figure 15Q-1, which occurs about every 175 years, allows a spacecraft to swing from one planet to the next without the need for large on-board propulsion systems. The flyby of each planet bends the spacecraft's flight path and increases its velocity enough to send it to the next destination. By using this "gravity assist" technique, first demonstrated with NASA's Mariner-10 Venus/Mercury mission in 1973–74, the flight time to Neptune was reduced from 30 years to 12.

Show the cadets Figure 15Q-2.

The original Voyager mission to Jupiter and Saturn sent Voyager-1 to Jupiter on March 5, 1979 and Saturn on November 12, 1980, followed by Voyager-2 to Jupiter on July 9, 1979, and Saturn on August 25, 1981. The two spacecraft's paths differed in that:

- Voyager-1's trajectory was designed to send the spacecraft close to Saturn's large moon, Titan, and behind Saturn's rings.
- Voyager-2 was aimed to fly by Saturn at a point that would automatically send the spacecraft in the direction of Uranus.

After Voyager-2's successful Saturn encounter, it was shown that the spacecraft would likely be able to fly to Uranus with all instruments operating. Subsequently, NASA also authorized the Neptune leg of the mission, which was renamed the Voyager Neptune Interstellar Mission. Voyager-2 encountered Uranus on January 24, 1986, returning detailed photos and other data about the planet, its moons, magnetic field and dark rings.

Voyager-1 continues outward, conducting studies in space beyond the outer planets. Eventually, its instruments may be the first of any spacecraft to sense the heliopause.

The heliopause is the boundary between the end of the Sun's magnetic influence and the beginning of interstellar space.

After Voyager-2's closest approach to Neptune on August 25, 1989, the spacecraft flew a course taking it into interstellar space. Reflecting the Voyagers' new destinations, the project is now known as the Voyager Interstellar Mission.

The Voyager Interstellar Mission (VIM)

The heliopause is the boundary between the solar and the interstellar winds. This is a definitive and unambiguous frontier that the Voyagers will approach and pass through.

Show the cadets Figure 15Q-3.

Voyager-1 crossed the solar wind termination shock in December 2004 and entered into the heliosheath, the turbulent region leading up to the heliopause. The Voyagers should cross the heliopause 10 to 20 years after reaching the termination shock. In 2007, Voyager-2 was observing preshock phenomena, indicating that it was close to the termination shock.

The solar wind termination shock is where the 1 600 000 km/h solar wind slows to about 400 000 km/h on contact with the interstellar winds.

When the Voyagers cross the heliopause, hopefully while the spacecraft are still able to send science data to Earth, they will be in interstellar space. Once Voyager is in interstellar space, it will be immersed in matter that came from explosions of nearby stars.

Show the cadets Figure 15Q-4.

Both spacecraft will continue to study ultraviolet sources among the stars, and the fields and particles instruments aboard the Voyagers will continue to explore the boundary between the sun's influence and interstellar space. The Voyagers are expected to return valuable data for at least another decade. Communications will be maintained until the Voyagers' power sources can no longer supply enough electrical energy to power critical subsystems.

The Voyagers have enough electrical power and thruster fuel to operate until at least 2020. By that time, Voyager-1 will be 19.9 billion km (12.4 billion miles) from the sun and Voyager 2 will be 16.9 billion km (10.5 billion miles) away. The Voyagers are destined – perhaps eternally – to wander the Milky Way.

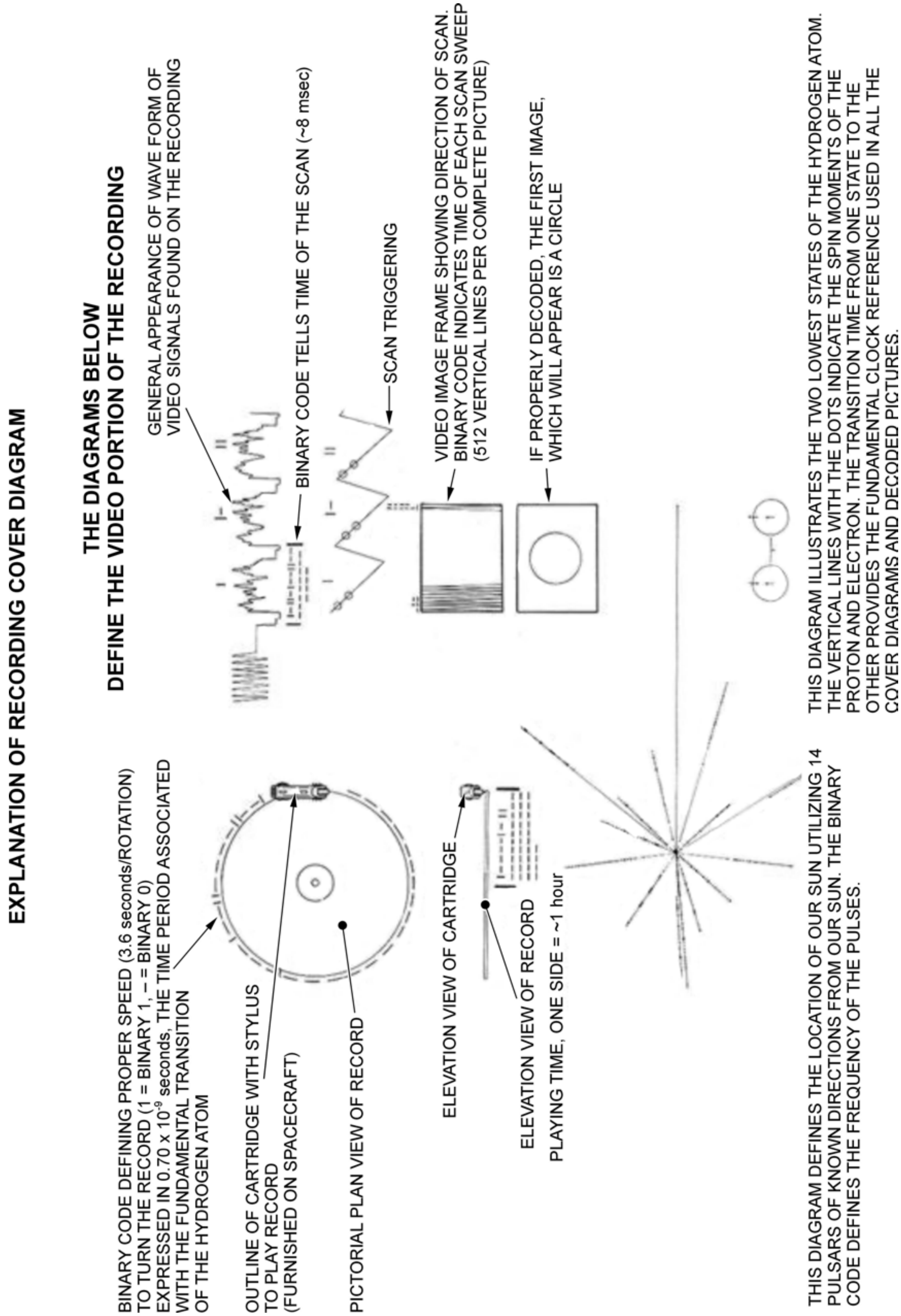
For current distances of the Voyagers, check mission weekly reports at NASA website http://voyager.jpl.nasa.gov/mission/weekly-reports/index.htm.

The Golden Record

Show the cadets Figure 15Q-5.

NASA placed a message on board Voyager-1 and -2 intended to communicate a story of our world to any extraterrestrials that find the spacecraft. A phonograph record – a 30 cm gold-plated copper disk containing sounds and images selected to portray the diversity of life and culture on Earth, carries the Voyager message. Instructions, in symbolic language, explain the origin of the spacecraft and indicate how the record is to be played. Once the Voyager spacecraft left the solar system (by 1990, both were already beyond the orbit of Pluto), they were in empty space with only the solar wind for company. It will be 40 000 years before they make a close approach to any other planetary system.

Explain symbols of the recording cover diagram as shown in Figure 15-5-1. This is information that extraterrestrials would need to understand the golden record.



"Voyager: The Intersteller Mission", by NASA, 2003, The Golden Record. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/spacecraft/goldenrec1.html

Figure 15-5-1 Key to the Golden Record

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. In what year were the two Voyager spacecraft launched?

Q2. Which Voyager spacecraft visited Saturn?

Q3. For whom was the golden record prepared?

ANTICIPATED ANSWERS

A1. 1977.

A2. Both of them: Voyager-1 in November 1980 and Voyager-2 in August 1981.

A3. Extraterrestrials.

Teaching Point 3	**Describe Unmanned Space Exploration**
Time: 20 min	Method: Interactive Lecture

MISSIONS TO PLANETS WITHIN THE SOLAR SYSTEM

Launched on March 2, 1972, Pioneer-10 was the first spacecraft to travel through the asteroid belt, make direct observations and obtain close-up images of Jupiter. During its Jupiter encounter, Pioneer-10 imaged the planet and its moons and took measurements of Jupiter's magnetic field, atmosphere and interior. These measurements of the environment near Jupiter were crucial in designing later spacecraft.

Pioneer-10 ended its successful mission on March 31,1997. Pioneer-10's weak signal continued to be tracked by the NASA's Deep Space Network as part of an advanced concept study of communication technology in support of NASA's future interstellar probe mission. The power source on Pioneer-10 finally failed in 2003. Pioneer-10 will continue into interstellar space, heading for the red star Aldebaran, which forms the eye of Taurus (The Bull). It will take Pioneer-10 over 2 million years to reach Aldebaran.

THE PHOENIX MARS MISSION

Show the cadets Figure 15R-1.

The Phoenix Mars Lander is the first spacecraft designed to visit a polar region of Mars at ground level. Its mission is to explore the soil and atmosphere of the polar regions of Mars to determine if the environment could be hospitable to life.

Show the cadets Figures 15R-2, 15R-3 and 15R-4.

Phoenix was launched from the Kennedy Space Center on August 3, 2007, to land near the northern polar cap of Mars on May 25, 2008, in an area known as Vastitas Borealis. At 125 km (78 miles) above the surface, Phoenix entered the thin Martian atmosphere. It slowed itself down by using atmospheric friction. A heat shield protected the lander from the extreme temperatures generated during entry.

Show the cadets Figures 15R-5, 15R-6 and 15R-7.

Antennas located on the back of the shell which encases the lander are used to communicate with one of three spacecraft currently orbiting Mars. These orbiters relay signals and landing info to Earth.

Mission Characteristics

In the continuing search for water on Mars, the polar regions are attractive because water ice has been found there. The Phoenix landing site was chosen farther north than previous missions, at a latitude equivalent to that of northern Canada, between 65 and 72 degrees north latitude.

To study Martian atmospheric processes, Phoenix was designed to scan the atmosphere up to 20 km (12.4 miles) in altitude, to obtain data about the formation, duration and movement of clouds, fog, and dust plumes. This capability includes temperature and pressure sensors.

Show the cadets Figure 15R-1. Point out the robotic arm.

Phoenix is equipped with a 2.35 m robotic arm to dig for clues about the history of water on Mars. Although the Phoenix mission will not be capable of moving about on Mars, the Phoenix Lander is designed to investigate by scooping up samples for analysis by its on-board chemistry set. This analysis includes whether the soil is salty, alkaline, and/or oxidizing, and then tests for complex organic molecules necessary for life.

Why would we search for water? Water is a key clue to the most critical scientific questions about Mars. Water is a precursor for life as we know it, a potential resource for human explorers and a major agent of climate and geology.

Canada's Lidar Weather Station

Canada's contribution to the Phoenix mission was a meteorological station that records the daily weather of the Martian northern plains using temperature, wind and pressure sensors, as well as a light detection and ranging (lidar) instrument. The weather station helps improve models of the Martian climate and predict future weather processes, paving the way for future exploration missions. Resembling a brilliant green laser, the lidar probes what is known as the "boundary layer" of the Martian atmosphere (the turbulent layer of the atmosphere about 7–10 km above the surface) and provides information about the structure, composition and optical properties of clouds, fog and dust in the lower atmosphere (up to 20 km above the landing site).

THE CASSINI-HUYGENS MISSION TO SATURN

Four NASA spacecraft have been sent to explore Saturn. Pioneer-11 was first to fly past Saturn in 1979. Voyager-1 flew past a year later, followed by its twin, Voyager-2, in 1981. The fourth spacecraft to visit Saturn was Cassini-Huygens.

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have cadets learn an astrophysicist's perspective of the Cassini-Huygens mission.

RESOURCES

- Five-minute video *Moons* (Reference C3-251),
- Laptop computer,
- Multimedia projector, and
- Projection screen.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute the *Moons* video worksheet located at Annex S.
2. Have the cadets read all the questions before the video is started.
3. Have the cadets fill out the worksheet as they watch *Moons*.
4. Correct the answers on the worksheet using the answer key located at Annex T.

SAFETY

N/A.

Mission Summary

Cassini is the fourth spacecraft to explore Saturn, but the first to explore the Saturnian system of rings and moons from orbit. Cassini carried the Huygens probe to explore the atmosphere of Titan, one of Saturn's more than 60 moons.

Cassini-Huygens' journey to Saturn began on October 15, 1997. The spacecraft was sent to Venus for the first of four planetary gravity assists designed to boost Cassini-Huygens toward Saturn. The spacecraft entered orbit around Saturn on June 30, 2004 and immediately began sending back intriguing images and data.

Show the cadets Figure 15S-1. Point out the Saturnian moons in Figure 15S-1, with particular attention to Titan near the right side of the picture.

Saturn has the most extensive and complex ring system in our solar system. It is made up of billions of particles of ice and rock, ranging in size from grains of sugar to houses. The rings travel at varying speeds. There are hundreds of individual rings, which are believed pieces of shattered moons, comets and asteroids. Each of the billions of ring particles orbit the planet on their own path.

Huygens' Descent to Titan

The Huygens probe was released from the Cassini probe and dove into the thick atmosphere of Titan in January 2005. The sophisticated instruments on both spacecraft provided scientists with data and images of this mysterious region of our solar system.

Show the cadets Figures 15S-2 and 15S-3.

It was discovered that Saturn's orange moon, Titan, has hundreds of times more liquid hydrocarbons than all the known oil and natural gas reserves on Earth. The hydrocarbons rain from the sky, collecting in vast deposits that form lakes and dunes. Individual lakes have more oil than the entire Earth.

Cassini Orbiter Flybys

Cassini-Huygens looped around the Sun twice. On the first orbit it flew close behind Venus in its solar orbit, where it received a gravity assist. The next orbit provided two gravity assists from a second flyby of Venus in June 1999 and of Earth in August 1999. With these three gravity assist boosts, Cassini-Huygens had enough orbital momentum to reach the outer Solar System. One last gravity assist manoeuvre from Jupiter on December 30, 2000 gave Cassini-Huygens the final thrust of energy it needed to reach Saturn. The mission arrived at Saturn in July 2004.

Cassini orbited Saturn for four years, sending back data to Earth. Cassini completed 75 orbits of the ringed planet, 44 close flybys of the mysterious moon Titan, and numerous flybys of Saturn's other icy moons. During a flyby of Saturn's moon Enceladus, it was discovered that there is so much liquid water under Enceladus' frozen surface that it erupts at 400 m per second in geysers that rise into space. Flying at 15 km per second, Cassini passed through the watery plumes at an altitude of 200 km.

Show the cadets Figures 15S-4 and 15S-5.

Whether these and other facts about the Saturnian system turn out to be useful to humans remains to be seen; the European Space Agency states that there is more work left to be done for future scientists.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is the mission of the Phoenix lander?

Q2. Will the Phoenix mission be capable of moving about on Mars?

Q3. Why would we search for water on Mars, Titan or Enceladus?

ANTICIPATED ANSWERS

A1. To explore the soil and atmosphere of the polar regions of Mars to determine if the environment could be hospitable to life.

A2. No.

A3. Water is a precursor for life as we know it, a potential resource for human explorers and a major agent of climate and geology.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What year was Sputnik-1 launched into space?

Q2. What outstanding discovery of the International Geophysical Year did Explorer provide?

Q3. What type of assist did Cassini-Huygens use four times to accelerate?

ANTICIPATED ANSWERS

A1. 1957.

A2. The Van Allen Belts.

A3. Gravity assist.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The half-century from the launch of Sputnik in late 1957 to Huygen's Titan descent in early 2005 saw remarkable accomplishments in space exploration. These were possible due to technological advances and a tenacious refusal to accept defeat despite setbacks.

INSTRUCTOR NOTES/REMARKS

TP 2 must be updated each year to reflect current events.

Model kits of spacecraft may be purchased online as training aids.

REFERENCES

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C3-240 NASA. (2007). *Sputnik: The Fiftieth Anniversary*. Retrieved February 9, 2008 from http://history.nasa.gov/sputnik/.

C3-241 European Space Agency. (2008). *Cassini-Huygens Homepage*. Retrieved February 9, 2008, from http://huygens.esa.int/science-e/www/area/index.cfm?fareaid=12.

C3-242 NASA. (2008). *NASA Cassini-Huygens Homepage*. Retrieved February 9, 2008, from http://saturn.jpl.nasa.gov/home/index.cfm.

C3-251 European Space Agency. (2008). ESA: Multimedia Gallery Videos. *Moons*. Retrieved April 5, 2008, from http://www.esa.int/esa-mmg/mmg.pl?mission=Cassini-Huygens&type=V.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO C340.04 – DESCRIBE ELEMENTS OF THE NIGHT SKY

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Figures 15U-1 to 15U-4.

Visit the National Research Council (NRC) website (Reference C3-221) and retrieve a planisphere star chart, make one copy for each cadet. Prepare one planisphere for use in TP1.

Photocopy Annex V for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to elements of the night sky, to generate interest and emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described elements of the night sky.

IMPORTANCE

It is important for cadets to be able to describe the elements of the night sky so they may apply the knowledge acquired while viewing the night sky or during online stargazing. These activities may generate interest in astronomy.

Teaching Point 1	**Describe Fixed Elements of the Night Sky**
Time: 15 min	Method: Interactive Lecture

VISIBLE STARS

Stars are large spherical bodies, many times the size of Earth, composed of hydrogen and heavy elements that are compressed and heated by the pressure of gravitation. This heat and pressure causes nuclear reactions, which make the star visible. A star's gravity then compresses the ongoing nuclear explosion, which prevents the star from disintegrating.

Although the smallest stars are many times larger than Earth, they are so far from Earth that, except for the Sun, they appear as mere luminous points. Their great distance also makes them appear fixed in the sky even though each star is actually moving in a vast orbit around the centre of the galaxy.

> Star brightness is called magnitude. The lower the magnitude, the brighter the object. The brightest star visible in the night sky is Sirius, classified as a magnitude of −1.

Presently, the scale of visibility ranges from a faint magnitude 30, which are objects that can be detected by the Hubble Space Telescope, to a bright magnitude -27 which corresponds with the Sun. On this scale, the Sun is 16 trillion times brighter than a magnitude 6 star.

Ancient peoples imagined patterns using individual stars. One of the most useful and easily identifiable patterns uses seven bright stars: Alkaid, Mizar, Alioth, Megrez, Phekda, Merak and Dubhe. Together these stars form the Big Dipper, which is part of the constellation Ursa Major.

> Show the cadets Figure 15U-1.

In the mid-northern hemisphere, the Big Dipper can be seen at any time of the year and at any time of night from everywhere in Canada. The Big Dipper is the most prominent stellar configuration in the night sky. It can easily be identified by untrained observers, making it the ideal reference point for finding other elements of the night sky.

The Big Dipper swings around the sky as the Earth rotates through day and night, so it appears in different orientations. Every 24 hours it circles the North Star (Polaris).

> Show the cadets Figure 15U-2.

> Show the cadets Figure 15U-3.

CONSTELLATIONS

> Constellations are patterns of stars partitioned and named long ago by our ancestors.

Of the 88 constellations recognized by the International Astronomical Union approximately one quarter of these are in the southern sky and not visible from mid-northern latitudes. About half of the remaining constellations are faint and hard to distinguish.

> Hand out Annex U to each cadet.

Many of the visible and well-known constellations are shown in this handout. All constellations, including Ursa Major (the Big Dipper), circle the sky every 24 hours, with Polaris – the North Star – at the centre of the circle.

A planisphere may be used to locate constellations by holding it so the time of year is at the top. This represents the orientation of the constellations as seen at midnight. Remember that the constellations swing around Polaris once every 24 hours and also once every 12 months. A planisphere is only correct at midnight. At midnight, the stars at the top of the planisphere will be in front of an observer facing north and the stars at the bottom of the planisphere will be in front of an observer facing south.

> Distribute the two parts of a planisphere retrieved from the NRC website http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf to each cadet. Demonstrate how to assemble a planisphere using a prepared copy.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets use the Big Dipper to locate other elements of the night sky.

RESOURCES

Handout of Figure 15U-4 showing the seasonal locations of the constellations in the night sky.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets rotate their handout so that today's date is located at the top (midnight tonight).
2. Have the cadets find the Big Dipper in Ursa Major.
3. When all cadets have found Ursa Major, have them find Polaris (at centre).

4. When all cadets have found Polaris, have them find the star Sirius in the constellation Canis Major (about July 5 position near the rim).
5. Have the cadets locate their own sign of the Zodiac (hint: midnight on their birthday).

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in this activity will serve as the confirmation of this TP.

Teaching Point 2	**Describe Moving Objects of the Night Sky**
Time: 10 min	Method: Interactive Lecture

SATELLITES

There are many moving lights in the sky, including aircraft and satellites. A satellite is any celestial body orbiting the earth, but most satellites that are large enough to be seen from the surface of the Earth are man-made. Aircraft have a flashing white light to identify their position as well as red and green wing tip lights, while man-made satellites orbiting the Earth are star-like and do not twinkle. They appear to shine with a steady white glow due to sunlight reflecting off the metal surfaces. Satellites are more prominent during the spring and summer when the Earth's shadow is lower in the sky. Sightings are greater just after dark and drop off close to midnight. Satellites move in a linear fashion at a regular pace, though most observers tend to view their motion as wavy or jerky. Some of these orbiting objects are inhabited by people.

To find the International Space Station (ISS) or any space shuttle, go to NASA's website http://spaceflight.nasa.gov/realdata/sightings/. Select your location from the menu and find out where to look in the sky.

Show the cadets Figure 15V-1.

The times that the spacecraft will be visible are listed. The NASA website uses the following format:

THE FOLLOWING ISS SIGHTINGS ARE POSSIBLE FROM FRI FEB 08 TO WED FEB 20

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
ISS	Fri Feb 08/07:04 PM	2	51	20 above WNW	51 above N

HUMANSPACEFLIGHT: Sighting opportunities by NASA, 2003. Retrieved February 8, 2008, from http://spaceflight.nasa.gov/realdata/sightings/

Figure 15-6-1 Building the ISS

The first column lists the spacecraft; the second column gives the date and time of the viewing. The third column shows how long the viewing will be possible. The fourth column shows the maximum height above the horizon that the spacecraft will be seen. The fifth column shows the direction in which the spacecraft will first appear and the final column shows the direction in which it will be last visible.

Hand out Annex V to each cadet.

PLANETS

The easiest way to observe planets is to know when and where to expect them. This information is readily available on astronomical calendars, observer handbooks and most astronomy resource books or can be easily found on the internet.

Planet	Magnitude	Description
Mercury	0	Mercury is only visible for a few weeks each year because of its orbit. It is yellow and can be seen just after sunset or just before sunrise.
Venus	−4	Venus is visible in the early evening or the early morning for several months each year. It cannot be seen more than four hours after sunset or before sunrise. Venus appears white and is very bright.
Mars	−3 to 1	Because the distance from Earth varies, so does the apparent brightness of Mars. It appears to be a rusty colour due to the light reflecting off the red planet. Mars travels across half the sky in one year, making it interesting to track.
Jupiter	−2 to −3	Jupiter is brighter than most stars but is still not as bright as Venus. Jupiter appears creamy white and can occasionally be seen all night long.
Saturn	0	Saturn is often mistaken for a star since its brightness matches that of some of the brighter stars. Saturn appears as a pale yellow orb.
Uranus	6	Uranus has a distinct blue-green hue.
Neptune	8	Neptune appears to be approximately the same size of Uranus, though it has a deeper blue hue. They can be differentiated by their position in the sky.

Five planets are visible to the naked eye: Mercury, Venus, Mars, Jupiter and Saturn. Uranus and Neptune must be viewed through binoculars or a telescope.

Planets, like satellites, do not twinkle. Remember, the higher the brightness magnitude, the dimmer the planet – just like stars.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is a satellite?

Q2. When is the planet Venus visible?

Q3. How many planets are visible to the naked eye?

ANTICIPATED ANSWERS

A1. A satellite is any celestial body orbiting the earth.

A2. Venus is visible in the early-evening or the early-morning.

A3. Five.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What makes stars visible?

Q2. What are constellations?

Q3. What is the easiest way to observe planets?

ANTICIPATED ANSWERS

A1. Sustained nuclear reactions caused by the pressure and heat of gravity.

A2. Constellations are patterns of stars partitioned and named long ago by our ancestors.

A3. The easiest way to observe planets is to know when and where to expect them.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowledge about elements of the night sky is useful when viewing the night sky or during online stargazing. Recognizing these elements will enhance the enjoyment of amateur astronomy.

INSTRUCTOR NOTES/REMARKS

This EO may be conducted with EO C390.09 (Identify Elements of the Night Sky, Chapter 18, Section 14).

REFERENCES

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C3-221 National Research Council of Canada. (2007). *Explore the Night Sky*. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/eng/education/astronomy/constellations/html.html.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 7

EO C340.05 – SIMULATE LIFE IN SPACE

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for TP 1 as it is an interactive way to allow cadets to experience some aspects of life in space. This activity contributes to the development of knowledge of life in space in a fun and challenging setting.

An in-class activity was chosen for TPs 2 and 3 as it is an interactive way to provoke thought and simulate some of the challenges of living in space.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson, the cadet shall have experienced simulated aspects of life in space.

IMPORTANCE

It is important for cadets to realize the challenges of living in a space environment in order to understand the Canadian Space Program. A space environment requires many considerations for the human body to exist comfortably including eating, washing, and working.

Teaching Point 1 — **Explain the Medical Effects of Weightlessness**

Time: 35 min — Method: Practical Activity

MEDICAL EFFECTS OF WEIGHTLESSNESS

On Earth, gravity pulls everything down. Thus, the lower torso and legs carry the weight of the body. In space, because of zero gravity, astronauts float and the legs are not used to support the body.

In space, the lower back and leg muscles are affected the same way as muscles that have been in a cast for a while. Muscles become flabby and lose tone and mass and the astronaut experiences “bird leg syndrome”. “Bird leg syndrome”, called muscular atrophy, makes the limbs thinner. The bones also become weaker because of the loss of minerals like calcium, potassium, and sodium.

The weightlessness of space also affects the cardiovascular system. On Earth, because of gravity, blood naturally pools in the legs, forcing the heart to pump against gravity to supply enough blood to the brain. In space, the heart acts the same as it would on Earth. However, because there is no gravity, the blood rushes to the torso and head. In space the astronaut experiences “puffy face syndrome”. The veins in the neck and face stand out more, and the eyes become red and swollen.

Astronauts try to lessen “puffy face” and “bird leg” syndromes by exercising as often as possible. Astronauts must exercise at least two hours every day to keep their muscles healthy. Astronauts use exercise machines to work both the lower and the upper body muscles. They use a series of straps and restraints to remain secure against the exercise equipment.

ACTIVITY

Time: 25 min

OBJECTIVE

The objective of this activity is to have the cadets simulate exercises that astronauts must perform to maintain bone density and muscle mass when living in a space environment.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets stretch for two minutes.
2. Have the cadets alternate between running on the spot and jumping jacks for eight minutes.
3. Have the cadets stretch for two minutes.
4. Have the cadets brainstorm and design exercises that will allow astronauts to keep a set of muscle groups fit in a weightless environment.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What do astronauts use to exercise?

Q2. What happens to an astronaut in zero gravity?

Q3. How is the cardiovascular system affected in space?

ANTICIPATED ANSWERS

A1. Astronauts use exercise machines to work both the lower and the upper body muscles.

A2. Astronauts float and their legs are not used to support the body.

A3. Due to the lack of gravity the blood rushes to the torso and head.

Teaching Point 2	**Explain the Challenges of Living in Space**
Time: 30 min	Method: In-Class Activity

CHALLENGES OF LIVING IN SPACE

Washing Hands With Rinseless Soap

In space, astronauts cannot wash with water, as water is very difficult to contain in a zero gravity environment. If water drops were left floating in the space vehicle, they could cause serious problems with the equipment. Astronauts use rinseless soap during space missions to clean themselves. Rinseless soap applies easily, the same way as regular soap or hair shampoo, and does not require water to be effective. The alcohol in the rinseless soap kills bacteria.

Sampling Space Food

There are many factors to consider when astronauts live in a space environment and one of these is food. The preparation of the food itself requires special considerations. Storage and transport require the product to be lightweight and have a long shelf life without refrigeration. Weight is critical during a space mission due to transport cost and efficiency. Some methods of food preparation and storage include freeze-drying, retort packing at 125 degrees Celsius, vacuum packing, and dehydrating. Preservation of taste and texture can be difficult with some of these methods. An example of space food is freeze-dried ice cream or strawberries.

Have the cadets feel how light the package of space freeze-dried ice cream or strawberries are by allowing them to hold the wrapped product.

Some dehydrated foods require rehydration, such as macaroni and cheese or spaghetti. The water is kept contained during the transfer from reservoir to food package to avoid loss. An oven is provided in the space shuttle and the space station to heat foods to the proper temperature.

Condiments such as ketchup, mustard, and mayonnaise are provided. Salt and pepper are available, but only in a liquid form, because astronauts cannot sprinkle salt and pepper on their food. The salt and pepper would simply float away. The particles could clog air vents, contaminate equipment or enter an astronaut's eyes, mouth, or nose.

Astronauts eat three meals a day – breakfast, lunch and dinner. Nutritionists ensure the food astronauts eat provides a balanced supply of vitamins and minerals. Caloric requirements differ for different astronauts. For instance, a small astronaut weighing approximately 54 kg would require only about 1900 calories a day, while a large astronaut weighing 100 kg would require about 3200 calories a day.

There are many foods an astronaut can choose from, such as:

- fruits,
- nuts,
- peanut butter,
- chicken,
- beef,
- seafood,
- candy, and
- brownies.

Possible drinks include:

- coffee,
- tea,
- orange juice,
- fruit punches, and
- lemonade.

As on earth, space food comes in packages that must be disposed of. Astronauts must dispose of the packages in a trash compactor inside the space shuttle when they are finished eating. Some packaging actually prevents food from floating away. Food packages are designed to be flexible, easy to use and to maximize space when being stowed or disposed of.

ACTIVITY

Time: 20 min

OBJECTIVE

The objective of this activity is to have the cadets simulate how astronauts wash and eat in space.

RESOURCES

- Freeze-dried strawberries,
- Other freeze-dried fruit as available,
- Freeze-dried ice cream, and
- Rinseless soap.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of three.
2. Distribute rinseless soap to each group of cadets.
3. Have the cadets wash their hands.
4. Distribute a package of freeze-dried ice cream and strawberries to each group of cadets.
5. Have the cadets taste the freeze-dried ice cream and strawberries.

SAFETY

- Warn cadets and staff that are lactose intolerant that the ice cream contains milk products.
- Warn cadets and staff with an allergy to strawberries that the freeze-dried strawberries are real strawberries.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why are dehydrated foods used by astronauts for some of their meals?

Q2. What do astronauts use to wash their hands and hair?

Q3. Why would salt and pepper be a problem in a space environment?

ANTICIPATED ANSWERS

A1. Dehydrating food is used to reduces weight and increases shelf life.

A2. They use rinseless soap and shampoo.

A3. The grains of salt or pepper could clog air vents, contaminate equipment or enter an astronaut's eyes, mouth, or nose.

Teaching Point 3	**Have the Cadets Simulate Working in Space by Installing a Nut on a Bolt Wearing Two Pairs of Thick Work Gloves**
Time: 20 min	Method: In-Class Activity

Working in zero gravity is a challenge. Often, the only resistance felt by astronauts is the spacesuit itself. In weightless space, any movement in any direction encounters Newton's Third Law and causes an equal force in the opposite direction. For example, when turning a bolt, the force applied in any direction results in an equal force in the opposite direction. Astronauts must attach themselves to, or hold on to, any object to work on it so that they can control the opposite reactive effect.

Newton's Third Law: for every action there is an equal and opposite reaction.

Spacesuits introduce constraints on movement because they are bulky and, being pressurized, they are stiff. The pressure in an astronaut's spacesuit is 4.3 pounds per square inch (psi). That is less than one-third of the pressure of Earth's atmosphere at sea level (14.7 psi). The air pressure outside an airplane flying at 35 000 feet is near 4.3 psi. It is also about the same as the extra pressure that keeps a football inflated, and like a football, the suit is hard to bend.

Pressure is especially noticeable when wearing gloves. Spacesuit gloves are designed so that there is little pressure when the hand is at rest, but resistance can be felt when the hand is open. This makes manipulating objects difficult when working in the spacesuit.

Tools used in a space environment must be two to three times larger than normal because the gloves are bulky and make manipulating the regular-sized tools difficult. In space, it becomes difficult to do tasks that would be easy to do on Earth. Small details like threading nuts onto bolts require more effort and, worse, dropped objects can be hazardous as they continuously float around and may damage other instruments, controls, or surfaces.

ACTIVITY

Time: 15 min

OBJECTIVE

The objective of this activity is to have the cadets simulate what astronauts do to manipulate objects in a space environment.

RESOURCES

- Work gloves, and
- 1/2-inch National Coarse nuts and bolts.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of six.
2. Give each group of cadets two pair of gloves and a bolt and a nut.
3. Have one cadet from each group put on two pairs of work gloves and try to pick up the bolt.
4. Put the nut in the cadets' gloved hand and ask the cadet to put the nut on the bolt.
5. Have each cadet perform Steps 3. and 4.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are some of the constraints of the spacesuit?

Q2. What law of motion applies to moving in space?

Q3. Why are tools used in space two to three times larger than tools used on Earth?

ANTICIPATED ANSWERS

A1. A spacesuit is suit is stiff because it is pressurized and it is bulky.

A2. Newton's Third Law of motion: for every action there is an equal and opposite reaction.

A3. Spacesuit gloves are stiff and bulky, which restricts the ability to manipulate smaller objects.

END OF LESSON CONFIRMATION

The cadets' participation in all the activities will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Astronauts living in a space environment face many challenges, even in simple things such as washing and eating. With careful planning and consideration of these challenges, life in space can be comfortable and fun.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 8

EO C340.06 – LAUNCH A WATER ROCKET

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Construct a launching pad as shown at Annex W.

Prepare a string guidance system as shown at Annex X.

Photocopy Annex Y for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for TPs 1 and 2 as it is an interactive way to introduce cadets to water rockets. This activity contributes to the understanding of rocketry in a fun and challenging setting.

A group discussion was chosen for TP 3 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions, and feelings about water rockets.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet, as a member of a group, shall have constructed and launched a water rocket.

IMPORTANCE

It is important for cadets to launch a water rocket so that they can experience the difference that a higher exhaust pressure makes in rocket flight, compared with using an effervescing tablet for power as was done in EO M140.01 (Build and Launch a Model Rocket, A-CR-CCP-801/PF-001, Chapter 13, Section 1).

Teaching Point 1 — **Supervise the Cadets constructing a Water Rocket**

Time: 20 min — Method: Practical Activity

Supervise the cadets as they construct a water rocket, to include:

1. fuselage,
2. stabilizing fins,
3. nose cone,
4. centre of gravity trimming, and
5. decorations.

ACTIVITY

OBJECTIVE

The object of this activity is to have the cadets construct a water rocket, which will fly under its own self-contained power.

RESOURCES

- One-litre plastic pop bottles with caps removed,
- Construction paper,
- Scissors,
- Glue,
- Putty or modelling clay,
- Packing tape, and
- Instructions for constructing a water rocket.

ACTIVITY LAYOUT

Cadets shall be organized in groups of no more than four, working together at one table, with all the resources required to build a water rocket.

ACTIVITY INSTRUCTIONS

1. Give each cadet a copy of Annex Y.
2. Explain the instructions located at Annex Y.
3. Each group will construct a water rocket in the manner depicted in Figure 15Y-1.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 2	**Supervise the Cadets Launching a Water Rocket**
Time: 50 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have each group of cadets launch a water rocket constructed in TP 1 and experimentally determine its flight characteristics.

RESOURCES

- Water rockets constructed in TP 1,
- Air pump with pressure gauge,
- Launch pad,
- Drinking straws,
- Packing tape,
- 3-mm string, and
- Safety glasses.

ACTIVITY LAYOUT

1. The CO shall select an outdoor area with controlled access for this training, at least 10 m by 20 m.
2. The string guidance system shall be secured to a suitable tower and the launch pad.
3. Place the launch pad in the centre of the launch area.
4. Anchor the launch pad securely in place.

ACTIVITY INSTRUCTIONS

1. Have one group of cadets place their water rocket, quarter filled with water, on the launch pad.
2. Ensure other cadets stand back 5 m; if necessary, rope off the launch site.
3. After the water rocket is attached to the launcher, have one cadet pump air into the rocket to more than 344 kPa (50 psi) pressure.
4. When pressurization is complete, all cadets shall stand behind the launch control officer.
5. Before conducting the countdown, ensure that the guidance system area is clear.
6. Have one cadet launch the water rocket by pulling the launch release cord.

7. Repeat this process for each group.
8. When all water rockets have been launched, have the cadets retrieve their water rockets.

SAFETY

- Safety glasses must be worn by all cadets and staff during this activity.
- In case of a misfire, the instructor shall ensure that no one approaches the launch pad until the instructor has removed the misfired water rocket.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in launching a water rocket will serve as the confirmation of this TP.

Teaching Point 3	**Conduct an Activity Debriefing**
Time: 10 min	Method: Group Discussion

BACKGROUND KNOWLEDGE

The point of the group discussion is to draw the following information from the group using the tips for answering/facilitating discussion and the suggested questions provided.

Characteristics of the Successful Launches

The forces acting upon the cadets' water rockets in flight are those acting upon any aircraft:

- gravity,
- thrust,
- drag, and
- lift, which is minimal in this case unless the water rocket is provided with an airfoil.

Drag and lift are atmospheric forces that result from air coming in contact with the body of the water rocket.

There are many propellants used in rocketry, resulting in a variety of exhaust pressures and velocities. The greater the exhaust pressure, the higher the exhaust velocity. The rocket's power is increased as exhaust velocity of the propellant increases.

When launching a water rocket, there is a difference that a higher exhaust pressure makes in rocket flight, compared with using an effervescing tablet for power as was done in EO M140.01 (Build and Launch a Model Rocket, A-CR-CCP-801/PF-001, Chapter 13, Section 1). Since the water rocket launched in this lesson is heavier when filled with propellant, it may start slower, but the greater mass of the propellant may allow it to attain even greater speeds and distances.

Rocket Behaviour Under Newton's Laws

First Law. Every object in motion tends to remain in motion until an external force is applied to it.

Second Law. The direction of acceleration is the same as the direction of the force. Therefore, since the reactive force pushes upwards against the bottle as the water is directed downwards, the force acting upon the water rocket is also directed upwards.

Third Law. For every action there is an equal and opposite reaction. Therefore, matter such as water particles escaping outward from the rear nozzle will push upon the body of the water rocket.

GROUP DISCUSSION

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, eg, everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. Which rocket was heavier? The water rocket or the film canister rocket in Proficiency Level One?

Q2. Which rocket flew further?

Q3. Which rocket flew faster?

Q4. How might increased pressure or an increased volume of propellant affect the rocket?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the group discussion will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in launching the water rocket and in the group discussion will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

There are many propellants used in rocketry, resulting in a variety of exhaust pressures and velocities. The greater the exhaust pressure, the higher the exhaust velocity. The rocket's power is increased as exhaust velocity of the propellant increases.

INSTRUCTOR NOTES/REMARKS

Prior to this lesson, instructors shall prepare a launching platform and guidance system as shown at Annexes W and X or reference C3-016.

The launching pad should be saved for future training.

Each group shall be allowed a number of attempts to achieve a successful launch.

If a suitable location for this launching water rockets is not available at the squadron's LHQ, that part of the lesson can be carried out as part of a field exercise.

REFERENCES

C3-016 EG-2003-01-108-HQ NASA. (2003). *Rockets: A Teacher's Guide With Activities in Science, Mathematics, and Technology*. Washington, DC: NASA.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 9

EO C340.07 – IDENTIFY GLOBAL POSITION SYSTEM (GPS) COMPONENTS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Retrieve current information from reference C3-243 and update the lesson as required.

Create slides of figures located at Annexes Z to AB.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to GPS components, to generate interest, and emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

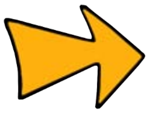
By the end of this lesson the cadet shall be have identified GPS components.

IMPORTANCE

It is important for cadets to be able to identify GPS components so that they will clearly understand the operation and capabilities of GPS when it is used in the field or in an aircraft.

Teaching Point 1	**Explain How the GPS Operates**
Time: 25 min	Method: Interactive Lecture

In 1870, an American named Edward Everett Hale suggested a system of four satellites be placed in a circumpolar orbit to provide a global positioning service. This idea was published as a story called *The Brick Moon* in a series of installments in Boston's Atlantic Monthly magazine in 1870 and 1871.



The complete *The Brick Moon* is available at the University of Virginia Library at website http://etext.virginia.edu/toc/modeng/public/HalBric.html.

THE THREE COMPONENTS OF GPS

There are multiple positioning systems that use satellites, including the Russian military's Glonass system and the US military's Navstar system. This lesson describes Navstar, but both systems share the same principles in data transmission and positioning methods, though other details such as orbits differ. Other systems existing or planned include those belonging to Japan and the European Union.

Today's GPS represents a considerable advance from Hale's brick moon idea. It has three components:

- orbiting satellites,
- earthbound control stations, and
- receivers that can be anywhere – earthbound, flying or orbiting.

Satellites

The space segment of GPS consists of 24 operational satellites in six orbital planes (four satellites in each plane). The spacing of the satellites are arranged so that a minimum of five satellites are in view from every point on the globe at any time. The satellites orbit at an altitude of 20 200 km. That altitude, clear of the atmosphere, means that satellites will orbit according to very simple mathematics. Although all the satellites are at the same altitude and their six orbits do cross, the satellites do not collide because they are carefully synchronized.

Control Stations

The control segment of GPS consists of five monitor stations and three ground antennas located around the world. A Master Control Station (MCS) is located at Schriever Air Force Base (AFB) in Colorado. The monitor stations passively track all satellites, gathering information to be processed at the MCS to determine satellite orbits and to update each satellite's navigation message. Updated information is transmitted to each satellite via the ground antennas.

Receivers

The user segment of GPS consists of antennas and receiver-processors that provide positioning, velocity, and precise timing to the user. There is a wide variety of receivers.

Individuals may purchase GPS handsets that are available through commercial retailers. Equipped with these GPS receivers, users can accurately locate where they are and easily navigate to where they want to go, whether walking, driving, flying, or boating. GPS receivers have become a mainstay of transportation systems worldwide, providing navigation for aviation, ground, and maritime operations. Disaster relief and emergency services depend upon GPS receivers for location and timing capabilities in their life-saving missions. Everyday activities such as banking, mobile phone operations, and even the control of power grids, are facilitated by the accurate timing provided by GPS receivers. Farmers, surveyors, geologists and countless others perform their work more efficiently, safely, economically, and accurately using the free and open signals of the GPS satellites.

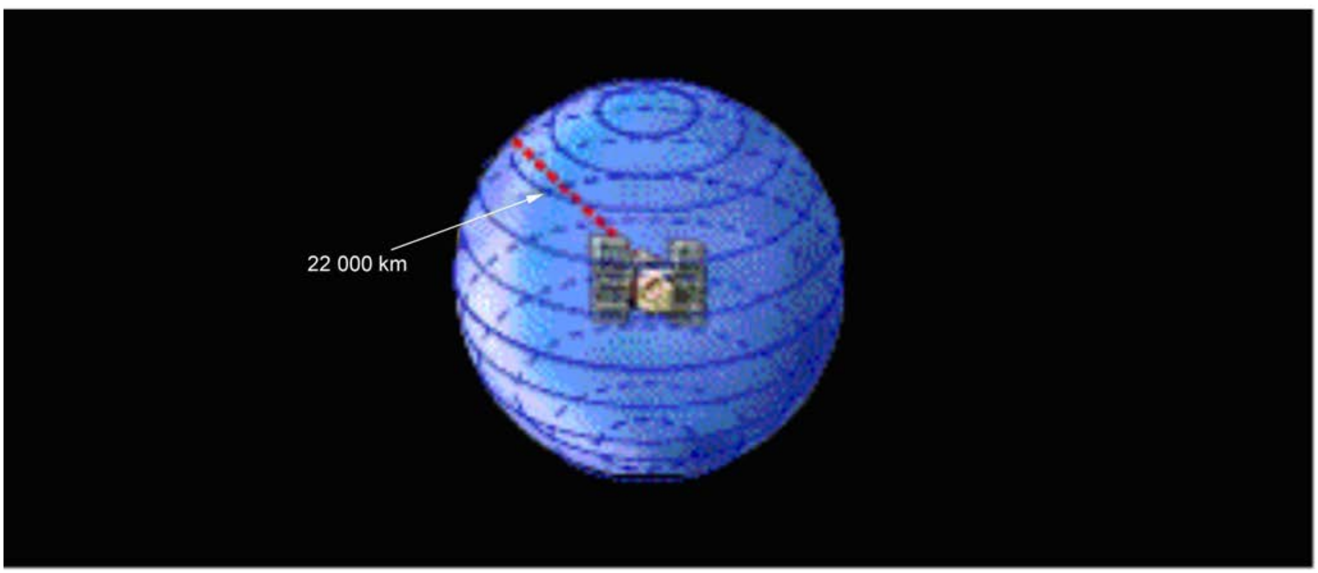
TRILATERATION FROM THREE SATELLITES

Since angles are not used in the computation, trilateration is a more accurate term than the popular term triangulation. However, the term triangulation is used by most people. For the purposes of this lesson, the two terms are interchangeable.

The principle behind GPS is the use of satellites in space as reference points for describing locations on earth. By very accurately measuring distance from three satellites a position can be trilaterated anywhere on or over the earth.

Show the cadets Figure 15Z-1.

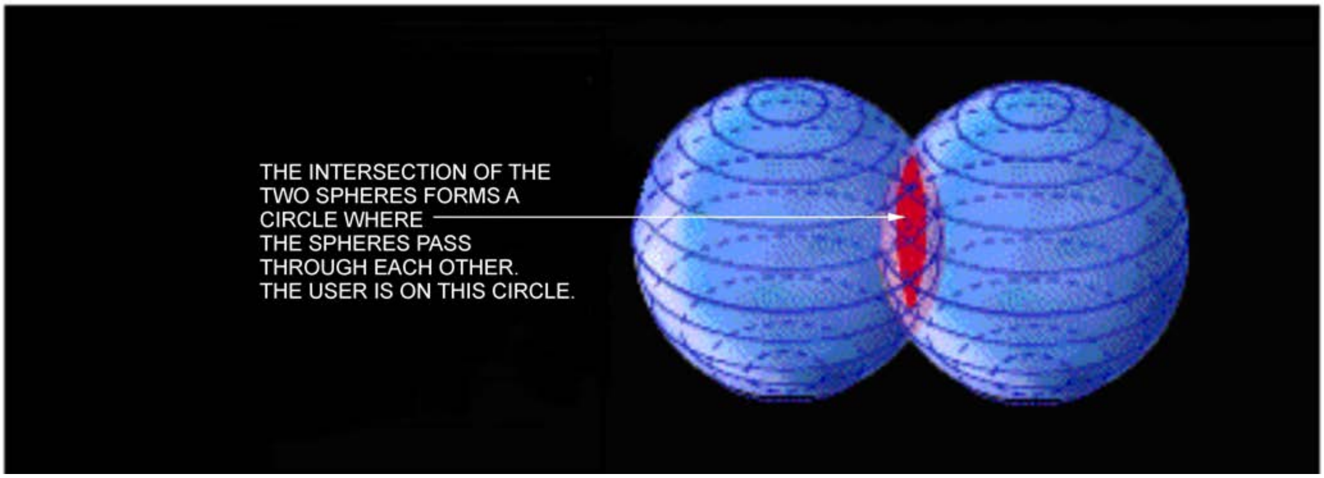
A single measurement of distance from a satellite might find the distance to be 22 000 km. Knowing that this location is 22 000 km from a particular satellite narrows down all the possible locations one could be, to the surface of a sphere that is centered on this satellite and has a radius of 22 000 km.



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15-9-1 First Trilateration

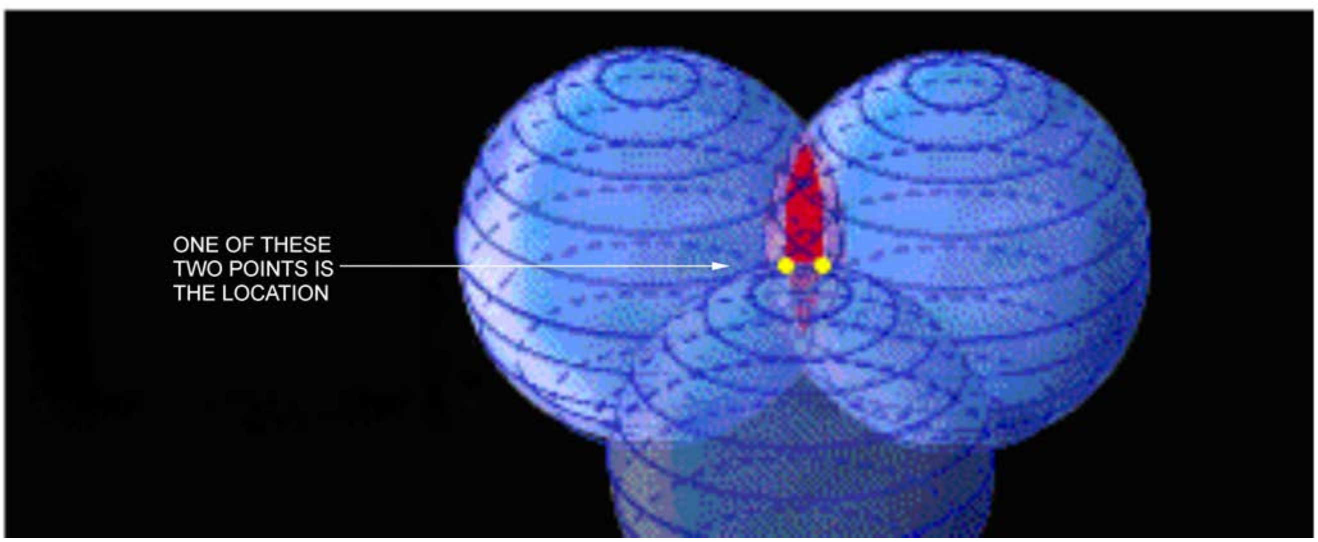
If a second measurement shows this same location to be 23 000 km from a second satellite, it is not only on the first sphere but also on a sphere 23 000 km from the second satellite. The location must be somewhere on the circle where these two spheres intersect.



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15-9-2 Second Trilateration

If a third measurement shows the same location to be 24 000 km from a third satellite, it is not only on the first sphere and the second sphere, but also on another sphere that is 24 000 km from the third satellite. This narrows the location down to the two points where the 24 000 km sphere intersects with the circle formed by the intersection of the first two spheres.



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

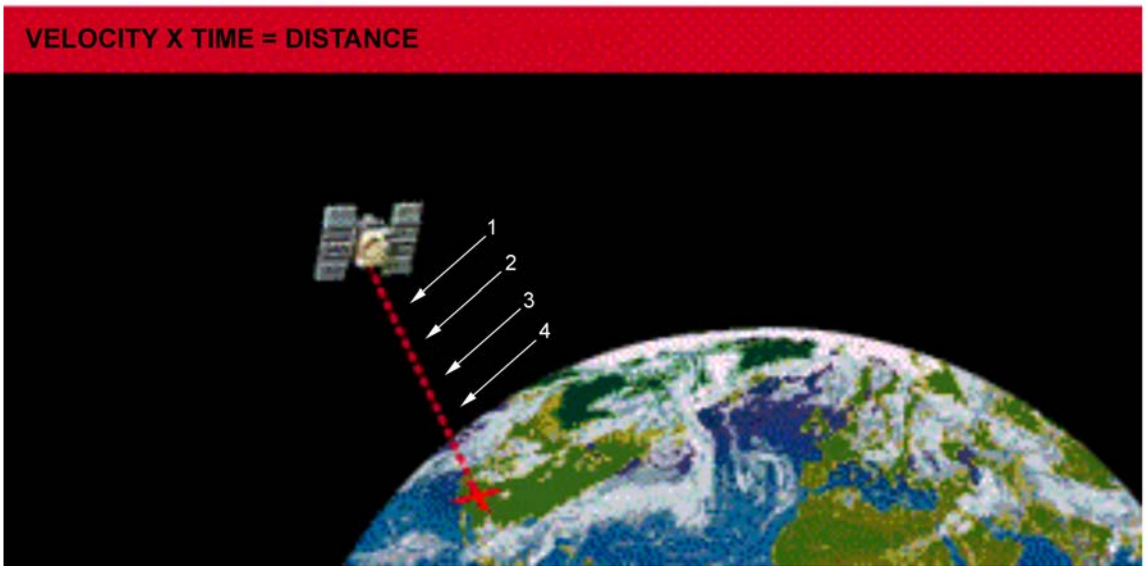
Figure 15-9-3 Third Trilateration

From three satellites a location can be determined to be one of just two points in space – only one of which will usually be on the surface of the earth or at the correct altitude above it. To decide which of those two points is the true location, a fourth trilateration measurement is necessary. However, one of the two points may be a ridiculous answer (either too far from Earth or moving at an impossible velocity) and so can be rejected without further measurement.

TIMING RADIO SIGNALS

Show the cadets Figures 15AA-1 and 15AA-2.

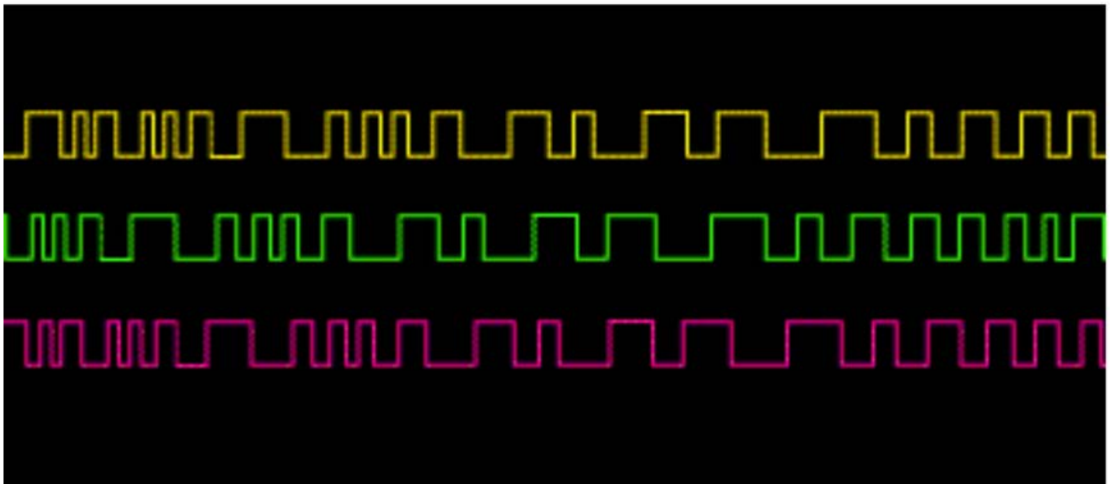
Distance to a satellite is determined by measuring how long a radio signal takes to travel from that satellite to the user's receiver. By comparing how long it takes the satellite's coded signal to arrive at the user's receiver, compared to the receiver's internal clock, the travel time can be determined. Finally, comparing that measured travel time to the speed of light gives the distance.



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15-9-4 Travelling Down

Each GPS satellite transmits a coded waveform radio signal (somewhat like those shown in Figure 15-9-5). Notice that the individual pulses, or waves, are of different shapes. This allows the receiver to recognize individual pulses. GPS receivers generate waveforms that are identical to those transmitted by the satellite, for the receiver's internal use. To calculate the travel time of the radio signal from the GPS satellite, the GPS receiver measures how much time the received satellite waveform is behind its own identical internal waveform. It does this by comparing synchronization of its own internal waveforms with that of the waveforms received from each satellite.

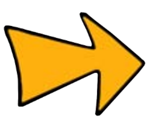


"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15-9-5 Coded Signals

Of course, this system requires perfect synchronization. All three of the GPS components – satellites, control stations and receivers – have excellent timekeeping ability.

Show the cadets The Challenge of Timing slide located at Annex AA.



Timing is tricky.

Precise clocks are needed to measure travel time.

The travel time from a satellite directly overhead is about 0.06 seconds.

The time required to synchronize the receiver's internal coded pulses with the satellite's coded pulses is equal to the travel time.

Distance to the satellite is equal to travel time multiplied by the speed of light.

As well as extremely accurate internal timing, the GPS receiver must have one last critical piece of information – the exact time on the satellite's clock. The speed of light is so great, and the travel time of the radio signal is so short, that the clock in the GPS satellite and the clock in the GPS receiver must be synchronized perfectly. This requirement, given the degree of accuracy necessary, is a formidable challenge. The method that was used to accomplish this feat involves high-speed computer processing combined with data from a fourth GPS satellite.

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have the cadets experience the precision of GPS.

RESOURCES

- One hand-held GPS receiver, and
- Paper and pencil/pen.

ACTIVITY LAYOUT

Training area suitable for drill.

ACTIVITY INSTRUCTIONS

1. Designate a right marker.
2. Face the right marker south.
3. Have the remaining cadets fall in single file and perform a right dress.
4. Give the marker a hand-held GPS receiver.
5. Have the marker call out the coordinates shown on the GPS receiver and pass the receiver to the next cadet.
6. Write down the marker's coordinates.
7. Repeat Steps 5. and 6. for each cadet in the file.
8. List the coordinates on a whiteboard or flip chart.
9. Have the cadets examine the listed coordinates to determine:
   (a) How many seconds did the longitude change from one end of the file to the other?
   (b) How many seconds did the longitude change per cadet, on average?

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the three components of the GPS?

Q2. How many satellites does it take to mathematically establish a location?

Q3. How is distance to a single satellite determined?

ANTICIPATED ANSWERS

A1. Satellites, control stations and receivers.

A2. Four.

A3. By measuring how long a radio signal takes to travel from that satellite to the user's receiver.

Teaching Point 2	**Describe the Constellation of 24 GPS Satellites**
Time: 5 min	Method: Interactive Lecture

THE CONSTELLATION OF 24 GPS SATELLITES

There are more than 24 GPS satellites in orbit. Satellites are constantly being moved or replaced, either temporarily or permanently. However, at any given time, 24 of the satellites are in service.

ORBIT CHARACTERISTICS

The 24 GPS satellites' circular 20 200 km orbits are inclined 55 degrees with respect to Earth's equator. The satellites complete an orbit every 12 hours and rise 4 minutes earlier each day, which adds up to 24 hours in a year. This is necessary because Earth orbits the Sun once a year and, to keep accurate time, the satellite must not change orbital position in the course of a year, relative to the stars.

STATION-KEEPING MANOEUVRES

Once per year each satellite requires a station-keeping manoeuvre, also referred to as repositioning, to move the satellite back to its original orbital position. The satellites have a tendency to drift from their assigned orbital positions. One reason for this is the gravitational pull of the Earth, Moon and Sun. These manoeuvres require, on average, 12 hours of unusable time for each satellite.

ON-BOARD GPS EQUIPMENT

In addition to the radio transmitters required to communicate with the user's GPS receivers on at least two separate frequencies, a GPS satellite will usually also have:

- accurate clocks and computers for generation of coded timing signals,
- radio receivers and transmitters to communicate with the earth-based MCS,
- antennas for the radio equipment,
- rocket thrusters for orbital location and attitude adjustments,
- propellant tanks for the thrusters engines,
- computers for controlling the thrusters engines,
- solar panels to power on-board electrical equipment, and
- batteries for storing the electrical power.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How many GPS satellites are in orbit?

Q2. What is the shape of a GPS satellite orbit?

Q3. What is a station-keeping manoeuvre for?

ANTICIPATED ANSWERS

A1. More than 24.

A2. Circular.

A3. To move the satellite back to its original orbital position after it drifts.

Teaching Point 3	**Describe the Network of Earth-Based Control Stations**
Time: 5 min	Method: Interactive Lecture

THE NETWORK OF EARTH-BASED CONTROL STATIONS

The GPS satellite orbits are exact and the satellites are constantly monitored. Radar is used to check each satellite's exact altitude, position and speed. Errors are called "ephemeris errors" because they affect the satellite's orbit or "ephemeris." These errors are caused by gravitational pulls from the moon and sun and by the pressure of solar radiation on the satellites. The errors are usually very slight but they must be corrected to achieve the required accuracy.

Show the cadets Figure 15AA-1.

The control component of GPS consists of five monitor stations, three ground antennas and one MCS. The monitor stations passively track all satellites in view, accumulating ranging data. This information is passed to the MCS where it is processed to determine satellite orbits and to update each satellite's navigation message. Updated information is transmitted to each satellite via the ground antennas.

FIVE MONITOR STATIONS

The five monitor stations are located at:

- Hawaii, in the eastern Pacific Ocean,
- Kwajalein, in the western Pacific Ocean's Marshall Islands east of Hawaii,
- Ascension Island, in the south Atlantic Ocean,
- Diego Garcia, in the Indian Ocean, and
- Colorado Springs, in central USA.

THREE GROUND ANTENNAS

The three ground antennas are at Ascension Island, Diego Garcia and Kwajalein. These are necessary for transmitting control signals from the MCS to the satellites.

THE MASTER CONTROL STATION (MCS)

The MCS is located at the US Schriever AFB in Colorado. Only the MCS communicates with the GPS satellites, using the three ground antennas at Ascension Island, Diego Garcia and Kwajalein.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. In which US state is the MCS located?

Q2. What do monitor stations do?

Q3. Name the location of one ground antenna.

ANTICIPATED ANSWERS

A1. Colorado.

A2. The monitor stations passively track all satellites in view, accumulating ranging data.

A3. Ascension Island, Diego Garcia, or Kwajalein.

Teaching Point 4	**Describe the User Receivers**
Time: 15 min	Method: Interactive Lecture

GPS USER RECEIVERS

By obtaining a GPS receiver, users automatically get the use of the space component and the control components of the system. GPS receivers are designed and built to interact correctly with the space and control components of GPS. All GPS receivers have an almanac programmed into their computers that tells them where in the sky each satellite is, moment by moment. It only remains to measure how far away the satellites are and then the receiver can calculate its own location.

TIME CORRECTION FOR THE USER RECEIVER

As well as extremely accurate timing, the GPS receiver must have one critical piece of information to measure the distance to a satellite – the exact time on the satellite's clock. The speed of light is so great, and the travel time of the radio signal is so short, that the clock in the GPS satellite and the clock in the GPS receiver must be synchronized perfectly. This requirement, and the degree of accuracy necessary, is a formidable challenge. The method that was used to accomplish this feat involves high-speed computer processing combined with additional data from a fourth GPS satellite.

If the GPS receiver's clocks and the GPS satellite's clocks are perfectly synchronized to universal time, then all the satellite ranges would intersect at a single point (which is the position of the receiver). With imperfect clocks such as those found in the real world, a measurement taken from a fourth GPS satellite, done as a crosscheck, will not intersect with the first three. Since any offset from universal time will affect all measurements equally, the GPS receiver's computer searches for a single correction factor. The correction factor that the receiver must find is the one that it can subtract from all its timing measurements to cause them to intersect at a single point – the location of the receiver. This solution is accomplished by high-speed computing. Once the correction factor is found, the receiver will know not only its own location, but also the precise time on all the satellite's clocks.

USER RECEIVER APPLICATIONS

Many uses for GPS have been found, but there are five main categories: locating, navigating, tracking, mapping, and timing.

Locating

The first and most obvious application of GPS receivers is the determination of a position or location. A GPS receiver is the first positioning system to offer highly precise location data for any point on the planet, in any weather. That alone would be enough to qualify it as an important tool, but GPS accuracy makes it useful in special applications.

Besides just identifying a location, an exact reference locator is sometimes needed for extremely precise scientific work. When a GPS receiver was used to measure Mount Everest, the data collected improved past work, but also revealed that the mountain is getting taller.

Navigating

By providing more precise navigation tools and accurate landing systems, a GPS receiver not only makes flying safer, but also more efficient. With precise point-to-point navigation, a GPS receiver saves fuel and extends an aircraft's range by ensuring pilots do not stray from the most direct routes to their destinations.

Tracking

Tracking is the process of monitoring something as it moves from one location to another. Commerce relies on fleets of vehicles to deliver goods and services either across a city or across a nation. Effective fleet management has important implications, such as telling a customer when a package will arrive, spacing buses for the best-scheduled service, directing the nearest ambulance to an accident, or helping tankers avoid hazards.

A GPS receiver used in conjunction with communication links and computers can provide the backbone for systems tailored to applications in agriculture, mass transit, urban delivery, public safety, and vessel and vehicle tracking. So it is no surprise that police, ambulance, and fire departments have adopted GPS to pinpoint both the location of the emergency and the location of the nearest response vehicle on a computer map. With this clear visual picture of the situation, dispatchers can react immediately and confidently.

Mapping

Using a GPS receiver to survey and map precisely saves time and money. A GPS receiver makes it possible for a single surveyor to accomplish in a day what used to take weeks with an entire team. Even at that faster speed surveyors can do their work with a higher level of accuracy than was possible without a GPS receiver.

Mapping is the art and science of using a GPS receiver to locate items, then create maps and models of everything in the world: mountains, rivers, forests and other landforms, roads, routes, and city streets as well as precious minerals and resources.

The Longitude of Greenwich describes some of the problems that prevent GPS technology from meshing perfectly with the standard maps that are used throughout the world. Even Britain's Royal Observatory was stumped. Details of this Prime Meridian location puzzle can be found at the Royal Observatory website http://www.nmm.ac.uk/server/show/conWebDoc.416.

The accuracy of GPS receivers can reveal serious problems with standard mapping methods and that can cause problems that are not easy to solve. One case involves the Prime Meridian.

The problem: Why does a GPS receiver operating on the zero meridian at Greenwich indicate a longitude differing by about 100 m from zero?

Show the cadets Figure 15AB-1.

The Prime Meridian was defined, in classical navigation and map-making, to be the line of longitude passing through Greenwich in England. All other lines of longitude were measured relative to this meridian, which was originally established to be 0 degrees. That was how the International Date Line came to be on the opposite side of the earth, at 180 degrees longitude in the middle of the Pacific Ocean.

However, longitudes, latitudes and heights in the system that the GPS uses are all measured relative to a theoretical spheroid that best fits mean sea level over the whole globe. While this represents a level of accuracy that was unavailable to previous generations of cartographers (map-makers), the difference of 100 m in the location of the Prime Meridian obviously poses a problem for today's surveyors and cartographers.

When using a GPS receiver in conjunction with standard maps, it is possible to find significant conflicts between the two systems. The information from a GPS receiver will be precisely accurate, but the information it provides can be confusing when used with a standard map.

Timing

Although a GPS receiver is well known for navigation, tracking, and mapping, it is also used to disseminate precise time, time intervals, and frequency. Time is a valuable resource and knowing the exact time is more valuable still. Knowing that a group of timed events is perfectly synchronized is often very important. A GPS receiver makes synchronization and coordination easy and reliable.

There are three fundamental ways time is used. As a universal marker, time tells us when things happened or when they will happen. As a way to synchronize people, events and other types of signals, time helps keep the world on schedule. As a way to tell how long things last, time provides and accurate, unambiguous sense of duration.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What critical piece of information does a GPS receiver need to find to calculate its position?

Q2. What are the five main categories of GPS applications?

Q3. Why must a GPS receiver always calculate a correction factor for its internal clock?

ANTICIPATED ANSWERS

A1. The exact time on the satellite's clock.

A2. Locating, navigating, tracking, mapping, and timing.

A3. All clocks are imperfect and the GPS must have time that is perfectly synchronized with the GPS satellite.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the three components of the GPS?

Q2. How many GPS satellites are in orbit?

Q3. In which US state is the MCS located?

ANTICIPATED ANSWERS

A1. Satellites, control stations, and receivers.

A2. More than 24.

A3. Colorado.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Few pieces of information are as useful as a clear and precise description of one's location. GPS describes location, trajectory and speed of any object of interest, making GPS service invaluable to transportation, industry and commerce – as well as leisure pursuits.

INSTRUCTOR NOTES/REMARKS

N/A.

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C3-244 Trimble Navigation Limited. (2006). *GPS Tutorial*. Retrieved February 10, 2008, from http://www.trimble.com/gps/index.shtml.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 10

EO C340.08 – DESCRIBE ASPECTS OF THE INTERNATIONAL SPACE STATION (ISS)

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a slide of Annex AC.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to aspects of the ISS, to generate interest, and emphasize the teaching points.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have described aspects of the ISS.

IMPORTANCE

It is important for cadets to describe aspects of the ISS in order to understand the scope of international cooperation involved, the size of the project and the mission capability of the ISS.

Teaching Point 1 — **Describe the Major Components of the ISS**

Time: 15 min — Method: Interactive Lecture

MAJOR COMPONENTS OF THE ISS

The ISS is a large-scale project which requires international cooperation. Major contributors include the United States through National Aeronautics and Space Administration (NASA); Canada through the Canadian Space Agency (CSA); Britain, France, Germany, and Spain through the European Space Agency (ESA); Italy through the Italian Space Agency; Japan through Tsukuba Space Centre; and Russia through Roscosmos.

Each of these contributors has been responsible for the funding and construction of the major components of the ISS.

Construction of the ISS was started in 1998 and is scheduled to be completed by 2010.

Images of the ISS and its individual modules can be viewed at the NASA website. Each of the modules described here are cylindrical in shape and are connected either to each other or to one of the nodes.

Show slide of Annex AC. If a model is available, it should be used as well.

National Aeronautical and Space Administration, STS-118 Build the Station, Build the Future, NASA (p. 54)

Figure 15-10-1 Space Shuttle *Endeavour* (STS-118) After Undocking From the ISS

Zarya

Zarya (sunrise) was the first module of the ISS to be launched. It was also the first Russian contribution. The module is used primarily for storage, though its original purpose was to provide power, communications and orientation control while waiting for the Zvezda module.

Unity

The Unity Node is a connecting passageway to living and work areas of the ISS. This was the second ISS module and the first US contribution.

Zvezda

The Zvezda Service Module serves as the cornerstone for the first habitable sections of the ISS. The module provided the early living quarters, life support, electrical power distribution, data processing, flight control system and propulsion system. Launched in July 2000, this module has already undergone updates to both hardware and software. This was the second Russian contribution to the ISS.

Harmony

The Harmony Node increases the living and workspace of the ISS by 500 cubic metres. It is a passageway between the three station science facilities (Destiny, Kibo and Columbus), and provides a platform for the Multi-Purpose Logistics Modules, the transfer vehicle, the mating adaptor for the shuttle, and the Canadarm2. This was a US contribution.

Destiny

Destiny is the US laboratory attached to the ISS. Destiny's interior is modular in design so that as mission requirements change, modules can be added or removed. At maximum capacity, Destiny is expected to hold 13 experiments focusing on human life sciences, materials research, Terran observations and commercial applications.

One feature of Destiny which has affected life on earth already is its window. From here, high quality photos and videos of earth can be taken, such as those used for BBC's documentary productions *Blue Planet* and *Planet Earth*.

Multi-Purpose Logistics Modules (MPLMs)

Three MPLMs were constructed by the Italian Space Agency to assist in the transportation of materiel to and from the ISS. The modules are pressurized and are designed to be carried inside the shuttle bay during launch and recovery. Once in space, the shuttle will dock with the ISS and use its Canadarm to transfer the MPLM to a docking port on the ISS. Crew from the ISS will transfer goods to and from the MPLM. Once the transfer is complete the MPLM will return to earth onboard the shuttle.

The three MPLMs are named after famous Italians:

- MPLM Leonardo, named after Leonardo da Vinci;
- MPLM Donato, named after Donato di Niccolo Di Betto Bardi (aka Donatello);
- MPLM Rafaello, named after Rafaello Sanzio (aka Raphael).

Kibo

A Japanese contribution, Kibo (hope) is a scientific research facility. It includes two laboratory facilities, two logistics modules, a Remote Manipulator System, and an Inter-Orbit Communication System. Experiments in Kibo focus on space medicine, biology, Terran observations, material production, biotechnology and communications research.

Columbus

Built in Germany, Columbus is the ESA's largest contribution to the ISS. Columbus is a research laboratory which will expand the research facilities of the ISS. It is attached to the Harmony Node, as well as the Destiny and Kibo research labs. Experiments focus on life sciences, materials sciences, fluid physics, and other research in a weightless environment which cannot be conducted on earth.

Two unique aspects of Columbus include:

- remote access to experiments, allowing researchers on earth to coordinate with the station crew to conduct experiments; and
- the ability to conduct experiments in the vacuum of space at any of the four exterior mounting platforms.

Automated Transfer Vehicles (ATVs)

In 2008, the ESA started construction on the first of at least seven ATVs. The ATV is designed to be an unpiloted cargo carrier, which will supply the ISS with liquid and dry cargo as well as gases. It has a substantially greater cargo capacity than the Russian *Progress* cargo carrier, which currently delivers cargo to the ISS. Its secondary duty is as a garbage scow, collecting garbage from the ISS.

The Mobile Servicing System (MSS)

The MSS is a robotic system that plays a key role in the assembly and maintenance of the ISS. It moves equipment and supplies around the exterior of the station, supports astronauts during extravehicular activity (EVA), and services instruments and modules attached to the ISS.

The MSS is composed of three parts, all contributed by Canada. They are:

- **Canadarm 2.** The next generation of the Canadarm located in the space shuttle, Canadarm 2 has improved agility, increased size and capabilities, and is not fixed to one position.
- **Mobile Base System.** The mobile base system is a work platform, which moves along rails attached to the outside of the ISS. This provides the Canadarm 2 with lateral mobility along the main trusses of the ISS.
- **Special Purpose Dexterous Manipulator (Dextre).** Dextre is a two armed robot, which may be attached to the Canadarm 2. Its purpose is to handle delicate assembly tasks currently conducted by astronauts.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Which was the first ISS module to be launched?

Q2. Which three modules are research facilities on the ISS?

Q3. What is Canada's contribution to the construction of the ISS?

ANTICIPATED ANSWERS

A1. Zarya.

A2. Destiny, Kibo and Columbus.

A3. The MSS.

Teaching Point 2	**Discuss ISS Missions**
Time: 10 min	Method: Interactive Lecture

ISS MISSIONS

The main role of the ISS is to be a research facility. Once construction of the ISS is complete, scientists from the various contributing space agencies will be able to conduct hundreds of experiments from many fields of study.

Materials International Space Station Experiment (MISSE)

The MISSE will test the durability of hundreds of samples ranging from lubricants to solar cell technologies. The samples are better engineered to withstand the Sun, extreme temperatures and other elements. They will be attached to the exterior of the ISS, taking them outside of the protection of the Earth's atmosphere. By examining how the materials fare in space, researchers will be able to develop new materials for use in spacecraft as well as make materials that can last longer on Earth.

One example of where this research will be used on Earth is in exterior paint. Materials in space are subjected to more ultra-violet radiation (responsible for paint degradation) than materials on Earth. By applying the knowledge gained in these experiments, paint producers can create paint, which will last longer.

Minus Eighty Degrees Celsius Laboratory Freezer for ISS (MELFI)

MELFI is a large freezer onboard the ISS. It uses nitrogen gas (N_2) as the freezing agent. The purpose of MELFI is to store biological and life sciences samples at controlled temperatures. These temperatures range from 10 degrees Celsius to 99 degrees below 0 Celsius. Samples may include blood, urine, or plants.

Synchronized Position Hold, Engage, Reorient, Experimental Satellites (SPHERES)

SPHERES are spherical satellites the size of a bowling ball. They will be used inside the ISS to test a set of instructions which will be used by spacecraft performing autonomous rendezvous and docking manoeuvers. Three free-flying SPHERES will perform formation flying inside the cabin of the ISS. Each of these satellites is self-contained with power, propulsion, computers and navigation equipment. The results of this study will be used for satellite servicing, vehicle assembly and determining formations for spacecraft to fly.

Online Viewing of ISS Missions on NASA TV

It is possible to view the ISS missions through online streaming video at the NASA website. Most of the video is archived footage, however live footage is aired during scheduled broadcasts. NASA TV is accessible on the NASA website at http://www.nasa.gov.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What will researchers be able to do with the data gained from MISSE?

Q2. What will the results of SPHERES be used for?

Q3. Where can one go to view NASA TV?

ANTICIPATED ANSWERS

A1. Researchers will be able to develop new materials for use in spacecraft as well as make materials that can last longer on earth.

A2. The results of this study will be used for satellite servicing, vehicle assembly and determining formations for spacecraft to fly.

A3. NASA TV is accessible on the NASA website at http://www.nasa.gov.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are the two Russian contributions to the ISS?

Q2. Which Italian contribution will be used to assist the space shuttle in delivering cargo to the ISS?

Q3. Which two vehicles, other than the space shuttle, are used for transporting goods to and from the ISS?

ANTICIPATED ANSWERS

A1. Zarya and Zvezda modules.

A2. The MPLMs (Leonardo, Donato, and Raffaello).

A3. The Russian *Progress* and the ATVs.

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The ISS is a major step forward for humanity. Not only does it allow for scientific research of space, but it represents collaboration between the different nations of man. Resources that may otherwise be used in conflict are being used to further humanity's knowledge and abilities.

INSTRUCTOR NOTES/REMARKS

A model of the ISS would make an ideal visual aid for this lesson. Scale models may be purchased through online sources or ordered at the local hobby store.

In lieu of a model, a large poster would make a great visual aid. Images and multimedia are available through online sources, including NASA.

REFERENCES

C3-245 NASA. (2008). *International Space Station*. Retrieved February 10, 2008, from http://www.nasa.gov/mission_pages/station/main/index.html.

C3-246 NASA. (2008). *NASA TV*. Retrieved February 12, 2008, from http://www.nasa.gov/multimedia/nasatv/index.html.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 11

EO C340.10 – IDENTIFY ONLINE STARGAZING PROGRAMS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Visit the SkyView and SKY-MAP.ORG websites and navigate through the various databases presented.

Create slides of Annexes AD and AE.

Photocopy the handout located at Annex AF for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets, generate interest, present background material, and clarify online stargazing.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet should be expected to identify two online stargazing programs.

IMPORTANCE

It is important for cadets to identify online stargazing programs because online stargazing supports amateur astronomy. When weather and background light make outdoor viewing impossible, these programs make stargazing possible.

Teaching Point 1	**Discuss NASA's SkyView**
Time: 5 min	Method: Interactive Lecture

NASA'S SKYVIEW

SkyView is a virtual observatory on the Internet, which generates images of any part of the sky.

SkyView takes observations that other astronomers have made and uses them to create an image of the celestial target of interest. The user must specify which survey or surveys to use.

How to Access SkyView

> Show the cadets Figure 15AD-1.

1. Type the URL http://skyview.gsfc.nasa.gov/ in the address field on the Internet.
2. On the SkyView home page, select the Non-Astronomers page using a blue button found halfway down the page, on the left side of the screen.

> Show the cadets Figure 15AD-2.

3. Choose the SkyView Query Form button. Access an interactive form to select the desired view of the sky. There are, at a minimum, two required parameters:
   (a) the celestial coordinates of the sky to be viewed or the object's name, and
   (b) the database to be accessed for creating the view.

> The celestial coordinate system describes an object's position as right ascension and declination.
>
> **Right Ascension.** This is comparable to longitude on the earth, but measured in hours, minutes and seconds.
>
> **Declination.** This is comparable to latitude on the earth, measured in degrees.

> The easiest way to determine coordinates is to visit SKY-MAP.ORG; details of which are explained in the next TP. If the desired target is known, put it in the SkyView Query Form.

Show the cadets Figure 15AD-3.

NGC 4030, a galaxy in the constellation Virgo, was entered as the target in the text box, the image returned is shown in Figure 15AD-3.

The target is the object or area of interest – the name or position of a star, galaxy or nebula, or perhaps the coordinate position of some newly discovered object. Specify the position as a target name, for example, 3C273, M31 or 'Crab Nebula', or by using celestial coordinates.

SkyView cannot be used to look at images of objects in our solar system such as planets, asteroids or comets. SkyView is for deep space only.

SkyView's Non-Astronomers Page

Show the cadets Figure 15AD-4.

With SkyView, one can look at the sky in many different wavelengths of light. This includes the optical light that people see, along with the invisible radio, infrared, X-ray and gamma-ray data. Different kinds of objects show up in these different regimes; that is, the sky looks very different at radio wavelengths than in the optical. The Non-Astronomers page discusses each in turn, working down from the most energetic radiation, gamma-ray, through visible light and down to the radio spectrum.

The table shown in the Non-Astronomers page gives a quick overview of what can be seen in each regime and suggests a survey and image size for each. These suggested sizes are generally quite close to the defaults, which are useful for cadets who have no image size preference.

Databases accessible from SkyView are explained on the Non-Astronomers page, and include:

- EGRET >100 MeV Gamma-ray wavelengths
- PSPC 2Deg-Int X-ray wavelength
- EUVE 83 Extreme Ultraviolet (EUV) wavelength
- DSS Optical wavelength
- 2MASS K, or IRIS 100 Infrared (IR) wavelength
- FIRST or 1420 MHz Radio wavelength

While not all cadets will want to pursue these various databases, those that do will find adequate explanations on the Non-Astronomers page. Cadets should be encouraged to take advantage of NASA's explanations of the databases and how to use them.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is NASA's SkyView?

Q2. Where can more information about operating SkyView be found?

Q3. What two parameters are required to operate SkyView?

ANTICIPATED ANSWERS

A1. SkyView is a virtual observatory on the Internet, which generates images of any part of the sky.

A2. On SkyView's Non-Astronomers page.

A3. The coordinates of the sky to be viewed and the database to be accessed.

Teaching Point 2	**Discuss SKY-MAP.ORG**
Time: 5 min	Method: Interactive Lecture

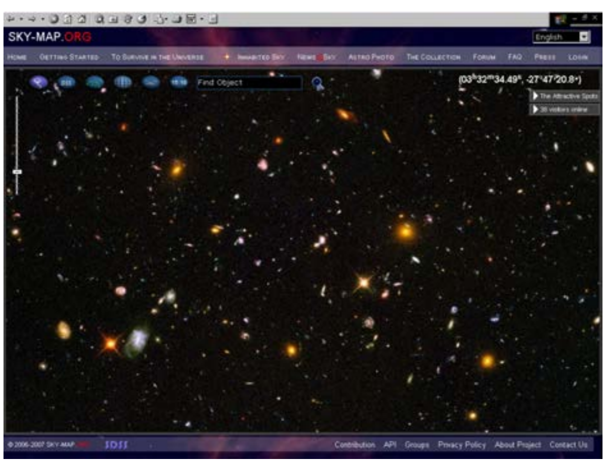
SKY-MAP.ORG

SKY-MAP.ORG is an interactive information-management system, which encompasses the entire universe. The basic element of the system is a detailed map of the sky that depicts more than half a billion celestial objects. Instructions are provided on the display. No additional instructions are necessary to browse the map or change its scale.

By using the smallest scale, the whole sky can be viewed at once. Using the largest scale, tiny areas with distant and extremely dim celestial objects, such as distant galaxies, can be viewed – courtesy of the Hubble Space Telescope (HST).

Purpose

SKY-MAP.ORG, according to its Ontario-based creators, is an attempt to show the beauty of the universe to everybody – to small children and their parents, the amateur astronomer and the professional astrophysicist.



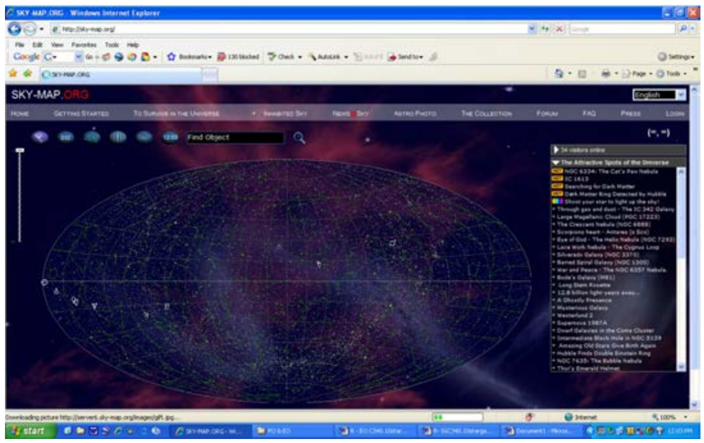
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-1 The View From the Hubble Space Telescope

Show the cadets Figure 15AE-1.

How to Access SKY-MAP.ORG

1. Type http://sky-map.org in the address field on the Internet.
2. On the first screen presented, click on the “Home” button above the top of the star-field and the full universe, seen from Earth, will be shown.



SKY-MAP.ORG, 2008, “SKY-MAP.ORG”. Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-2 SKY-MAP.ORG Home Page

Show the cadets Figure 15AE-2.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is SKY-MAP.ORG?

Q2. Where are operating instructions for SKY-MAP.ORG found?

Q3. Where is SKY-MAP.ORG based?

ANTICIPATED ANSWERS

A1. SKY-MAP.ORG is an interactive information-management system which encompasses the entire outer space.

A2. Instructions are provided on the display.

A3. Ontario.

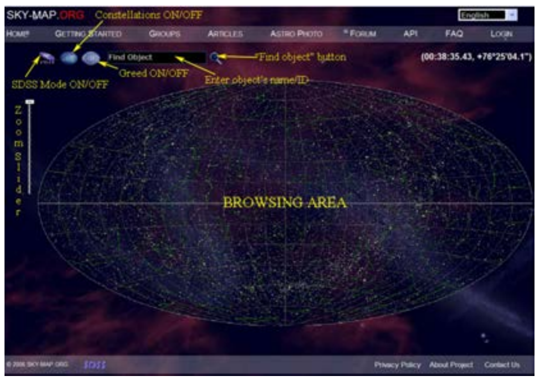
Teaching Point 3 | **Explain the SKY-MAP.ORG User Interface**

Time: 15 min | Method: Interactive Lecture

THE SKY-MAP.ORG USER INTERFACE

When using SKY-MAP.ORG, the browsing area of the screen portrays the selected view of the sky.

Show the cadets Figure 15AE-3.



SKY-MAP.ORG, 2008, “SKY-MAP.ORG”. Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-3 SKY-MAP.ORG Instruction Page

PROGRAM CONTROL FEATURES

Placing the mouse cursor over a button without clicking reveals the purpose of the control button at the top of the browsing area. As the program becomes more sophisticated, new buttons will be added. The basic controls needed to navigate are shown in Figure 15-11-3. The “Home” button returns the program to the home page showing the entire night sky as seen from the Solar system.

SKY-MAP.ORG offers two different browsing modes:

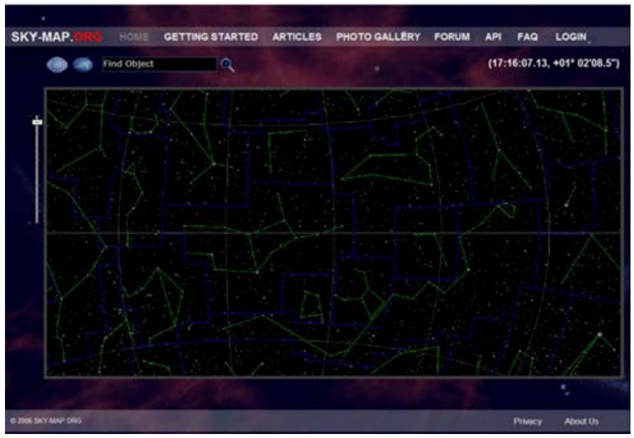
- Normal Mode, and
- Sloan Digital Sky Survey (SDSS) Mode.

Normal Mode

Show the cadets Figure 15AE-4.

The image in this figure shows the sky in Normal Mode. When in Normal Mode, SKY-MAP.ORG can access various databases to display the desired fields of view.

In the example shown, a planar projection of the whole sky is seen. Pointing the mouse at any object inside the browsing area will cause an information window to automatically appear, providing basic scientific data about the object. Left-clicking on the zoom slider causes the scale of the sky map to be changed, thereby altering the detail of the browsing area.



SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-4 SKY-MAP.ORG Normal Mode

In this figure, the scale has been changed to a higher magnification so that only a portion of the sky can be viewed. The scale can be enlarged again using the zoom slider, to view very faint objects.

An Object's Basic Information Window (BIW)

If the mouse cursor is close enough to an object (or on an object), its BIW appears, showing the data about the object. The basic data includes ID, names, constellations, exact coordinates, distances from Earth and apparent magnitudes. Left-clicking once while the BIW is still open, causes the object page to open. An object page contains detailed information about its star. In addition an object page displays all photo images where the star is present, articles and all external links about the star.

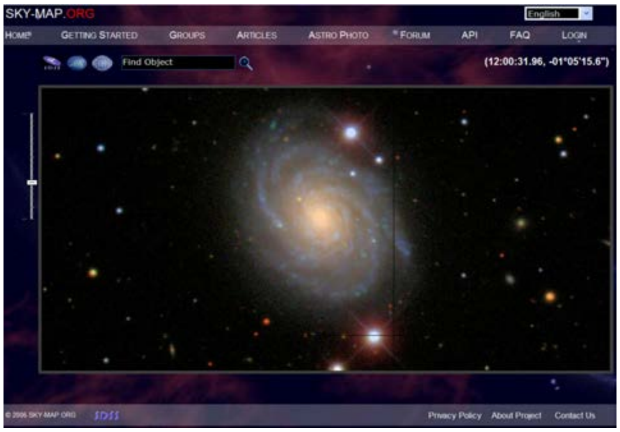
To view the stars at this moment, use the button provided with the correct time shown. When the button is pushed, the program asks for the user's location. When the user enters the name of the closest town or the latitude and longitude, the star field that is overhead will be presented. This feature only works in Normal Mode, not in SDSS Mode.

SDSS MODE

Show the cadets Figure 15AE-5.

This figure shows a view of the browsing area in SDSS mode. In this case, SKY-MAP.ORG has found galaxy NGC 4030 in constellation Virgo. NGC 4030 is at celestial coordinates:

- Right ascension: 12 hours 00 minutes 23.40 seconds
- Declination: -01°06'03.0"



SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-5 Spiral Galaxy in SDSS Mode

When online, the photographic plate can be found by entering the name NGC 4030 into the "Find Object" text box or by entering the coordinates as right ascension followed by a comma and then declination. If coordinates are entered, however, considerable magnification must be applied to see NGC 4030. At this scale, it is only magnitude 0, appearing as a bright star.

Star brightness is called magnitude. The lower the magnitude, the brighter the object. The brightest star visible in the night sky is Sirius, classified as a magnitude of −1.

Sirius, the brightest star, is found at coordinates 06 45 08.90, -16 42 58.0 in Normal Mode. SDSS does not currently cover this part of the sky, but many astro photos of Sirius can be located through Sirius' BIW.

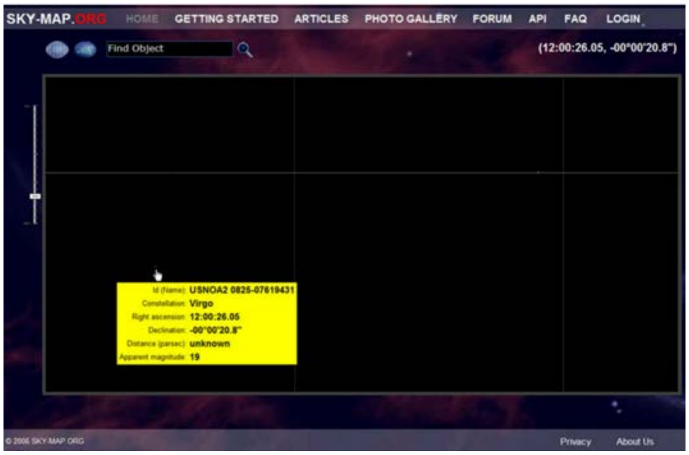
Navigating in Normal Mode

Normal Mode uses a drag-and-drop operation to shift the sky in the browsing area. To move the browsing area, place the mouse in the browsing area without pointing at any object. Press and hold the left button of the mouse and move the mouse – the star field will move with the mouse cursor.

There are about 500 million stars in the databases. Only a small amount of these stars can be displayed simultaneously in the browsing area at any given period of time. Faint celestial objects (the less bright stars) can be viewed by increasing the scale of the map.

Show the cadets Figure 15AE-6.

This figure is a view, at a large scale, corresponding to high magnification, at the right ascension and declination coordinates shown near the top right corner of the screen.



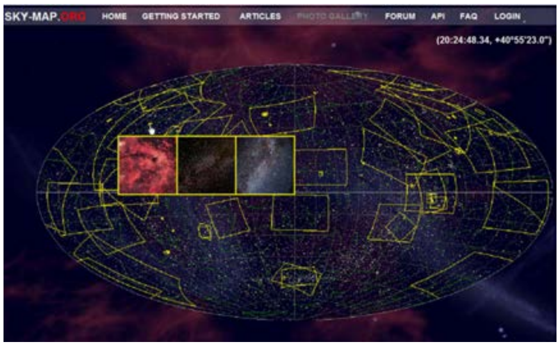
SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-6 Magnitude 19 in Virgo

In the example there are only two stars present in the browsing area. Both objects have a magnitude close to 19. That means these two stars can only be seen with powerful telescopes.

Photo Gallery

From the main menu, the photo gallery page with photo images can be accessed. The photo gallery index is a view similar to Figure 15AE-7.



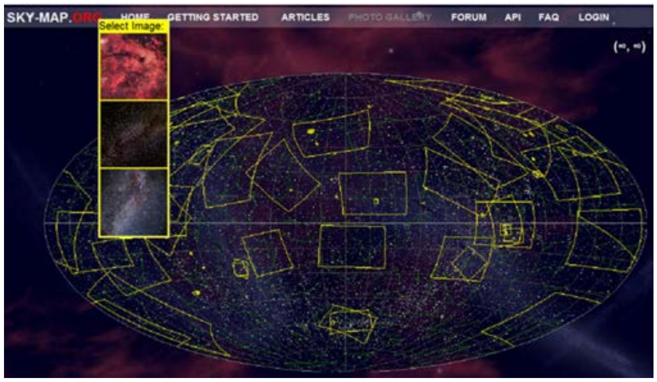
SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-7 SKY-MAP.ORG Photo Gallery

Show the cadets Figure 15AE-7.

Each field with yellow borders determines the boundaries of a star field photograph. When the mouse cursor is inside these boundaries, a minimized version of the photograph appears near the pointer. If the mouse cursor points to the area where fields meet, the photographs of all the fields will be displayed. For example, in this figure, the mouse points to the intersection of three different fields. The user can see the minimized versions of all three images. Left-clicking the mouse will change the mode to "Select Image" as shown in the next figure.

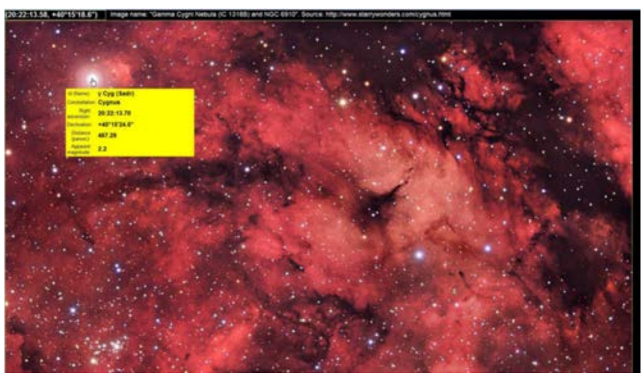
Show the cadets Figure 15AE-8.



SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-8 Image Selection

Clicking on the desired image in Figure 8 will load it as shown in Figure 15-11-9.



SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15-11-9 Gamma Cygni Nebula Image Selected

Show the cadets Figure 15AE-9.

Pointing the mouse on an object on the photograph causes the object's BIW to open exactly the same way as it did in the browsing area. Left-clicking on the object loads the object's page. The current coordinates of the mouse will be shown, with the original source directly above it.

CATALOGUES AND DATABASES AVAILABLE FOR ACCESS

Infrared Astronomical Satellite (IRAS) Sky Survey

The IRAS conducted a survey of 98 percent of the sky from low Earth orbit during a ten-month period from January to November 1983. The purpose of the survey was to produce an extremely reliable catalogue of infrared point sources at a sensitivity that was unobtainable from within the Earth's atmosphere. The stability of the orbiting IRAS infrared detectors allowed the viewing of extended, or non-point-like, astronomical sources with the IRAS survey data.

H-ALPHA SKY SURVEY

H-alpha is a particular frequency of radiation associated with hydrogen atoms. Hydrogen is the primary component of celestial nebulae. H-alpha can indicate the shape and size of a gas cloud.

Astro Photo Survey

SKY-MAP.ORG's Astro Photo Survey is a collection of astronomical photos. Credit is usually given at the top of the individual photo so that the user knows where it originated.

Sloan Digital Sky Survey (SDSS)

Simply put, the SDSS is the most ambitious astronomical survey ever undertaken. When completed, it will provide detailed optical images covering more than a quarter of the sky, and a three-dimensional map of about a million galaxies and quasars, which are extremely bright, mysterious objects. As the survey progresses, the data is released to the scientific community and general public in annual increments.

The SDSS uses a dedicated, 2.5-metre telescope on Apache Point, New Mexico, equipped with two powerful special-purpose instruments. The 120-megapixel camera can image 1.5 square degrees of sky at a time, about eight times the area of the full moon. A pair of spectrographs fed by optical fibres measure spectra of (and hence distances to) more than 600 galaxies and quasars in a single observation. A custom-designed set of software data pipelines keeps pace with the enormous data flow from the telescope.

This data, as well as more catalogues and additional databases, will be added from time to time to the list of images that SKY-MAP.ORG can access.

Give each cadet a copy of the Astronomy Basics handout located at Annex AF.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are the two modes that SKY-MAP.ORG can operate in?

Q2. In the SKY-MAP.ORG Photo Gallery, what marks the boundaries of a star field photograph?

Q3. What can be entered into the "Find Object" text box to select a target object?

ANTICIPATED ANSWERS

A1. Normal Mode and SDSS Mode.

A2. Yellow borders.

A3. The object's name or the object's celestial coordinates.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Where is SKY-MAP.ORG based?

Q2. What two parameters are required to operate NASA's SkyView?

Q3. When completed, approximately how much of the sky will be mapped in SDSS Mode?

ANTICIPATED ANSWERS

A1. Ontario.

A2. The coordinates of the sky to be viewed and the database to be accessed.

A3. When completed, it will provide detailed optical images covering more than a quarter of the sky.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Industrialization and the growth of cities has made viewing the sky difficult for the majority of Canadians but online stargazing provides an alternative way to pursue this interesting hobby.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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ASTRONAUT MARC GARNEAU

Canadian Space Agency, 2008, Image Gallery: Marc Garneau (STS-97). Retrieved March 2, 2008, from http://www.espace.gc.ca/asc/app/gallery/results2.asp?session=&image_id=garrneau-01

Figure 15A-1 Astronaut Marc Garneau

ASTRONAUT MARC GARNEAU

Marc Garneau was a Captain (Navy) in the Canadian Forces and was Canada's first astronaut.

MISSIONS

A veteran of three space flights (STS-41G in 1984, STS-77 in 1996 and STS-97 in 2000), Marc Garneau has logged over 677 hours in space.

STS-41G

Mission: Earth Radiation Budget Satellite (ERBS).

Space Shuttle: *Challenger*.

Launched: October 5, 1984 at 7:03:00 a.m. EDT.

Landed: October 13, 1984 at 12:26:33 p.m. EDT.

Mission Duration: 8 days.

Orbit Altitude: 218 nautical miles.

This was the first flight to include two women, Sally Ride and Kathryn Sullivan. Sullivan was the first American woman to walk in space. The ERBS was deployed less than nine hours into the flight. As well, the Office of Space and Terrestrial Applications-3 (OSTA-3) carried three experiments in the payload bay. Components of Orbital Refueling System (ORS) were connected, demonstrating it is possible to refuel satellites in orbit.

Other payloads were:

- Large Format Camera (LFC),
- IMAX Camera, flying for the third time, and
- Canadian Experiments (CANEX), including:
  - Auroral Photography Experiment (APE),
  - Radiation Monitoring Equipment (RME), and
  - Thermoluminiscent Dosimeter (TLD).

STS-77

Mission: SPACEHAB; SPARTAN Inflatable Antenna Experiment (IAE).

Space Shuttle: *Endeavour*.

Launched: May 19, 1996, 6:30:00 a.m. EDT.

Landed: May 29, 1996, 7:09:18 a.m. EDT.

Mission Duration: 10 days.

Orbit Altitude: 153 nautical miles.

The fourth shuttle flight of 1996 was highlighted by four rendezvous activities with two different payloads. Primary payloads, all located in the cargo bay, were the SPACEHAB-4 pressurized research module, the IAE mounted on a Spartan 207 free-flyer and a suite of four technology demonstration experiments known as Technology Experiments for Advancing Missions in Space (TEAMS).

Using the Canadarm, the Spartan free-flyer (a platform for experiments) was deployed with the 60 kg (132 lbs) IAE antenna structure inflated to its full size of 15 m (50 feet) in diameter–about the size of a tennis court.

Potential benefits of inflatable antennas over conventional rigid structures include their lower development costs, greater reliability, and lower mass and volume requiring less stowage space and potentially a smaller launch vehicle.

TEAMS experiments were:

- Global Positioning System (GPS) Attitude and Navigation Experiment (GANE),
- Vented Tank Resupply Experiment (VTRE), and
- Liquid Metal Thermal Experiment (LMTE).

Aquatic Research Facility (ARF) experiments also took place. This was a joint Canadian Space Agency/NASA project that allowed investigation of a wide range of small aquatic species, including starfish, mussels and sea urchins.

STS-97

Mission: International Space Station Assembly Flight 4A.

Space Shuttle: *Endeavour*.

Launched: November 30, 2000, 10:06 p.m. EST.

Landed: December 11, 2000, 6:04 p.m. EST.

Mission Duration: 11 days.

Orbit Altitude: 200 nautical miles.

During their 11-day mission, the astronauts completed three spacewalks and extravehicular activities (EVAs), to:

- deliver and connect the first set of solar arrays to the International Space Station (ISS);
- prepare a docking port for arrival of the US Laboratory Destiny;
- install Floating Potential Probes to measure electrical potential surrounding the station;
- install a camera cable outside the Unity module; and
- transfer supplies, equipment and refuse between *Endeavour* and the station.

On flight day three, *Endeavour* was linked to the ISS while orbiting 200 nautical miles above northeast Kazakhstan. Extravehicular mobility units (EMUs), the Simplified Aid for EVA Rescue (SAFER) units, the Canadarm Remote Manipulator System (RMS), the Orbiter Space Vision System (OSVS) and the Orbiter Docking System (ODS) were all checked. Also, an ODS camera was installed.

From inside *Endeavour*, Mission Specialist Marc Garneau used the Canadarm RMS to remove the P6 truss from the payload bay, manoeuvring it into an overnight park position to warm its components. Shuttle astronauts moved through Endeavour’s docking tunnel and opened the hatch to the ISS docking port to leave supplies and computer hardware on the doorstep of the station. On flight day four, the crew entered the Unity module for the first time.

On flight day eight, the STS-97 crew paid the first visit to the Expedition One crew residing in the space station. Until then the shuttle and the station had kept one hatch closed to maintain respective atmospheric pressures, allowing the shuttle crew to conduct their spacewalks and mission goals. After a welcome ceremony and briefing, the eight spacefarers conducted structural tests of the station and its solar arrays, transferred equipment, supplies and refuse back and forth between the spacecraft.

On flight day nine, the two crews completed final transfers of supplies to the station and other items to be returned to earth. The *Endeavour* crew bade farewell to the Expedition One crew at 10:51 a.m. EST and closed the hatches between the spacecraft. After being docked together for 6 days, 23 hours and 13 minutes, *Endeavour* undocked from the station and made an hour-long, tail-first circle of the station. The undocking took place 204 nautical miles above the border of Kazakhstan and China. The final separation burn took place near the northeast coast of South America.

PLACE AND DATE OF BIRTH

Born February 23, 1949 in Quebec City.

EDUCATION

Marc Garneau's education includes:

- Early education in Quebec City, Saint-Jean-sur-Richelieu in Quebec and in London, England;
- Bachelor of Science degree in Engineering Physics from the Royal Military College of Kingston in 1970;
- Doctorate in Electrical Engineering from the Imperial College of Science and Technology, London, England, in 1973; and
- Attended the Canadian Forces Command and Staff College of Toronto in 1982–1983.

PROFESSIONAL EXPERIENCE

Marc Garneau was a Combat Systems Engineer in HMCS Algonquin from 1974 to 1976. While serving as an instructor in naval weapon systems at the Canadian Forces Fleet School in Halifax in 1976–77, he designed a simulator for use in training weapons officers in the use of missile systems aboard Tribal class destroyers. He served as Project Engineer in naval weapon systems in Ottawa from 1977 to 1980. Garneau returned to Halifax with the Naval Engineering Unit, which troubleshoots and performs trials on ship-fitted equipment, and he helped develop an aircraft-towed target system for the scoring of naval gunnery accuracy. Promoted to Commander in 1982 while at Staff College, Garneau was transferred to Ottawa in 1983 to become design authority for naval communications and electronic warfare equipment and systems. In January 1986, he was promoted to Captain. Garneau retired from the Navy in 1989.

In February 2001, Marc Garneau was appointed Executive Vice President of the Canadian Space Agency. He was subsequently appointed President of the Canadian Space Agency, effective November 22, 2001. He resigned from this position on November 28, 2005, to run for office in a federal election.

SPECIAL HONOURS

Marc Garneau's special honours include:

- Athlone Fellowship,
- National Research Council (NRC) Bursary,
- National Honourary Patron of Hope Air and Project North Star,
- President of the Board of the McGill Chamber Orchestra,
- Officer of the Order of Canada,
- promoted Companion of the Order of Canada,
- named Chancellor of Carleton University,
- recipient of the Prix Montfort en sciences,
- recipient of the Queen Elizabeth II Golden Jubilee Medal,

- recipient of the NASA Exceptional Service Medal,
- recipient of the NASA Space Flight Medals (1984, 1996, 2000),
- recipient of the Canadian Forces Decoration (military),
- co-recipient of the F. W. (Casey) Baldwin Award,
- awarded honourary advanced degrees from:
  - University of Ottawa,
  - Collège militaire royal de Saint-Jean,
  - Université Laval,
  - Technical University of Nova Scotia,
  - Royal Military College,
  - York University, and
  - University of Lethbridge.

AFFILIATIONS

Marc Garneau's affiliations include:

- honorary Fellow of the Canadian Aeronautics and Space Institute,
- member of the Association of Professional Engineers of Nova Scotia,
- member of the Navy League of Canada,
- honorary Member of the Canadian Society of Aviation Medicine, and
- member of the International Academy of Astronautics.

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ASTRONAUT ROBERTA BONDAR

Canadian Space Agency, 2008, Image Gallery: Roberta Lynn Bondar. Retrieved March 2, 2008, from http://www.space.gc.ca/asc/app/gallery/gallery/hight/cd_01_11.JPG

Figure 15B-1 Astronaut Roberta Bondar

ASTRONAUT ROBERTA BONDAR

Roberta Bondar enjoys flying, hot air ballooning, canoeing, biking, target shooting (rifle, handgun), fishing, cross-country skiing and hiking.

MISSIONS

In early 1990, Roberta Bondar was designated a prime Payload Specialist for the first International Microgravity Laboratory Mission (IML-1).

STS-42

Mission: IML-1.

Space Shuttle: *Discovery*.

Launched: January 22, 1992, 9:52:33 a.m. EST.

Landed: January 30, 1992, 8:07:17 a.m. PST.

Mission Duration: 8 days.

Orbit Altitude: 163 nautical miles.

The primary payload for STS-42 was the IML-1, making its first flight and using the pressurized Spacelab module. The international crew was divided into two teams for around-the-clock research on the human nervous system's adaptation to low gravity and the effects of microgravity on other life forms such as shrimp eggs, lentil seedlings, fruit fly eggs and bacteria. Materials processing experiments were also conducted, including crystal growth from a variety of substances such as enzymes, mercury iodide and a virus.

Other experiments during STS-42 were:

- Gelation of Sols: Applied Microgravity Research-1 (GOSAMR-1),
- IMAX camera,
- Investigations into Polymer Membrane Processing (IPMP),
- Radiation Monitoring Experiment III (RME III), and
- Shuttle Student Involvement Program (SSIP) experiments.

PLACE AND DATE OF BIRTH

Born December 4, 1945 in Sault Ste. Marie, Ont.

EDUCATION

Roberta Bondar's education includes:

- Elementary and secondary school in Sault Ste. Marie, Ont.,
- BSc in zoology and agriculture from the University of Guelph,
- MSc in experimental pathology from the University of Western Ontario,
- Doctorate in neurobiology from the University of Toronto,
- Doctor of Medicine from McMaster University, and
- Certification in scuba diving and parachuting.

PROFESSIONAL EXPERIENCE

Roberta Bondar was a neurologist and a clinical and basic science researcher in the nervous system. As an undergraduate student she worked for six years for the federal Fisheries and Forestry Department on genetics of the spruce budworm with reference to the visual system. After internship in internal medicine at Toronto General Hospital, she completed post-graduate medical training in neurology at the University of Western Ontario and in neuro-ophthalmology at Tuft's New England Medical Center (Boston) and at the Playfair Neuroscience Unit of Toronto Western Hospital. Bondar was appointed assistant professor of medicine (neurology) in 1982–84 at McMaster University. She specialized in carotid and transcranial ultrasound at the Pacific Vascular Institute, in Seattle, in 1988.

Bondar was one of the six Canadian astronauts selected in December, 1983 and she began astronaut training in February, 1984. In 1985 she was named chairperson of the Canadian Life Sciences Subcommittee for Space Station. She served as a member of the Ontario Premier's Council on Science and Technology. She was a Civil Aviation medical examiner and a member of the scientific staff of Sunnybrook Health Science Centre. As an astronaut, she has conducted research into blood flow in the brain during microgravity, lower body negative pressure and various pathological states.

Roberta Bondar left the Canadian Space Agency effective September 4, 1992, to pursue her research.

SPECIAL HONOURS

Roberta Bondar's special honours include:

- recipient of Ontario Graduate Fellowship,
- recipient of National Research Council (NRC) Scholarship,
- recipient of NRC Postdoctorate Fellowship,
- recipient of Ontario Ministry of Health Fellowship,
- recipient of Medical Research Council Fellowship,
- recipient of Career Scientist Award from the Ontario Ministry of Health,
- honourary member of Zonta International,
- honourary member Canadian Federation of University Women,
- recipient of Vanier Award from the Jaycees of Canada,
- co-recipient of the F. W. (Casey) Baldwin Award,
- honourary life member of Girl Guides of Canada,
- recipient of Senior Fellowship from Ryerson Polytechnical Institute, Toronto, and
- recipient of honourary degrees from:
  - Mount Allison University,
  - Mount St. Vincent University,
  - University of Guelph,
  - Lakehead University,
  - Algoma College,
  - Laurentian University,
  - Saint Mary's University,

  - McMaster University,
  - University of Regina,
  - University of Calgary,
  - University of Ottawa, and
  - University of Toronto.

AFFILIATIONS

Roberta Bondar's affiliations include:

- Fellow of the Royal College of Physicians and Surgeons of Canada,
- American Academy of Neurology,
- Canadian Neurological Society,
- Canadian Aeronautics and Space Institute,
- Canadian Society of Aerospace Medicine,
- College of Physicians and Surgeons of Ontario,
- Canadian Stroke Society,
- Aerospace Medical Association,
- Albuquerque Aerostat Ascension Association, and
- American Society for Gravitational and Space Biology.

ASTRONAUT STEVE MACLEAN

Canadian Space Agency, 2008, Image Gallery: Steve MacLean. Retrieved March 2, 2008, from http://www.espace.gc.ca/asc/app/gallery/results1.asp?session=

Figure 15C-1 Astronaut Steve MacLean

ASTRONAUT STEVE MACLEAN

Selected as one of the first six Canadian astronauts in December 1983, Steve MacLean began astronaut training in February 1984. From 1987 to 1993 he was the Program Manager for the Advanced Space Vision System (ASVS), a computer-based camera system designed to provide guidance data that enhances the control of both Canadarm and Canadarm2. From 1988 to 1991 he also assumed the role of Astronaut Advisor to the Strategic Technologies in Automation and Robotics (STEAR) Program.

MISSIONS

STS-52

Mission: U.S. Microgravity Payload-1 (USMP-1); Laser Geodynamic Satellite II (LAGEOS II).

Space Shuttle: Columbia.

Launched: October 22, 1992, 1:09:39 p.m. EDT.

Landed: November 1, 1992, 9:05:53 a.m. EST.

Mission Duration: 9 days.

Orbit Altitude: 163 nautical miles.

The primary mission objectives were the deployment of the LAGEOS-II, a joint effort between NASA and the Italian Space Agency (ASI), and also operation of the USMP-1.

In addition to LAGEOS II and USMP-1, other mission objectives included:

- Canadian experiments, CANEX-2, located in both the orbiter's cargo bay and mid-deck, consisting of:
    - Space Vision System (SVS),
    - Materials Exposure in Low-Earth Orbit (MELEO),
    - Queen's University Experiment in Liquid-Metal Diffusion (QUELD),
    - Phase Partitioning in Liquids (PARLIQ),
    - Sun Photospectrometer Earth Atmosphere Measurement-2 (SPEAM-2),
    - Orbiter Glow-2 (OGLOW-2),
    - Space Adaptation Tests and Observations (SATO), and
    - A small, specially marked satellite, the Canadian Target Assembly, which was deployed on day nine to support SVS experiments; and
- three independent sensors provided by the European Space Agency, including:
    - Modular Star Sensor,
    - Yaw Earth Sensor, and
    - Low Altitude Conical Earth Sensor.

STS-115

Mission: Installation of the P3/P4 truss arrays on the International Space Station.

Space Shuttle: Atlantis.

Launched: September 9, 2006 at 11:15 a.m. EDT.

Landed: September 21, 2006 at 6:21 a.m. EDT.

Mission Duration: 12 days.

Orbit Altitude: 122 nautical miles.

The STS-115 crew delivered and installed the P3/P4 truss arrays on the ISS. Three spacewalks were carried out to put the new P3/P4 truss in service. Spacewalkers, including Steve MacLean, connected power cables and activated gear readying the P3/P4, and its unfurled solar arrays, for power generation.

The STS-115 and Expedition 13 crews utilized both shuttle and station robotic arms, Canadarm and Canadarm2, during installation activities.

PLACE AND DATE OF BIRTH

Born December 14, 1954, in Ottawa, Ont.

EDUCATION

Steve MacLean's education includes:

- Primary and secondary school in Ottawa,
- Bachelor of Science (Honours) in Physics in 1977 from York University, and
- Doctorate in Physics in 1983 from York University.

PROFESSIONAL EXPERIENCE

From 1974 until 1976 Steve MacLean worked in sports administration and public relations at York University, and competed with the Canadian National Gymnastics Team from 1976 to 1977. He taught part-time at York University, from 1980 until 1983, and then became a visiting scholar at Stanford University. As a laser physicist, MacLean's research included work on electro-optics, laser-induced fluorescence of particles and crystals, and multi-photon laser spectroscopy.

MacLean was the Chief Science Advisor for the International Space Station from 1993 until 1994, when he was appointed Director General of the Canadian Astronaut Program for a two-year period.

In August 1996, MacLean began mission specialist training at the Johnson Space Center in Houston, Texas. After successfully completing basic training in 1998, he continued with advanced training while fulfilling technical duties in the NASA Astronaut Office Robotics Branch. Later, MacLean served as CapCom (Capsule Communicator) for both the ISS Program and the Shuttle Program at the Johnson Space Center.

In 2007, MacLean was Chief Astronaut for the CSA, coordinating the astronaut activities from CSA headquarters.

SPECIAL HONOURS

Steve MacLean's special honours include:

- recipient of the President's Award (Murray G. Ross Award) at York University,
- recipient of a Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship,
- recipient of two Ontario Graduate Scholarships,
- recipient of a NSERC Postdoctoral Fellowship, and
- recipient of honorary advanced degrees from:
    - Collège militaire royal de Saint-Jean in Que.,

- York University in Toronto, and
- Acadia University in Wolfville.

ASTRONAUT CHRIS HADFIELD

Canadian Space Agency, 2008, Image Gallery: Chris Hadfield. Retrieved March 2, 2008, from http://www.espace.gc.ca/asc/app/gallery/results1.asp?session=&search=0&ListAbsolutePage=8&root_categories=0&categories_0=0&keywords=Chris|Hadfield&images=ON

Figure 15D-1 Astronaut Chris Hadfield

ASTRONAUT CHRIS HADFIELD

In June 1992, Chris Hadfield was selected to become one of four new Canadian astronauts from a field of 5 330 applicants. He was assigned by the CSA to the NASA Johnson Space Center in Houston, Texas, in August of the same year where he addressed technical and safety issues for Shuttle Operations Development, contributed to the development of the glass shuttle cockpit, and supported shuttle launches at the Kennedy Space Center in Florida. In addition, Hadfield was NASA's Chief CapCom, the voice of mission control to astronauts in orbit, for 25 space shuttle missions. From 1996 to 2000, he represented CSA astronauts and coordinated their activities as the Chief Astronaut for the CSA.

From 2001 to 2003, Hadfield was the Director of Operations for NASA at the Yuri Gagarin Cosmonaut Training Centre (GCTC) in Star City, Russia. His work included coordination and direction of all ISS crew activities in Russia and oversight of training and crew support staff, as well as policy negotiation with the Russian Space Program and other international partners. He also trained and became fully qualified as a flight engineer cosmonaut in the Soyuz TMA spacecraft to perform spacewalks in the Russian Orlan spacesuit.

Hadfield is a civilian CSA astronaut, having retired as a Colonel from the Canadian Forces in 2003 after 25 years of military service. He was Chief of Robotics for the NASA Astronaut Office at the Johnson Space Center in Houston, Texas from 2003 to 2006, and then Chief of International Space Station Operations.

MISSIONS

STS-74

Mission: Second Shuttle-Mir Docking.

Space Shuttle: Atlantis.

Launched: November 12, 1995 at 7:30:43 a.m. EST.

Landed: November 20, 1995 at 12:01:27 p.m. EST.

Mission Duration: 8 days.

Orbit Altitude: 213 nautical miles.

This mission illustrated the international flavour of the space station effort in both the hardware and the crew. Hardware in the payload bay included:

- Canadian built Remote Manipulator System (RMS) arm,
- U.S. built Orbiter Docking System (ODS),
- Russian-Built Docking Module (DM) and solar array, and
- US/Russian built solar array.

Chris Hadfield was the fourth Canadian to fly on a shuttle but the first Canadian mission specialist. Awaiting Atlantis aboard Mir, were two Russian cosmonauts and a German cosmonaut, along with Russian and European Space Agency research samples and equipment.

On flight day three, Hadfield operated the Canadarm RMS to lift the DM from its stowed position and moved it to within five inches above the ODS in the forward part of the bay. ODS was flown on all Shuttle-Mir docking flights and served as a passageway between two spacecraft. Steering jets were then fired to push Atlantis against the DM. Once mating was confirmed, the Canadarm ungrappled from the DM and hatches between the DM and the ODS were opened.

The manual phase of rendezvous began when Atlantis was about 800 m from Mir. At 51.8 m from Mir, the approach was halted while Mir was manoeuvred into alignment for docking. After permission from flight directors in Moscow and Houston, Atlantis was moved to 9.1 m from Mir and then halted momentarily again to make final adjustments. The key camera for final approach was an elbow camera on the shuttle's Canadarm RMS.

Hatches between Mir and Atlantis were opened at 4:02 a.m. EST, November 15. Control of the DM was transferred to the Mir 20 crew. During mated operations, nearly 453.6 kg of water was transferred to Mir. Numerous experiment samples, including blood, urine and saliva, were moved to the orbiter for return to earth. The shuttle crew also brought gifts, including Canadian maple sugar candies and a guitar (second guitar on Mir). Lithium hydroxide canisters – a late addition – were transferred to Mir in case the faulty environmental control system failed again and the station's air needed to be "scrubbed" clean. The two spacecraft separated on November 18 and Atlantis began the journey home.

STS-100

Mission: International Space Station Assembly Flight 6A.

Space Shuttle: *Endeavour*.

Launched: April 19, 2001, 2:40:42 p.m. EDT.

Landed: May 1, 2001, 9:10:42 p.m. PDT.

Mission Duration: 12 days.

Docking with the ISS occurred at 9:59 a.m. EDT April 21. The advanced robotic arm, called Canadarm2, was attached to a pallet on the outside of the U.S. Destiny Lab. It was later directed to walk off the pallet and grab onto an electrical grapple fixture on Destiny that would provide data, power and telemetry to the arm. Days later the arm was used to hand off the cradle, on which it rested inside Endeavour's payload bay during launch, to the orbiter's arm. The exchange of the cradle from the station's Mobile Servicing System (MMS) Canadarm2 to the shuttle's RMS Canadarm marked the first ever robotic-to-robotic transfer in space.

As the astronauts rewired power and data connections for the arm, the backup power circuit failed to respond to commands from station flight engineer Susan Helms, who was operating from a workstation inside Destiny. Disconnecting and reconnecting the cables at the base of the arm resolved the situation and the redundant power path to the arm was then completed.

Other crew activities during the mission included attaching a UHF antenna on the outside of the station and inside, calibrating the Space Vision System – an alignment aid for operating the robotic arm – plus helping repair the space station's treadmill and also filming for IMAX.

ISS Trouble in Space

Computer problems surfaced late on April 24 when flight controllers for the station experienced a loss of command and control computer No. 1, one of three computers on board for systems management. The result was a loss of communication and data transfer between the space station Flight Control Room in Houston and the station.

Communication was routed through *Endeavour*, which enabled the station crew and flight controllers to talk to one another. No computer problems were encountered on *Endeavour*. Activities involving the Canadarm2 RMS were postponed.

Station flight engineer Susan Helms, using a laptop computer, was able to restore the ground's ability to monitor and send commands to the station's US systems. Through the laptop, data from the station computers could be transmitted to the ground for analysis and investigation of the problems.

Computer restoration continued successfully, especially C&C number three. C&C number one was found to have a failed hard drive. It was replaced by a backup payload computer.

Ground controllers successfully synchronized timers on all on-board computers and investigated an error in the software load that might have caused the computer problem. With one operational C&C computer in Destiny and a back-up laptop in Unity, the undocking procedure for Raffaello was given the go-ahead.

Endeavour undocked from the space station April 29, fired a separation burn and headed for home.

PLACE AND DATE OF BIRTH

Born August 29, 1959, in Sarnia and raised in Milton, Ont.

EDUCATION

Chris Hadfield's education includes:

- Graduate as an Ontario Scholar from Milton District High School,
- Bachelor degree in mechanical engineering (with honours) from RMC,
- Post-graduate research at the University of Waterloo, and
- Master of Science (aviation systems) from the University of Tennessee.

PROFESSIONAL EXPERIENCE

In total, Chris Hadfield has flown over 70 different types of aircraft. Raised on a corn farm in southern Ontario, he became interested in flying at a young age. As an air cadet, he won a glider pilot scholarship at age 15 and a power scholarship at age 16. He also taught skiing and ski racing part- and full-time for 10 years.

Hadfield underwent basic flight training in Portage La Prairie, Man., for which he was named top pilot in 1980. In 1983, he took honours as the overall top graduate from Basic Jet Training in Moose Jaw, Sask. and, in 1984–1985, he trained as a fighter pilot in Cold Lake, Alta. on CF-5s and CF-18s. For the next three years Hadfield flew CF-18s for the North American Aerospace Defence Command (NORAD) with 425 Squadron, during which time he flew the first CF-18 intercept of a Soviet "Bear" aircraft. He attended the United States Air Force (USAF) Test Pilot School at Edwards Air Force Base, in California and, upon graduation, served as an exchange officer with the US Navy at Strike Test Directorate at the Patuxent River Naval Air Station.

Colonel Hadfield's military accomplishments from 1989 to 1992 included:

- testing the F/A-18 and A-7 aircraft;
- completing the first military flight of F/A-18 enhanced performance engines;
- developing a new handling qualities rating scale for high angle-of-attack test;
- participating in the F/A-18 out-of-control recovery test program;
- performing research with NASA on pitch control margin simulation and flight; and
- piloting the first flight test of the National Aerospace Plane external-burning hydrogen propulsion engine.

SPECIAL HONOURS

Chris Hadfield's special honours include:

- recipient of Liethen-Tittle Award 1988 (top pilot graduate of the USAF Test Pilot School),
- recipient of U.S. Navy Test Pilot of the Year (1991),
- recipient of honorary Doctorate of Engineering from the Royal Military College (1996),
- recipient of Member of the Order of Ontario (1996),
- recipient of honorary Doctorate of Laws from Trent University (1999),

- recipient of Vanier Award (2001),
- recipient of Meritorious Service Cross (2001),
- recipient of NASA Exceptional Service Medal (2002),
- recipient of Queen Elizabeth II Golden Jubilee Medal (2003),
- inducted into Canada's Aviation Hall of Fame (2005), and
- commemorated on Royal Canadian Mint silver and gold coins for his spacewalk to install Canadarm2 on the ISS (2006).

AFFILIATIONS

Chris Hadfield's affiliations include:

- Royal Military College Club,
- Society of Experimental Test Pilots,
- Canadian Aeronautics and Space Institute,
- Honourary Patron of Lambton College,
- Trustee of Lakefield College School,
- Board member of the International Space School Foundation, and
- Executive with the Association of Space Explorers.

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ASTRONAUT BOB THIRSK

Canadian Space Agency, 2008, Image Gallery: Bob Thirsk. Retrieved March 2,2008, from http://www.space.gc.ca/asc/app/gallery/results2.asp?session=&image_id=Thrisk-1001

Figure 15E-1 Astronaut Robert (Bob) Thirsk

ASTRONAUT BOB THIRSK

In June and July 1996, Thirsk flew as a payload specialist aboard space shuttle mission STS-78, the Life and Microgravity Spacelab (LMS) mission. During this 17-day flight aboard Columbia, he and his six crewmates performed 43 international experiments devoted to life science and materials science.

In 2008, Thirsk was assigned to a long-duration flight as a member of Expedition 19 on the ISS, with duties that include robotic operations and conducting scientific experiments on behalf of Canadian and international researchers.

MISSIONS:

STS-78

Mission: LMS.

Space Shuttle: Columbia.

Launched: June 20, 1996, 10:49:00 a.m. EDT.

Landed: July 7, 1996, 8:36:45 a.m. EDT.

Mission Duration: 17 days.

Orbit Altitude: 150 nautical miles.

Mission Highlights

Five space agencies (NASA, European Space Agency, French Space Agency, Canadian Space Agency, and Italian Space Agency) and research scientists from 10 countries worked together on primary payload experiments of LMS. More than 40 experiments flown were grouped into two areas:

- life sciences, which included human physiology and space biology; and
- microgravity science, which included basic fluid physics investigations, advanced semiconductor and metal alloy materials processing and medical research in protein crystal growth.

Regarding STS-78, NASA observed:

Canadian Space Agency astronaut Bob Thirsk was uniquely qualified for this mission. A bio-medical engineer and a medical doctor, his knowledge and expertise reached into many areas, notably in the physiological adaptations that occur in weightlessness as well as in microgravity experimentation relating to materials processing and fluid physics.

Since 1983, when he was selected to become an astronaut, Bob Thirsk has accumulated 16 years of operational experience. He first trained as back-up Payload Specialist to Marc Garneau for Mission 41-G in October 1984. He was an investigator for three experiments that flew on previous Spacelab missions and was an alternate Payload Specialist on the IML-1 Mission.

One of the most common physiological changes astronauts must live with in a weightless environment is the redistribution of body fluids which can cause discomfort or problems in space or upon returning to earth. Thirsk was leader of an international team investigating this shift of body fluids in weightlessness and its effects on the body’s venous system. He has designed an experimental antigravity suit, a pressure suit he believes will help astronauts readapt to life back on earth.

During STS-78, Bob Thirsk participated in a number of experiments in life and microgravity sciences. Like the other six astronauts, he was both subject and researcher for several life sciences investigations. He had a major role in Canada’s Torso Rotation Experiment (TRE), designed by McGill University and sponsored by the Canadian Space Agency. TRE related eye/head/body movements to the symptoms of motion sickness that many astronauts experience. Thirsk was also involved in four muscle physiology experiments. Studies on previous missions have revealed a loss of muscle mass, biochemical changes in the muscle that oppose gravity and changes in the performance of certain muscle groups that bear weight and support the skeleton.

Dr. Thirsk had a strong interest in the lung function experiment whose goal was to explain the large differences in the ventilation and the perfusion (blood flow) to the top and bottom of the lung.

Bob Thirsk also participated in one microgravity science experiment, the Protein Crystallization Facility Experiment. The astronauts crystallized large proteins (such as DNA, RNA or viruses) that were analysed back on earth. The goal was to better understand the interactions within and between proteins and, eventually, to design better drugs to inhibit or improve certain effects.

The Columbia orbiter itself played a key part in tests to support raising the Hubble Space Telescope (HST) to a higher orbit during HST's second servicing mission. Columbia's vernier Reaction Control System jets were gently pulsed to boost the orbiter's altitude without jarring payloads. Raising the orbiter Columbia very gently, provided experience used to inform orbiter *Discovery's* later mission STS-82 how to raise HST's orbit without impacting its solar arrays. During STS-82 in February 1997, orbiter *Discovery* did indeed fire its manoeuvring jets several times to successfully boost HST to an orbit eight nautical miles higher.

PLACE AND DATE OF BIRTH

Born August 17, 1953, in New Westminster, B.C.

EDUCATION

Robert Thirsk's education includes:

- Primary and secondary schools in B.C., Alta., and Man.,
- BSc degree in Mechanical Engineering from the University of Calgary,
- MSc in Mechanical Engineering from the Massachusetts Institute of Technology (MIT),
- Doctorate of Medicine from McGill University, and
- Master of Business Administration from the MIT Sloan School of Management.

PROFESSIONAL EXPERIENCE

Robert Thirsk was in the family medicine residency program at the Queen Elizabeth Hospital in Montréal when he was selected in December 1983 for the Canadian Astronaut Program. He began astronaut training in February 1984 and served as backup payload specialist to Marc Garneau for the October 1984 space shuttle mission STS-41G.

Thirsk has been involved in various CSA projects including parabolic flight campaigns and mission planning. He served as crew commander for two space mission simulations: the seven-day CAPSULS mission in 1994, at Defence Research and Development Canada in Toronto, and the 11-day NEEMO 7 undersea mission in 2004 at the National Undersea Research Center in Key Largo, Florida. He also led an international research team investigating the effect of weightlessness on the heart and blood vessels.

In 1998, Thirsk was assigned by the CSA to NASA's Johnson Space Center in Houston to pursue mission specialist training. This training program involves advanced instruction on both shuttle and space station systems, extravehicular activity (EVA), robotic operations, and the Russian language. Within the NASA Astronaut Office, Thirsk serves as a capsule communicator (CapCom) for the International ISS program. CapComs participate in actual and simulated space missions as a communication link between the ground team at Mission Control and the astronauts in orbit. CapComs speak directly with the space station crew and assist with technical planning for the mission and last minute troubleshooting.

In 2004, Thirsk trained at the Yuri Gagarin Cosmonaut Training Centre near Moscow and became certified as a Flight Engineer for the Soyuz spacecraft. He served as backup Flight Engineer to European Space Agency (ESA) astronaut Roberto Vittori for the Soyuz 10S taxi mission to the ISS in April 2005. During the 10-day mission, Thirsk worked as Crew Interface Coordinator (European CapCom) at the Columbus Control Centre in Germany. Thirsk then returned to the Johnson Space Center in Houston to begin ISS Expedition crew training.

Further to Thirsk's CapCom training and experience for NASA missions, in 2007 he underwent Eurocom (European capsule communicator) training in Germany to support the European Space Agency's (ESA) Columbus Control Centre (COL-CC). The COL-CC provides command and control for the Columbus laboratory which was carried into orbit on February 7, 2008, by STS-122.

SPECIAL HONOURS

Bob Thirsk's special honours include:

- recipient of the Association of Professional Engineers, Geologists and Geophysicists of Alberta Gold Medal,
- recipient of the University of Calgary Distinguished Alumni Award,
- recipient of the Gold Medal of the Professional Engineers of Ontario, and
- honorary membership in the College of Physicians and Surgeons of British Columbia.

AFFILIATIONS

Bob Thirsk's affiliations include:

- Professional Engineers of Ontario,
- Canadian College of Family Physicians,
- Canadian Aeronautics and Space Institute,
- Aerospace Medical Association,
- Colleges of Physicians and Surgeons of Ontario and of British Columbia, and
- Canadian Foundation for the International Space University.

ASTRONAUT BJARNI TRYGGVASON

Canadian Space Agency, 2008, Image Gallery: Bjarni Tryggvason. Retrieved March 2, 2008, from http://www.space.gc.ca/asc/app/gallery/results2.asp?session=&image_id=astronaut

Figure 15F-1 Astronaut Bjarni Tryggvason

ASTRONAUT BJARNI TRYGGVASON

Bjarni Tryggvason is an airline transport rated pilot with more than 4 500 hours of flight experience and 1 800 hours as a flight instructor. He is active in aerobatic flight including time on the Tutor jet trainer with the Canadian Forces. He enjoys jogging, skiing and general fitness. He has two children.

MISSIONS

STS-85

Mission: Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere-Shuttle Pallet Satellite-2 (CRISTA-SPAS-02).

Space Shuttle: *Discovery*.

Launched: August 7, 1997, 10:41:00 a.m. EDT.

Landed: August 19, 1997, 7:07:59 a.m. EDT.

Mission Duration: 12 days.

Orbit Altitude: 150 nautical miles.

STS-85 carried a complement of payloads in the cargo bay that focused on Mission to Planet Earth objectives as well as preparations for ISS assembly:

- the Japanese Manipulator Flight Development (MFD),
- the Technology Applications and Science-01 (TAS-1),
- the International Extreme Ultraviolet Hitchhiker-02 (IEH-02), and
- CRISTA-SPAS-02.

This was the second flight of CRISTA-SPAS payload. CRISTA-SPAS-02 represented the fourth mission in a cooperative venture between the German Space Agency (DARA) and NASA. The payload included three telescopes and four spectrometers, deployed on flight day one, to gather data about earth's middle atmosphere. After more than 200 hours of free flight, CRISTA-SPAS-02 was retrieved on August 16. The three CRISTA telescopes collected 38 full atmospheric profiles of the middle atmosphere. A total of 22 sounding rockets and 40 balloons were launched to provide correlating data.

A complementary instrument, the Middle Atmosphere High Resolution Spectrograph Investigation (MAHRSI), provided additional data. This new information from STS-85 combined with that from the first CRISTA-SPAS flight (STS-66 in1994) was used to yield new insight into the distribution of ozone in earth's atmosphere. Once science operations were complete, CRISTA-SPAS was used in a simulation exercise to prepare for the first ISS assembly flight, STS-88.

TAS-1 was a Hitchhiker payload carrying eight experiments designed to demonstrate faster, better and cheaper avionics and processes. All these experiments were completed successfully:

- Solar Constant Experiment (SOLCON),
- Infrared Spectral Imaging Radiometer (ISIR),
- Shuttle Laster Altimeter (SLA),
- Critical Viscosity of Xenon (CVX),
- Space Experiment Module (SEM),
- Two Phase Flow (TPF),

- Cryogenic Flight Experiment (CFE), and
- Stand Alone Acceleration Measurement Device and the Wide Band Stand Alone Acceleration Measurement Device (SAAMD/WBSAAMD).

MFD was designed to evaluate use of the Small Fine Arm that will be part of the future Japanese Experiment Module's Remote Manipulator System on ISS. Despite some glitches, MFD completed a series of exercises by the crew on orbit as well as operators on ground. Two unrelated Japanese experiments, Two-Phase Fluid Loop Experiment (TPFLEX) and Evaluation of Space Environment and Effects on Materials (ESEM), were mounted near the Small Fine Arm in the payload bay.

IEH-02 was flying a second time and consisted of four experiments–all with the common objective of investigating solar extreme ultraviolet (EUV) flux and EUV emissions of the Jupiter/Io plasma torus system:

- Solar Extreme Ultraviolet Hitchhiker-2 (SEH),
- Ultraviolet Spectrography Telescope for Astronomical Research (UVSTAR),
- Distribution and Automation Technology Advancement - Colorado Hitchhiker and Student Experiment of Solar Radiation (DATA-CHASER), and
- Shuttle Glow Experiment-5 and -6.

Payloads inside the cabin included:

- Protein Crystal Growth - Single locker Thermal Enclosure System (PCG-STES),
- Midcourse Space Experiment (MSX),
- Shuttle Ionospheric Modification with Pulsed Local Exhaust (SIMPLEX),
- Southwest Ultraviolet Imaging System (SWUIS), used to observe the Hale-Bopp comet,
- two Get Away Special (GAS) payloads,
- Biological Research in Canisters-10 (BRIC-10), one in a series of flights,
- Solid Surface Combustion Experiment (SSCE), and
- Bioreactor Demonstration System-3 (BDS-3), a cell-biology research payload that had flown previously. On this flight, BDS was used for growing colon cancer cells to a larger size than can be achieved on earth.

The crew also worked with the Orbiter Space Vision System (OSVS), which will be used during ISS assembly. OSVS features series of dots, strategically placed on various payload and vehicle structures, which permit precise alignment and pointing capability.

PLACE AND DATE OF BIRTH

Born September 21, 1945, in Reykjavik, Iceland.

EDUCATION

Bjarni Tryggvason's education includes:

- Primary school in N.S. and B.C.,
- High school in Richmond, B.C.,
- BASc in Engineering Physics from the University of British Columbia, and
- completed postgraduate work in engineering with specialization in applied mathematics and fluid dynamics at the University of Western Ontario.

PROFESSIONAL EXPERIENCE

Bjarni Tryggvason was a meteorologist with the cloud physics group at the Meteorlogic Service Canada (formerly the Atmospheric Environment Service) in Toronto in 1972 and 1973. After that, he served as a research associate in industrial aerodynamics at the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario from 1974 to 1979.

Tryggvason was a guest research associate at Kyoto University, in Kyoto, Japan, in 1979 and at James Cook University of North Queensland, in Townsville, Australia in 1980. He was a lecturer in Applied Mathematics at the University of Western Ontario from 1980 to 1982.

From 1982 to 1984, Tryggvason was a research officer at the Low Speed Aerodynamics Laboratory at the National Research Council of Canada (NRC) and was a lecturer at the University of Ottawa and at Carleton University from 1982 to 1992.

Selected as one of the original six Canadian astronauts in December 1983, Tryggvason trained as a backup payload specialist for the CANEX-2 set of experiments, which flew on Mission STS-52 in October 1992. He was also the project engineer for the Space Vision System Target Spacecraft, which was deployed during that mission.

Tryggvason also served as the principal investigator for the following projects:

- development of the Large Motion Isolation Mount (LMIM), which flew numerous times on NASA KC-135 and DC-9 aircraft,
- Microgravity vibration Isolation Mount (MIM), which operated on the Russian space station, Mir, from April 1996 until January 1998 to support several Canadian and US experiments in material science and fluid physics, and
- the MIM-2 which flew on STS-85 in August 1997.

He was the originator and technical director during the early development phase of the Microgravity Vibration Isolation Subsystem (MVIS), which the CSA developed for the European Space Agency Fluid Science Laboratory for the ISS.

On August 7, 1997, Tryggvason flew as a payload specialist aboard Space Shuttle *Discovery* on Mission STS-85. His primary role was to test MIM-2 and perform fluid science experiments designed to examine sensitivity to spacecraft vibrations, in order to develop a better understanding of the need for systems such as the MIM on the ISS and to study the effect vibrations have on the many experiments performed on the ISS.

In August 1998, Tryggvason was invited to take part in NASA mission specialist training held at the Johnson Space Center in Houston, Texas. His class underwent two years of physical and academic training and was the first group of astronauts to be trained as both mission specialists for the space shuttle and as potential crewmembers for the ISS.

Following completion of mission specialist training, Tryggvason's NASA duties included serving as a crew representative for the Shuttle Avionics Integration Laboratory (SAIL), which is used to test shuttle flight software prior to onboard use. He also supported integrated simulations on the ISS Training Facility at the Johnson Space Center in Houston, Texas, and served as a CSA representative on the NASA Microgravity Measurement Working Group and on the ISS Microgravity Analytic Integration Team.

From mid 2001 to 2003, Tryggvason worked in the private sector while on leave from the CSA. He returned to work at the CSA in 2004. He has held the position of visiting professor at the University of Western Ontario. He has written more than 50 published papers and holds three patents.

SPECIAL HONOURS

Bjarni Tryggvason's special honours include:

- recipient of the Canadian Space Agency Innovators Award,
- recipient of the Order of the Falcon from Iceland,
- recipient of the NASA Space Flight Medal, and
- recipient of the Doctorate of Philosophy (honoris causa) degrees, from:
  - University of Iceland, and
  - University of Western Ontario.

AFFILIATIONS

Bjarni Tryggvason's affiliations include the Canadian Aeronautics and Space Institute.

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ASTRONAUT DAVE WILLIAMS

Canadian Space Agency, 2008, Image Gallery: Dave Williams. Retrieved March 2, 2008, from http://spaceflight.nasa.gov/gallery/images/shuttle/sts-118/html/jsc2001-00190.html

Figure 15G-1 Astronaut Dave Williams

ASTRONAUT DAVE WILLIAMS

Dave Williams is married and has two children. He enjoys flying, scuba diving, hiking, sailing, kayaking, canoeing, downhill and cross-country skiing.

MISSIONS

STS-90

Mission: Neurolab (the final Spacelab mission).

Space Shuttle: Columbia.

Launched: April 17, 1998, 2:19:00 p.m. EDT.

Landed: May 3, 1998, 12:08:59 p.m. EDT.

Mission Duration: 16 days.

Orbit Altitude: 150 nautical miles.

The launch of Columbia was postponed on April 16 for 24 hours due to difficulty with one of Columbia's two network signal processors, which format data and voice communications between the ground and the space shuttle. The network signal processor 2 was replaced, and Columbia lifted off on April 17.

Mission Highlights

Neurolab's 26 experiments targeted one of the most complex and least understood parts of the human body – the nervous system. The primary goals were to conduct basic research in neurosciences and expand understanding of how the nervous system develops and functions in space. Test subjects were crew members, rats, mice, crickets, snails and two kinds of fish. This was a cooperative effort of the Canadian Space Agency and several other national space agencies, including ESA (European Space Agency), NASA (USA), CNES (France), DARA (Germany) and NASDA (Japan). Most experiments were conducted in the pressurized Spacelab long module located in Columbia's X bay. This was the 16th and last scheduled flight of the ESA-developed Spacelab module although the Spacelab pallets continued to be used on the ISS.

STS-118

Launch: Aug. 8, 2007, 6:36 p.m. EDT.

Landed: Aug. 21, 2007,12:33 p.m. EDT.

Orbiter: *Endeavour*.

Mission Number: STS-118.

Mission Duration: 12 days, 17 hours, 55 minutes.

Altitude: 122 nautical miles.

Primary Payload: 22nd station flight (13A.1), S5 Truss.

Dave Williams was a mission specialist on STS-118, the 22nd flight to the ISS and the 20th flight for *Endeavour*. During the mission, the crew successfully added truss segment S5, a new gyroscope and an external stowage platform to the ISS.

Show the cadets Figure 15G-2.

The mission successfully activated a new system that enables docked shuttles to draw electrical power from the ISS to extend visits to the outpost. Williams took part in three of the four spacewalks – the highest number of spacewalks performed in a single mission. He spent 17 hours and 47 minutes outside – a Canadian record. *Endeavour* carried 2 280 kg of equipment and supplies to the station and returned to earth with 1 800 kilograms of hardware and used equipment. Travelling 8.5 million km in space, the STS-118 mission was completed in 12 days, 17 hours, 55 minutes, and 34 seconds.

PLACE AND DATE OF BIRTH

Born May 16, 1954, in Saskatoon, Sask.

EDUCATION

Dave Williams' education includes:

- High school in Beaconsfield, Que.,
- BSc (Biology) from McGill University,
- MSc (Physiology) from McGill University,
- Doctorate of Medicine from the Faculty of Medicine, McGill University,
- Master of Surgery from the Faculty of Medicine, McGill University, and
- Completed a residency in family practice in the Faculty of Medicine, University of Ottawa.

PROFESSIONAL EXPERIENCE

Dave Williams pursued postgraduate studies in advanced invertebrate physiology at the Friday Harbour Laboratories at the University of Washington, Seattle, but his interests shifted to vertebrate neurophysiology when, for his master's thesis, he became involved in basic science research on how adrenal steroid hormones modify the regulation of sleep-wake cycles. While working in the Neurophysiological Laboratories at the Allan Memorial Institute for Psychiatry, Williams assisted in clinical studies of slow wave potentials within the central nervous system.

Williams served as an emergency physician with the Emergency Associates of Kitchener-Waterloo and as the medical director of the Westmount Urgent Care Clinic. Subsequently, he became the director of the Department of Emergency Services at Sunnybrook Health Science Centre and assistant professor of Surgery at the University of Toronto.

In June 1992, the CSA selected Williams as one of four successful candidates from a field of 5 330 applicants to begin astronaut training. He completed basic training and, in May 1993, was appointed manager of the Missions and Space Medicine Group within the Canadian Astronaut Program. His assignments included supervising the implementation of operational space medicine activities for the Canadian Astronaut Program Space Unit Life Simulation (CAPSULS) Project.

In January 1995, Williams was selected to join the international class of NASA mission specialist astronaut candidates. He reported to the Johnson Space Center (JSC) in March 1995, for a year of training and evaluation. Following the successful completion of this training in May 1996, he was assigned to the Payloads and Habitability Branch of the NASA Astronaut Office.

From July 1998, until September 2002, Dave Williams held the position of Director of the Space and Life Sciences Directorate at the Johnson Space Center in Houston, Texas. With this appointment, he became the first non-American to hold a senior management position within NASA. He concurrently held a six-month position as the first deputy associated administrator for crew health and safety in the Office of Space Flight at NASA Headquarters in 2001.

In addition to these assignments, Dave Williams continued to take part in astronaut training to maintain and further develop his skills. In October 2001, he became an aquanaut through his participation in the joint NASA-NOAA (National Oceanic and Atmospheric Administration) NEEMO 1 mission, a training exercise held in Aquarius, the world's only underwater research laboratory located 5.6 km off the shores of Key Largo, Florida. During this seven-day exercise, Williams became the first Canadian to have lived and worked in space and in the ocean.

In 2006, Dave Williams took the lead of NEEMO 9 as the crew commander of this mission, dedicated to assess new ways to deliver medical care to a remote location, as in a long space flight.

SPECIAL HONOURS

Dave Williams' special honours include:

- Academic awards:
  - recipient of the A.S. Hill Bursary, McGill University (1980),
  - recipient of the Walter Hoare Bursary, McGill University (1981),
  - recipient of the J.W. McConnell Award, McGill University (1981 to 1983),
  - Faculty Scholar (1982), Faculty of Medicine, McGill University,
  - University Scholar (1983), Faculty of Medicine, McGill University,
  - recipient of the Psychiatry Prize, Wood Gold Medal,
  - Dean's Honour List, Physiology Department, McGill University (1983), and
  - recipient of Second prize (1986, 1987, 1988) for participation in the University of Toronto Emergency Medicine Research Papers Program;
- recipient of the Commonwealth Certificate of Thanks and the Commonwealth Recognition Award for contributions to the Royal Life Saving Society of Canada,
- recipient of the NASA Space Flight Medal,
- recipient of the Melbourne W. Boynton Award, American Astronautical Society (1999),
- recipient of the Ramon y Cajal Institute of Neurobiology, Spanish Council for Scientific Research (CSIC) Bronze Medal for contribution to neuroscience during Mission STS-90 (1999),
- recipient of the Rotary National Award for Space Achievement (2000),
- recipient of the NASA Outstanding Leadership Medal (2002),
- Patron of the International Life Saving Federation (2002),
- Spokesperson for the Life Saving Society Canada,
- Honorary Ambassador of the SmartRisk Foundation,
- NASA JSC Space and Life Sciences Directorate Special Professional Achievement Award (2003) for the implementation of the Automatic External Defibrillator Program that has saved several lives at the NASA Johnson Space Center, and
- Honorary Doctor of Laws, University of Saskatchewan (2004).

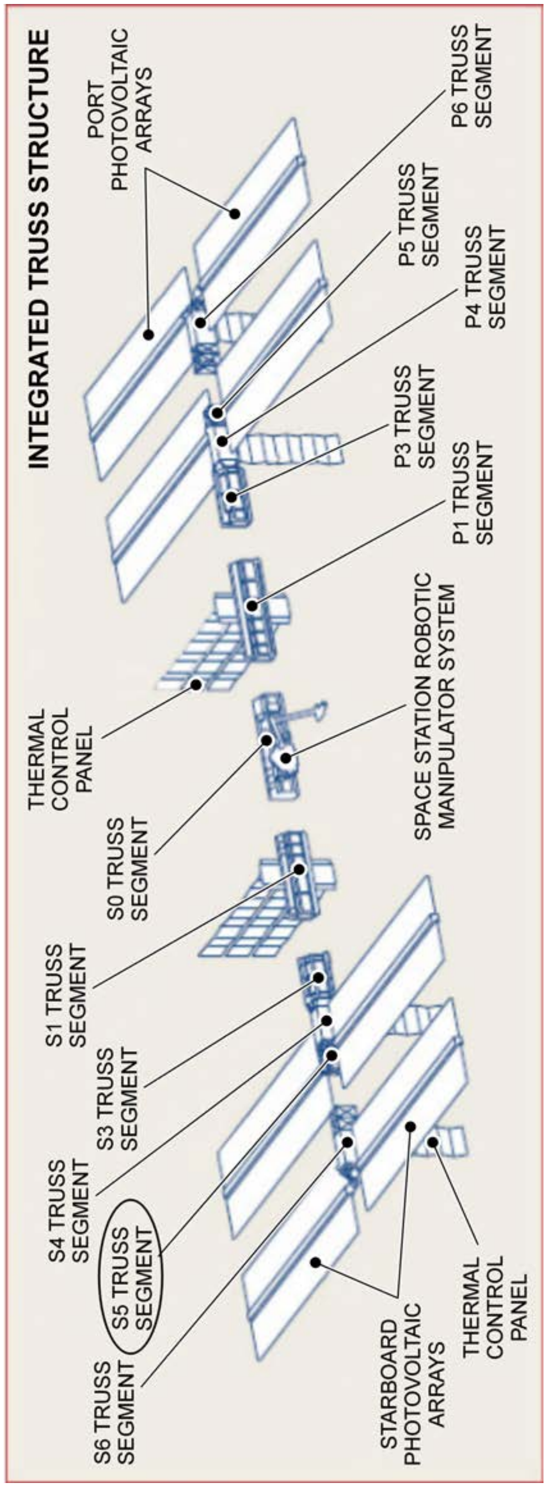
AFFILIATIONS

Dave Williams' affiliations include:

- Member of the College of Physicians of Ontario,
- Member of Ontario Medical Association,
- Member of the Canadian Association of Emergency Physicians,
- Member of the Undersea and Hyperbaric Medicine Society, and
- Member of the Aerospace Medical Association.

Past affiliations include:

- Society for Neuroscience,
- New York Academy of Science, and
- Montreal Physiological Society.



Canadian Space Agency, 2007, Missions: STS-118 Mission Overview. Retrieved March 2, 2008, from http://www.space.gc.ca/asc/eng/missions/sts-118/overview.asp

Figure 15G-2 Integrated Truss S5

ASTRONAUT JULIE PAYETTE

Canadian Space Agency, 2008, Astronauts: Julie Payette Biography. Retrieved March 2, 2008, from http://www.space.gc.ca/asc/eng/astronauts/biopayette.asp

Figure 15H-1 Astronaut Julie Payette

ASTRONAUT JULIE PAYETTE

Julie Payette enjoys running, skiing, racquet sports and scuba diving. She has a commercial pilot licence with float rating. Fluent in French and English, she can converse in Spanish, Italian, Russian and German. She plays the piano and has sung with the Orchestre symphonique de Montréal, the Piacere Vocale in Basel, Switzerland and the Tafelmusik Baroque Orchestra in Toronto. She is married and has two children.

MISSIONS

STS-96

Mission: Second International Space Station Flight.

Space Shuttle: Discovery.

Launched: May 27, 1999, 6:49:42 a.m. EDT.

Landed: June 6, 1999, 2:02:43 a.m. EDT.

Mission Duration: 10 days.

Orbit Altitude: 173 nautical miles.

Mission Highlights

All major objectives were accomplished during the mission. On May 29th, *Discovery* made the first docking to the ISS as it flew over the Russian-Kazakh border.

The 45th space walk in space shuttle history and the fourth of the ISS era took place during this mission. Astronauts transferred a US-built crane called the orbital transfer device and parts of the Russian crane Strela from the shuttle's payload bay and attached them to locations on the outside of the station. The astronauts also installed two new portable foot restraints, which will fit both American and Russian space boots, and they attached three bags filled with tools and handrails for use during future assembly operations.

The crew transferred 3 567 pounds of material, including clothing, sleeping bags, spare parts, medical equipment, supplies, hardware and about 84 gallons of water, to the interior of the station. The astronauts also installed parts of a wireless strain gauge system to help engineers track the effects of adding modules to the station throughout its assembly.

The astronauts spent a total of 79 hours, 30 minutes inside the station. Before departure, a series of 17 pulses of Discovery's reaction control system jets boosted the station to an orbit of approximately 246 statute miles. After spending 5 days, 18 hours and 17 minutes linked to the station, *Discovery* undocked at 6:39 p.m. EDT. Discovery's jets fired to move to a distance of about 400 feet for a 2-1/2 lap fly-around during which the crew made a detailed photographic record of the ISS.

After the fly-around, mission specialist Julie Payette deployed the Starshine satellite from the orbiter's cargo bay. The spherical, reflective object entered an orbit two miles below *Discovery*. The small probe became instantly visible from Earth as part of a project allowing more than 25 000 students from 18 countries to track its progress. Other payloads included the Shuttle Vibration Forces experiment and the Integrated Vehicle Health Monitoring for the Human Exploration and Development of Space (HEDS) Technology Demonstration.

PLACE AND DATE OF BIRTH

Born October 20, 1963, in Montréal, Que.

EDUCATION

Julie Payette's education includes:

- primary and secondary school in Montréal, Que.,

- International Baccalaureate from United World College of the Atlantic in Wales, UK,
- Bachelor of Engineering, Electrical cum laude from McGill University, Montréal, and
- Master of Applied Science, Computer Engineering, from the University of Toronto.

PROFESSIONAL EXPERIENCE

Before joining the space program, Julie Payette conducted research in computer systems, natural language processing and automatic speech recognition.

Her previous employment included:

- system engineer with IBM Canada (1986–1988),
- research assistant at the University of Toronto (1988–1990),
- visiting scientist at the IBM Research Laboratory, in Zurich, Switzerland (1991),
- research engineer with BNR/Northern in Montréal (1992), and
- in June 1992, the Canadian Space Agency selected Ms. Payette from 5 330 applicants to become one of four astronauts.

After her basic training in Canada, she worked as a technical advisor for the Mobile Servicing System (MSS Canadarm2), an advanced robotics system contributed by Canada to the ISS. In preparation for a space mission assignment, Payette obtained her commercial pilot license, studied Russian and logged 120 hours as a research operator on board reduced gravity aircraft. In April 1996, Payette was certified as a one-atmosphere, deep-sea diving suit operator. Payette obtained her military pilot captaincy on the CT-114 Tutor jet at the Canadian Forces Base in Moose Jaw, Sask. in February 1996. She obtained her military instrument rating in 1997. She has logged more than 1 200 hours of flight time.

Payette reported to the NASA Johnson Space Center in Houston, Texas in August 1996. She completed initial astronaut training in April 1998 and was assigned to work on technical issues in robotics for the Astronaut Office. In the spring of 1999, she visited the ISS aboard STS-96.

From September 1999, to December 2002, Payette was assigned to represent the astronaut corps at the European and Russian space agencies where she supervised procedure development, equipment verification and space hardware processing for the ISS Program.

After January 2003, Payette worked as a CapCom (Spacecraft Communicator) at Mission Control Center in Houston and was Lead CapCom for Space Shuttle mission STS-121 in 2006. The CapCom is responsible for all communications between ground controllers and the astronauts in flight.

SPECIAL HONOURS

Julie Payette’s special honours include:

- recipient of a scholarship to attend the Atlantic College in Wales, UK,
- recipient of a Greville-Smith Scholarship (highest undergraduate award at McGill University),
- McGill University Faculty Scholar (1983–1986),
- recipient of a Natural Sciences and Engineering Research Council of Canada (NSERC) Scholarship,
- recipient of a Massey College Fellowship,
- recipient of the Canadian Council of Professional Engineers Exceptional Achievement Award,
- recipient of the Chevalier de l’Ordre de la Pléiade de la francophonie,
- Ordre national du Québec,

- recipient of honorary Degrees from:
    - Queen’s University,
    - University of Ottawa,
    - Simon Fraser University,
    - Université Laval,
    - University of Regina,
    - Royal Roads University,
    - University of Toronto,
    - University of Victoria,
    - Nipissing University,
    - McGill University,
    - Mount Saint Vincent University,
    - McMaster University,
    - University of Lethbridge,
    - Mount Allison University, and
    - University of Alberta.

AFFILIATIONS

Julie Payette’s affiliations include:

- Member of l’Ordre des Ingénieurs du Québec,
- Fellow of the Canadian Academy of Engineering,
- Queen’s University Board of Directors,
- Former Governor-in-Council for NSERC, and
- Les Amies d’affaires du Ritz.

EARLY MANNED SPACE EXPLORATION TIMELINE

MERCURY PROGRAM

- October 1, 1958 National Aeronautics and Space Administration (NASA) created
- November 26, 1958 Mercury program announced
- December 4, 1959 Launch of Sam (a monkey) on Little Joe 2
- April 9, 1959 NASA names the seven Mercury astronauts
- January 21, 1960 Launch of Miss Sam (a monkey) on Little Joe IB
- January 31, 1961 Launch of Ham (a chimpanzee) on Mercury Redstone 2
- **May 5, 1961 Launch of Alan Shepard in Freedom 7 (suborbital)**
- July 21, 1961 Launch of Gus Grissom in Liberty 7 (suborbital)
- November 29, 1961 Launch of Enos (a chimpanzee) on Mercury Atlas 5 (orbital)
- January 3, 1962 Gemini program formally conceived
- **February 20, 1962 Launch of John Glenn in Friendship 7, first American human orbital flight**
- May 24, 1962 Launch of Scott Carpenter in Aurora 7
- October 3, 1962 Launch of Walter Schirra in Sigma 7
- May 15, 1963 Launch of Gordon Cooper in Faith 7, the final Mercury mission

GEMINI PROGRAM

- March 23, 1965. Gemini III. First manned Gemini flight completed three orbits
- June 03–07, 1965. Gemini IV. First American Extra Vehicular Activity (EVA)
- August 21–29, 1965. Gemini V. First use of fuel cells for electrical power
- **December 04, 1965.** Gemini VII**. First rendezvous in space, with Gemini VI-A**
- December 15, 1965. Gemini VI-A. First rendezvous in space, with Gemini VII
- **March 16, 1966.** Gemini VIII**. First docking with another (unmanned) spacecraft**
- June 03–06, 1966. Gemini IX-A. Three rendezvous and two hours of EVA
- July 18–21, 1966. Gemini X. Rendezvoused with target vehicle and EVA
- September 12, 1966. Gemini XI. Gemini record altitude of 1 189.3 km
- November 11, 1966. Gemini XII. Final Gemini flight: rendezvous, docking, EVA

APOLLO PROGRAM

- October, 1968 Apollo 7. Earth orbit
- **December,1968 Apollo 8. Ten lunar orbits**
- March, 1969 Apollo 9. First manned flight of lunar module
- May, 1969 Apollo 10. Dress rehearsal for Moon landing
- **July 20, 1969 Apollo 11. First lunar landing mission (on the Sea of Tranquility)**
- November, 1969 Apollo 12. Second lunar landing (on the Ocean of Storms)

- April, 1970 Apollo 13. Mission aborted after an on-board explosion
- January, 1971 Apollo 14. Third lunar landing (at Fra Mauro)
- July, 1971 Apollo 15. Fourth lunar landing (in the Hadley Apennine region)
- April, 1972 Apollo 16. Fifth lunar landing (on the Descartes highlands)
- December, 1972 Apollo 17. Last lunar landing (on theTaurus Littrow highlands)

NASA 40th Anniversary of the Mercury 7, by T. Gray, 2001. Retrieved March 5, 2008, from http://history.nasa.gov/40thmerc7/shepard.htm

Figure 15I-1 Alan B. Shepard

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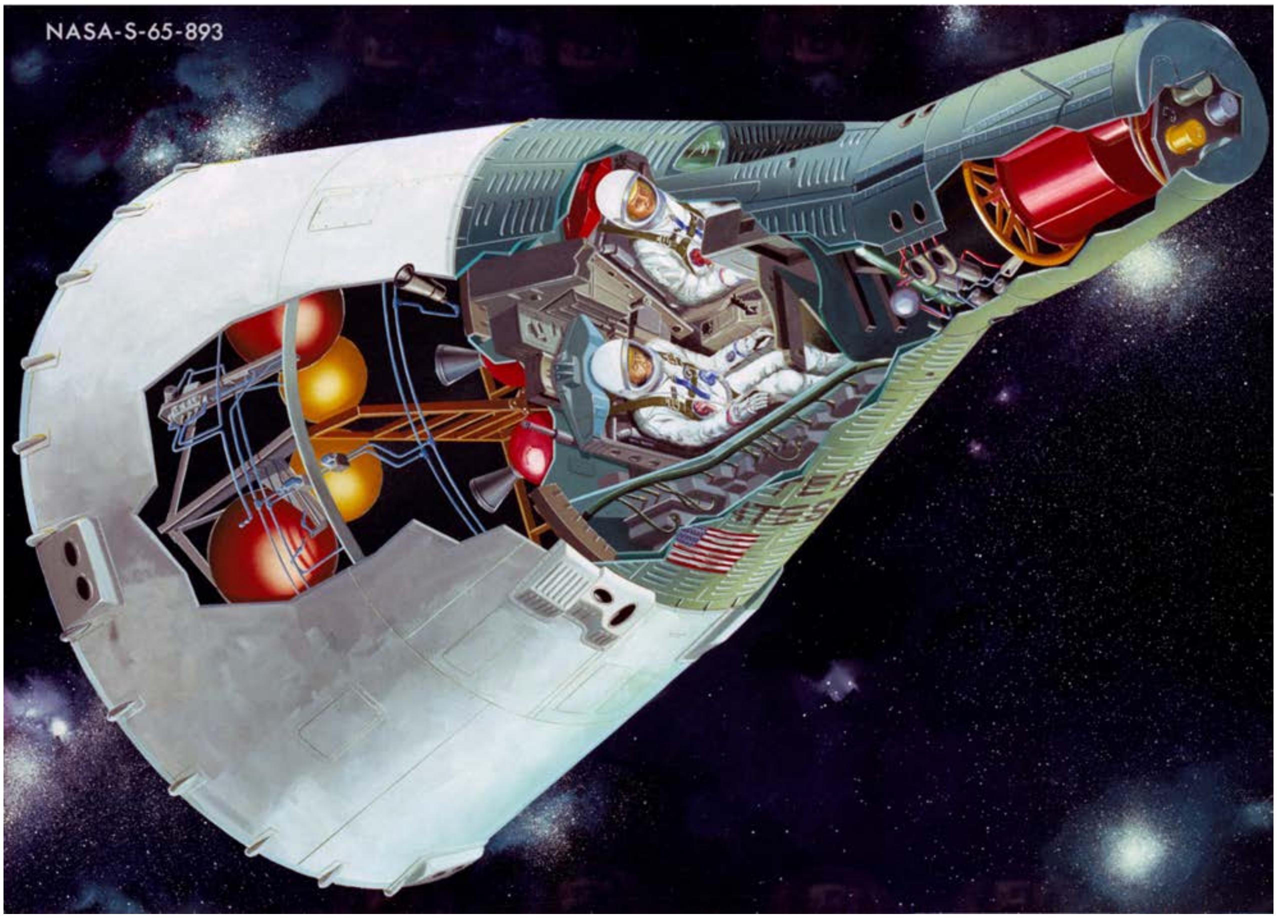
GEMINI PROGRAM

"Friendship 7: Biographies", by C. Gainor, 2007, James A. Chamberlin. Retrieved December 1, 2007, from http://history.nasa.gov/friendship7/pages/bios.html

Figure 15J-1 James A. Chamberlin



NASA Gemini: Stepping Stone to the Moon--40 Years Later. Retrieved March 5, 2008, from http://www.nasa.gov/mission_pages/gemini/index.html

Figure 15J-2 Gemini Capsule Cutaway

NASA Gemini: Stepping Stone to the Moon--40 Years Later. Retrieved March 5, 2008, from http://www.nasa.gov/mission_pages/gemini/index.html

Figure 15J-3 Gemini VII Seen From Gemini VI-A

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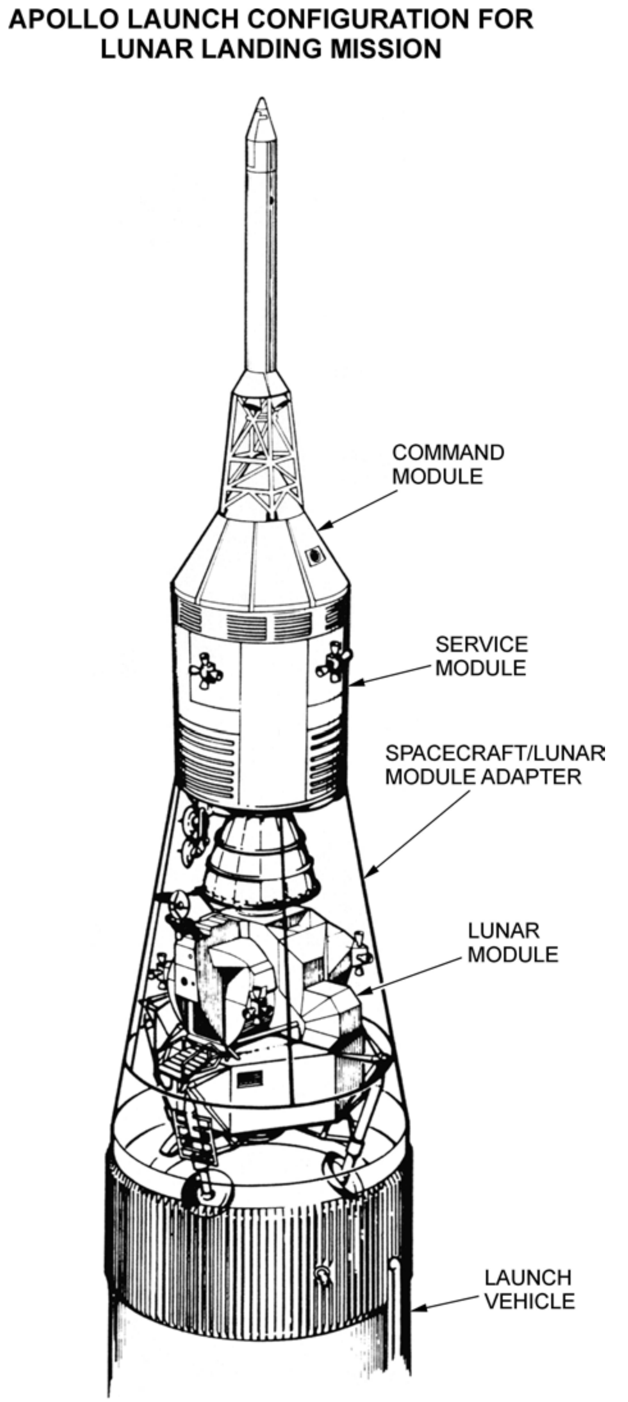
APOLLO PROGRAM

"Great Images in NASA", 2002, GPN-2000-000629. Retrieved December 1, 2007, from http://grin.hq.nasa.gov/ABSTRACTS/GPN-2000-001053.html

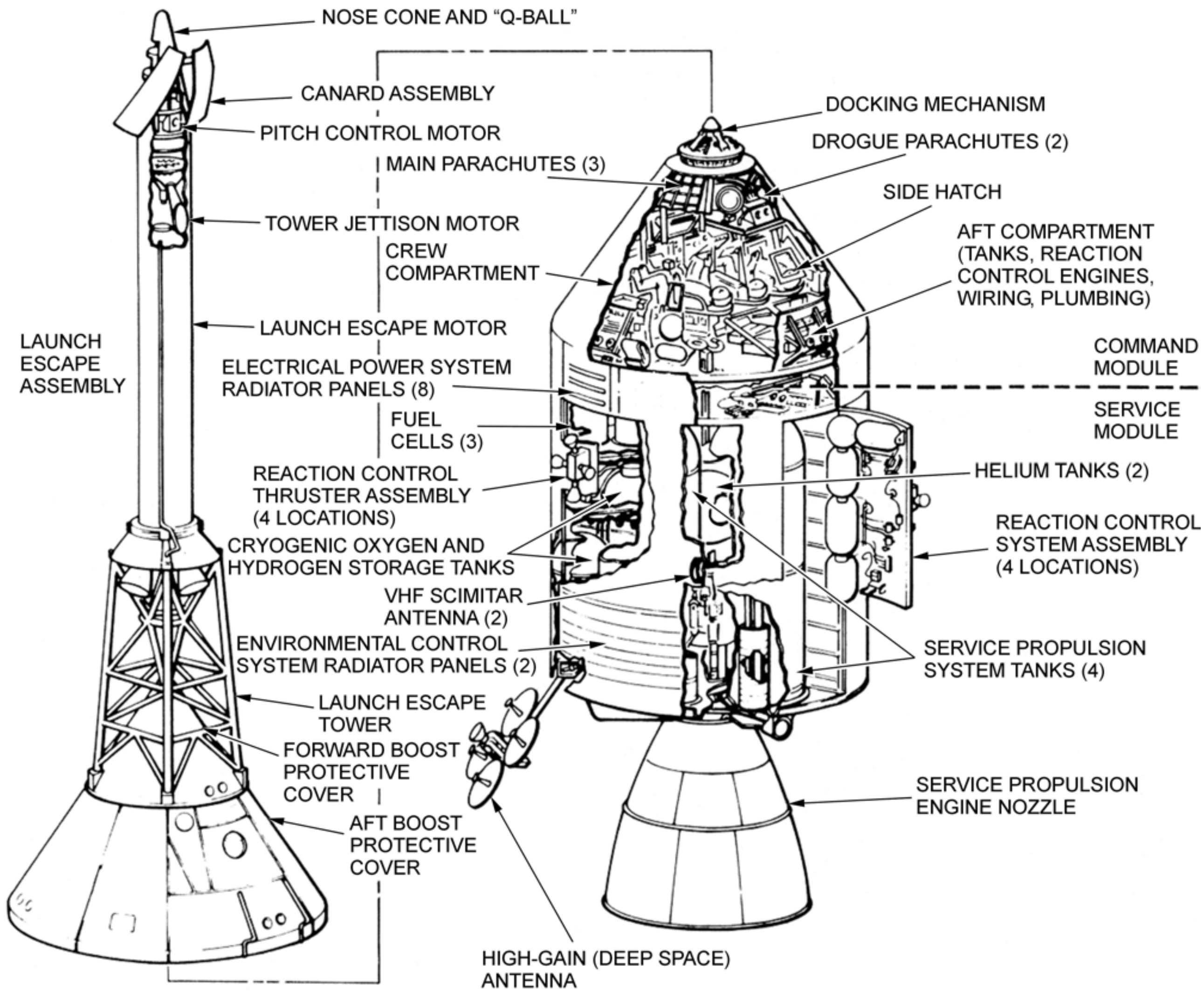
Figure 15K-1 Launching Apollo 11



Project Apollo Drawings and Technical Diagrams, NASA History Division, 2007. Retrieved March 5, 2008, from http://www.hq.nasa.gov/office/pao/History/diagrams/apollo.html

Figure 15K-2 In the Nose Cone

APOLLO COMMAND AND SERVICE MODULES AND LAUNCH ESCAPE SYSTEM



Project Apollo Drawings and Technical Diagrams, NASA History Division, 2007. Retrieved March 5, 2008, from http://www.hq.nasa.gov/office/pao/History/diagrams/apollo.html

Figure 15K-3 Modules Revealed

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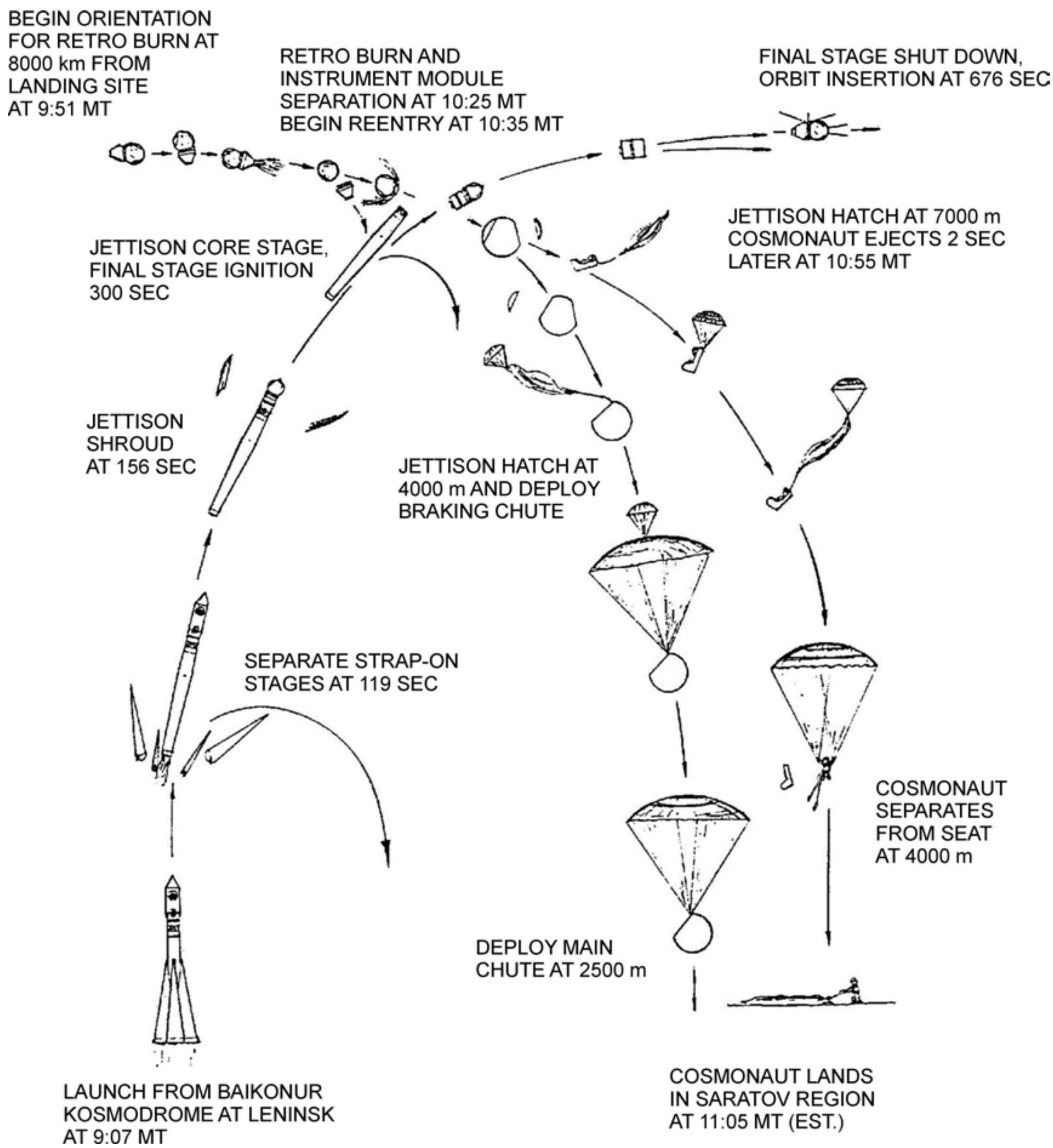
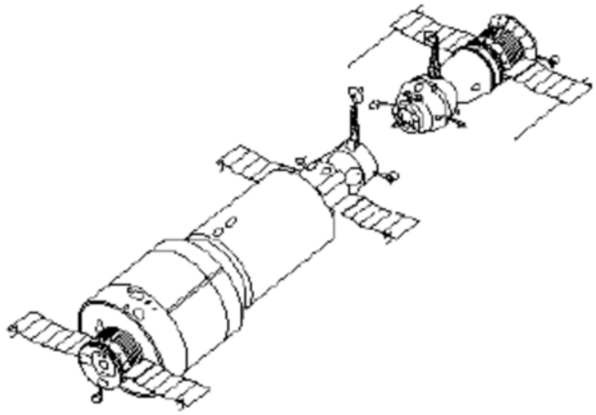
VOSTOK PROGRAM



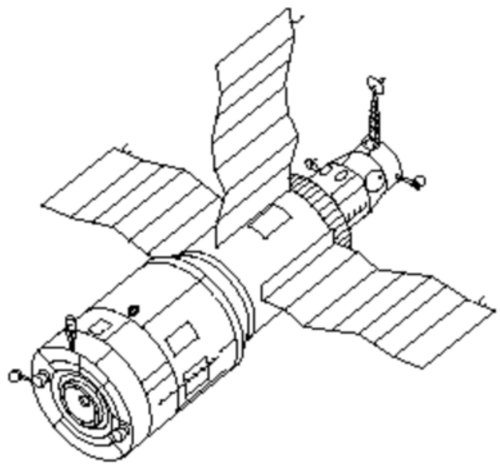
"Great Images in NASA", 2002, GPN-2002-000224. Retrieved December 1, 2007, from http://grin.hq.nasa.gov/ABSTRACTS/GPN-2000-001053.html

Figure 15L-1 Vostok-1 Historic First Manned Spacefight



"NASA Facts", 1997, International Space Station: Russian Space Stations. Retrieved December 1, 2007, from http://spaceflight.nasa.gov/history/shuttle-mir/spacecraft/to-s-mir.htm

Figure 15L-2 Salyut-1 Station With a Soyuz About to Dock

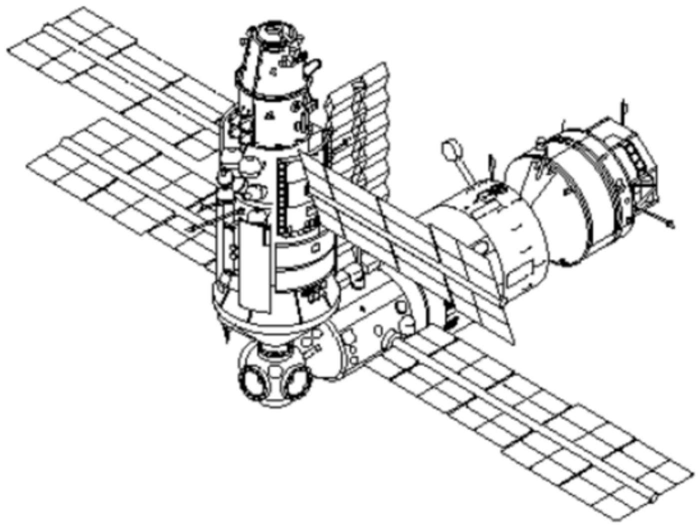


"NASA Facts", 1997, International Space Station: Russian Space Stations. Retrieved December 1, 2007, from http://spaceflight.nasa.gov/history/shuttle-mir/spacecraft/to-s-mir.htm

Figure 15L-3 Salyut-6 (1977–1982)

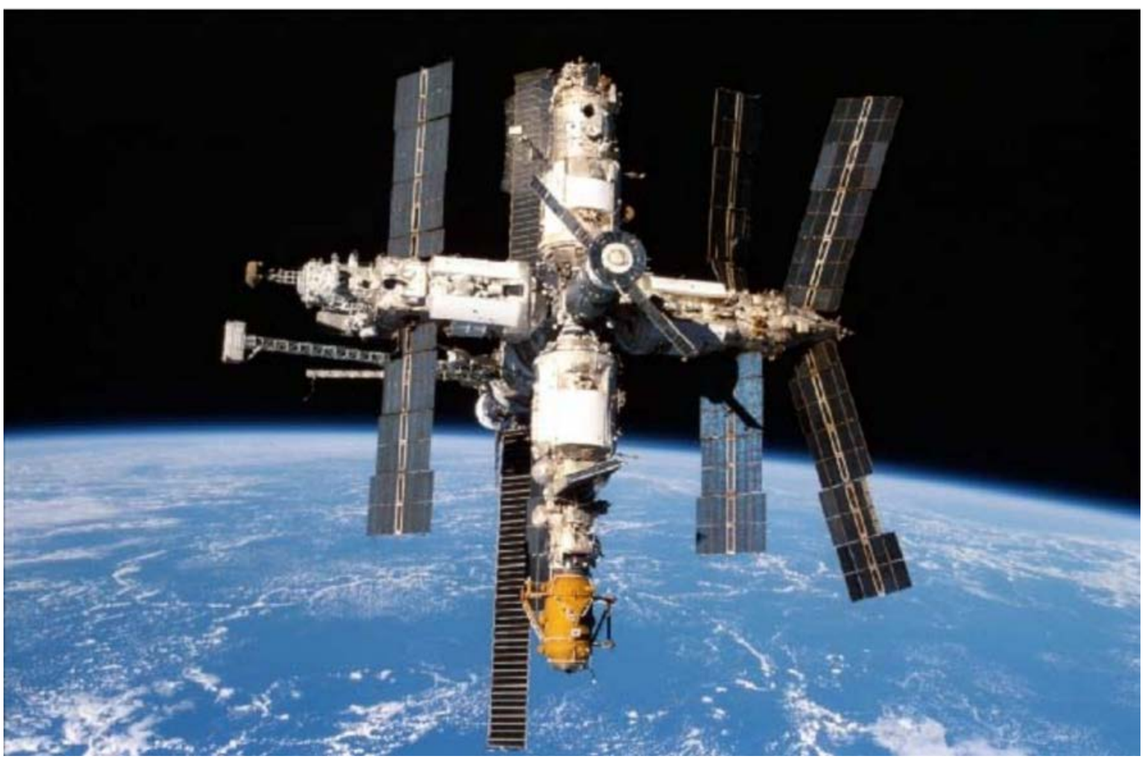
"Wikipedia", 2007, Salyut Program. Retrieved November 30, 2007, from http://en.wikipedia.org/wiki/Image:Salyut_7_from_Soyuz_T-13.jpg

Figure 15L-4 Salyut-7



"NASA Facts", 1997, International Space Station: Russian Space Stations. Retrieved December 1, 2007, from http://spaceflight.nasa.gov/history/shuttle-mir/spacecraft/to-s-mir.htm

Figure 15L-5 Mir Space Station



NASA "Multimedia Photo Gallery", 1998, STS 89. Retrieved December 2, 2007, from http://spaceflight.nasa.gov/history/shuttle-mir/spacecraft/s-mir.htm

Figure 15L-6 The Mir Space Station and Earth

CSA LOGO

Canadian Space Agency, 2008, Canadian Space Agency Logo. Retrieved April 14, 2008, from http://upload.wikimedia.org/wikipedia/en/0/01/Canadian_Space_Agency_logo.png

Figure 15M-1 CSA Logo

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OSM LOGO

Canadian Space Agency, 2008, Operational Space Medicine Logo. Retrieved April 14, 2008, from http://www.space.gc.ca/asc/eng/astronauts/osm_crest.asp

Figure 15N-1 OSM Logo

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CANADIAN SPACE PROGRAM

CANADA'S INVOLVEMENT IN SPACE TECHNOLOGIES

The CSA headquarters is located at the John H. Chapman Space Centre in Saint-Hubert, Que. Canada is involved in many aspects of space exploration. Canadian scientists and researchers are particularly interested with the development and testing of space technologies.

The David Florida Laboratory (DFL). The David Florida Laboratory is Canada's world-class spacecraft assembly, integration and testing centre.

The Canadian Analogue Research Network (CARN). CARN is the organization that uses Canadian sites for field studies. These analogue sites approximate conditions that may exist or have existed on Mars and other planetary bodies such as the moon and the Solar System's icy moons.

Partnerships With the Canadian Space Agency (CSA). The CSA has many partners including international space agencies, industry, post-secondary researchers and educational projects.

CSA MISSIONS

CSA has participated in many space missions with its partners. Canadian astronauts or Canadian technology has gone into space with agencies from the United States, Russia, Europe and Japan. There have been four basic types of CSA missions:

Telecommunications. Being able to keep all places in the country connected with advanced telecommunication services assists every Canadian in competing in the global marketplace.

Earth Observation. Canada's earth-observation initiatives enhance our understanding of the planet and its environment. By observing the earth from space, essential information on oceans, ice, land environments and the atmosphere is gathered.

Space Exploration. Canadian astronauts have been on many missions in various space shuttles. Canada is renowned for the exceptional instruments in its science satellites which collect data that will expand our understanding of the origin, formation, structure and evolution of celestial bodies and the universe.

Space Medicine. Space medicine combines many medical specialties to examine the effects of spaceflight on humans and prevent problems associated with living in a unique, isolated, and extreme environment like space.

For more information about the Canadian space program visit www.space.gc.ca.

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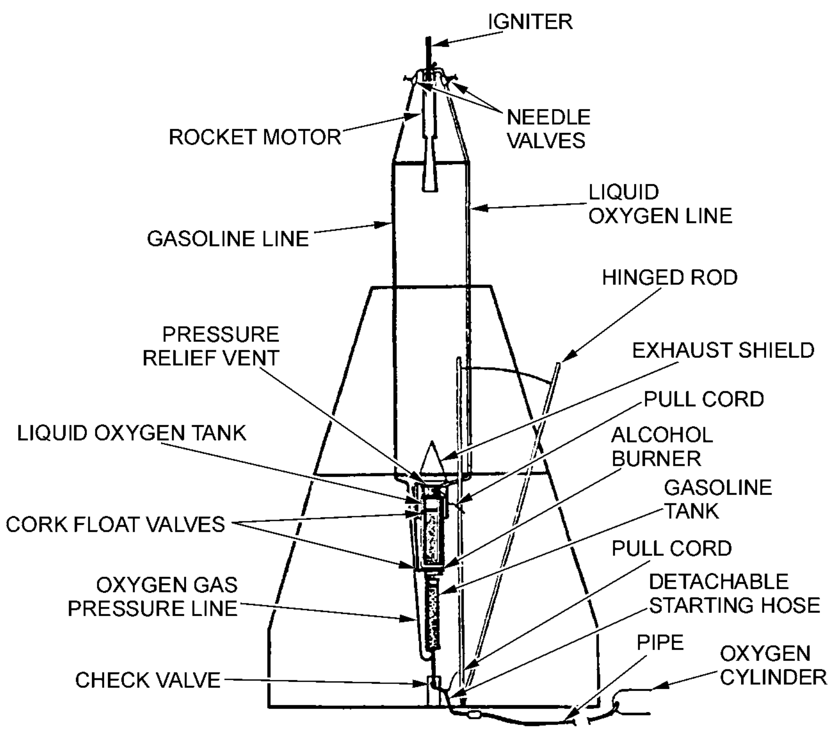
SPACE FLIGHT HISTORY

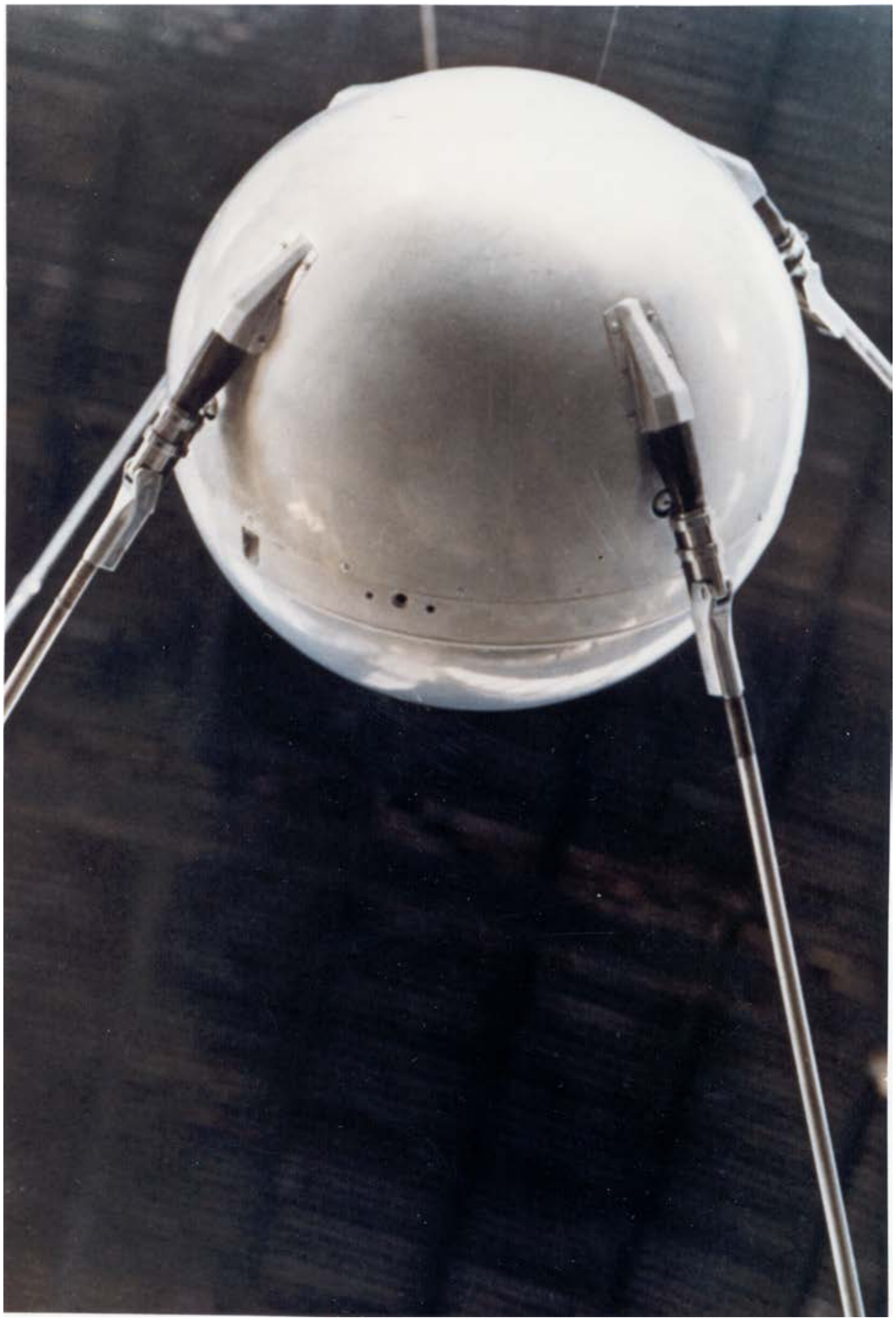
"A Beginner's Guide to Rockets", Rocket Gallery. Retrieved March 24, 2007, from http://exploration.grc.nasa.gov/education/rocket/gallery.html

Figure 15P-1 Dr. Robert Goddard, Father of Modern Rocketry



"Rockets", A Brief History of Rockets. Retrieved March 24, 2007, from http://www.grc.nasa.gov/WWW/K-12/TRC/Rockets/history_of_rockets.html

Figure 15P-2 Goddard's 1926 Rocket

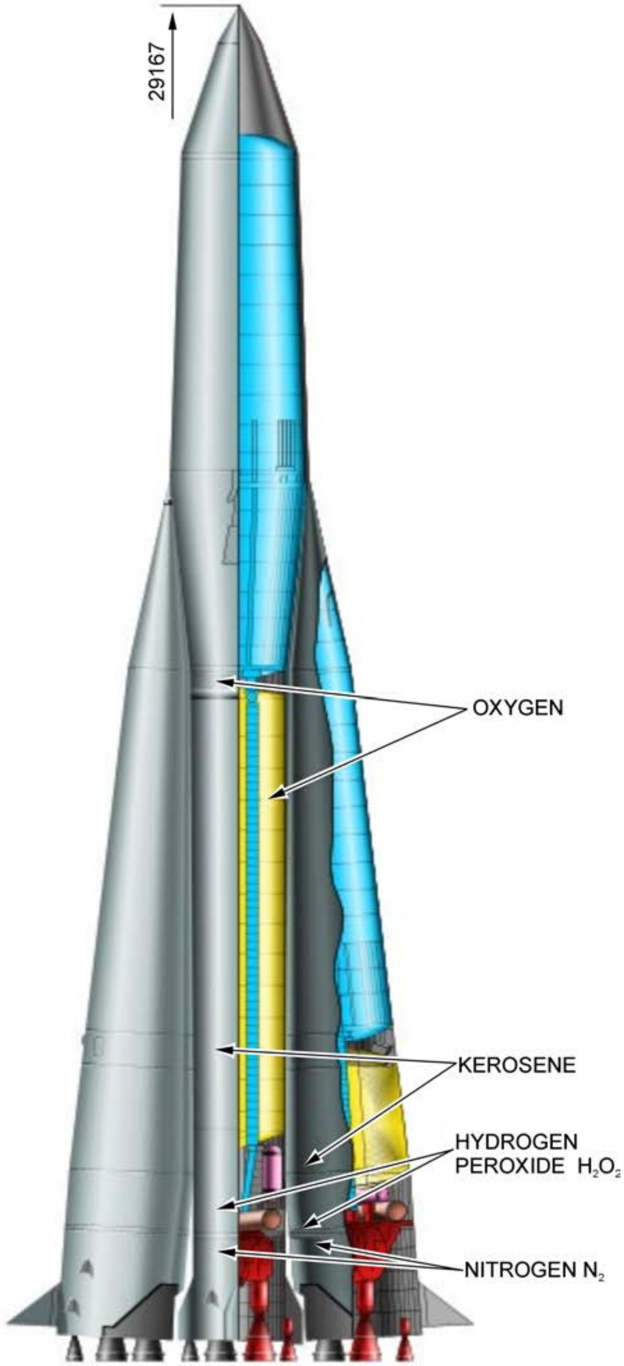


"Sputnik: The Fiftieth Anniversary", 2007, Photo Gallery. Retrieved November 29, 2007, from http://www.history.nasa.gov/sputnik/gallerysput.html

Figure 15P-3 Sputnik

"Sputnik: The Fiftieth Anniversary", 2007, Photo Gallery. Retrieved November 29, 2007, from http://www.history.nasa.gov/sputnik/gallerysput.html

Figure 15P-4 Sputnik Revealed



"Roscosmos", Space Programs Rocket Families R-7. Retrieved March 25, 2007, from http://www.roscosmos.ru/Roket1Show.asp?RoketID=8

Figure 15P-5 Sputnik's R-7 Rocket

"Russian Space Web", 2007, Rockets. Retrieved December 2, 2007, from http://www.russianspaceweb.com/r7.html

Figure 15P-6 Two-Stage R-7 Rocket Modified for Sputnik-1

Flight History JUPITER-C (three-stage configuration):

September 20, 1956: Lofted a payload to an altitude of 1 095 km and a range of 5 313 km from Cape Canaveral, Florida.

May 15, 1957: Lofted a nose cone to an altitude of 563 km and a range of 1 143 km.

August 8, 1957: Lofted a 1/3-scale Jupiter nose cone to an altitude of 459 km and a range of 2 141 km.

January 31, 1958: Orbited Explorer-1 satellite.

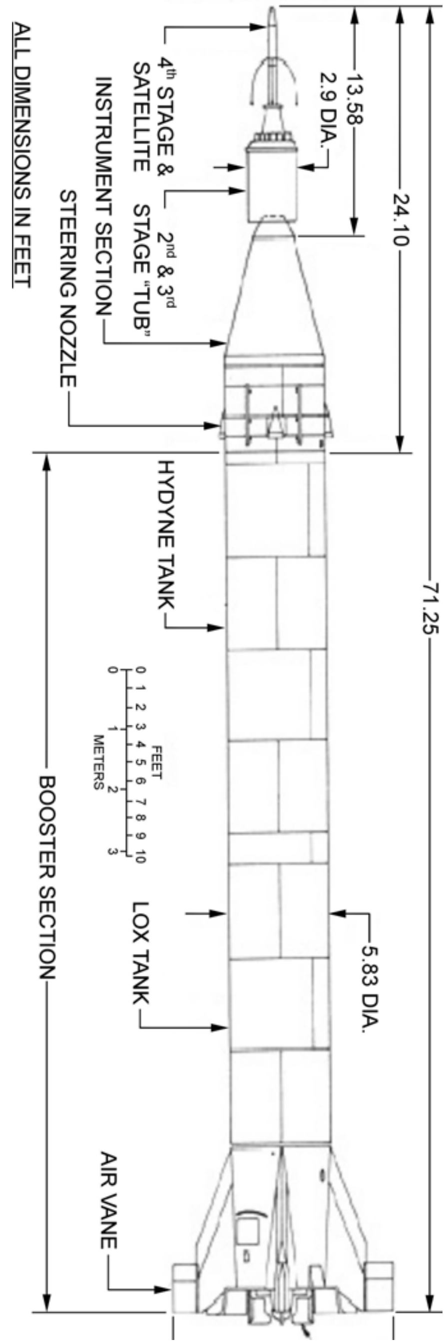
March 5, 1958: Attempted orbit of Explorer-II failed because fourth stage did not ignite.

March 26, 1958: Orbited Explorer-III satellite.

July 26,1958: Orbited Explorer-IV satellite.

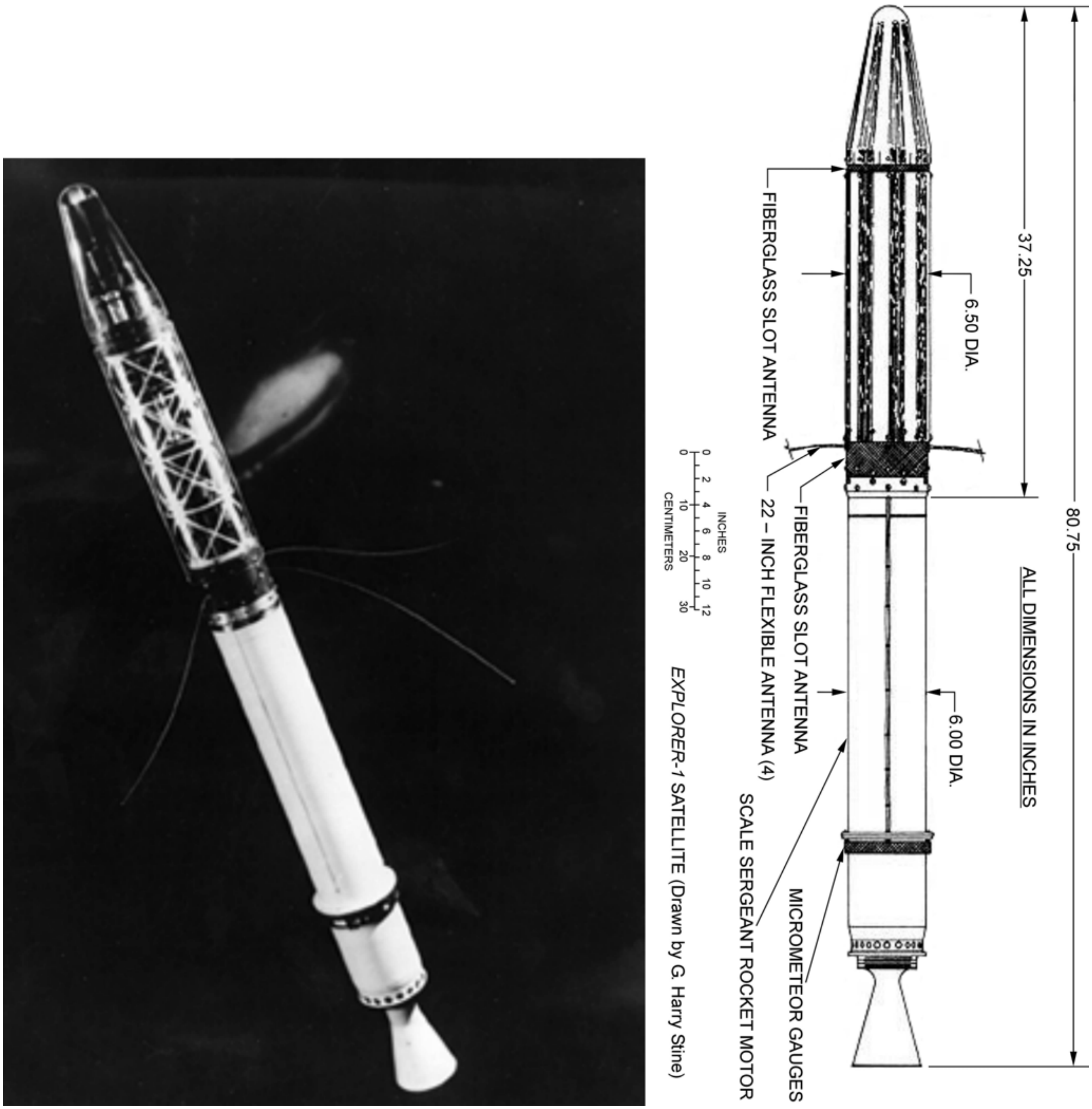
August 24,1958: Attempted orbit of Explorer-V satellite failed because booster collided with second stage after separation, causing the upper stage firing angle to be off.

October 23, 1958: Attempted orbit of inflatable Beacon satellite failed when second stage separated prematurely from booster.



"Sputnik: The Fiftieth Anniversary", Sputnik and The Dawn of the Space Age. Retrieved March 25, 2007, from http://history.nasa.gov/sputnik/expinfo.html

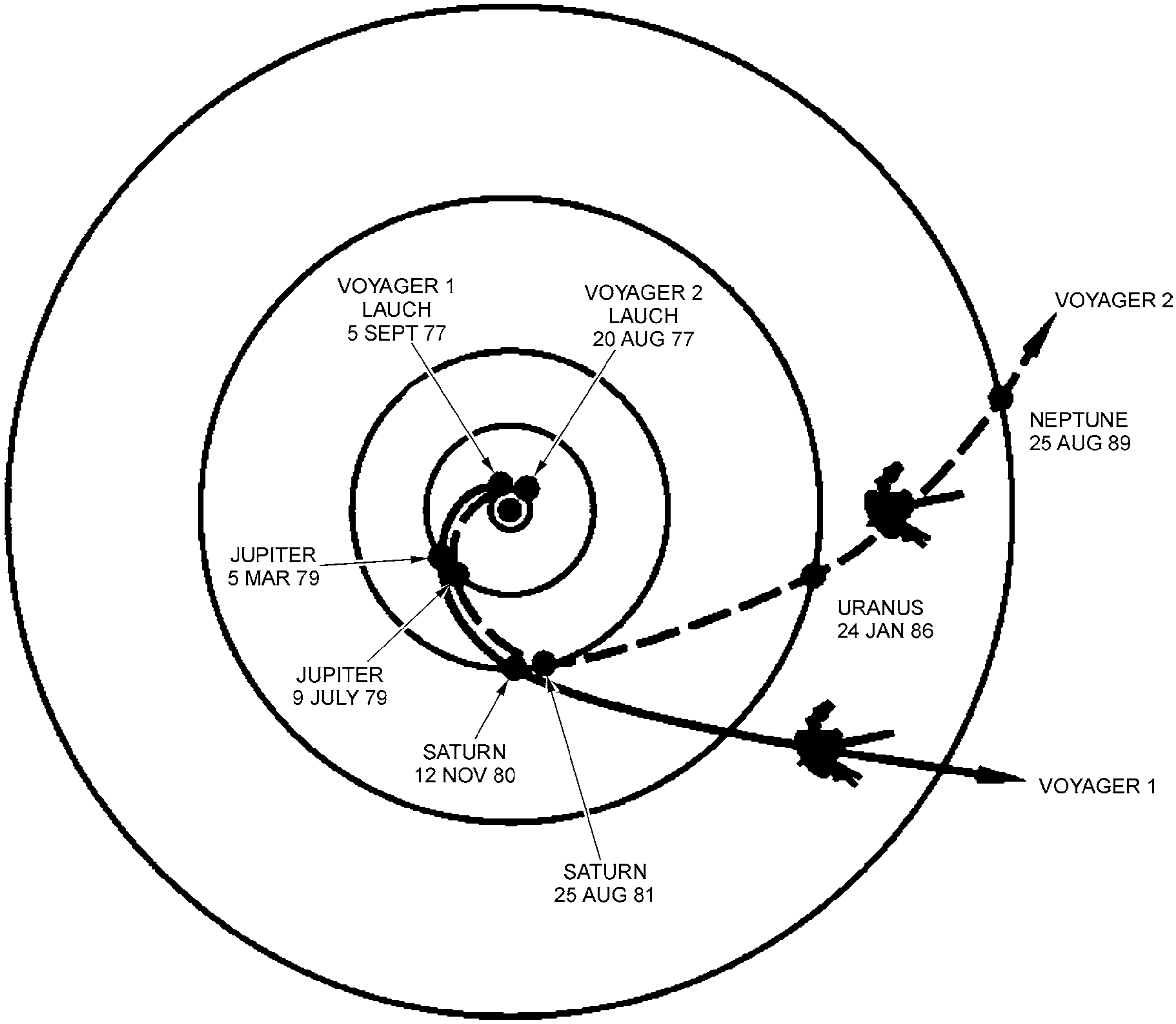
Figure 15P-7 Jupiter-C and Explorer 1



"Sputnik: The Fiftieth Anniversary", Sputnik and The Dawn of the Space Age. Retrieved March 25, 2007, from http://history.nasa.gov/sputnik/expinfo.html

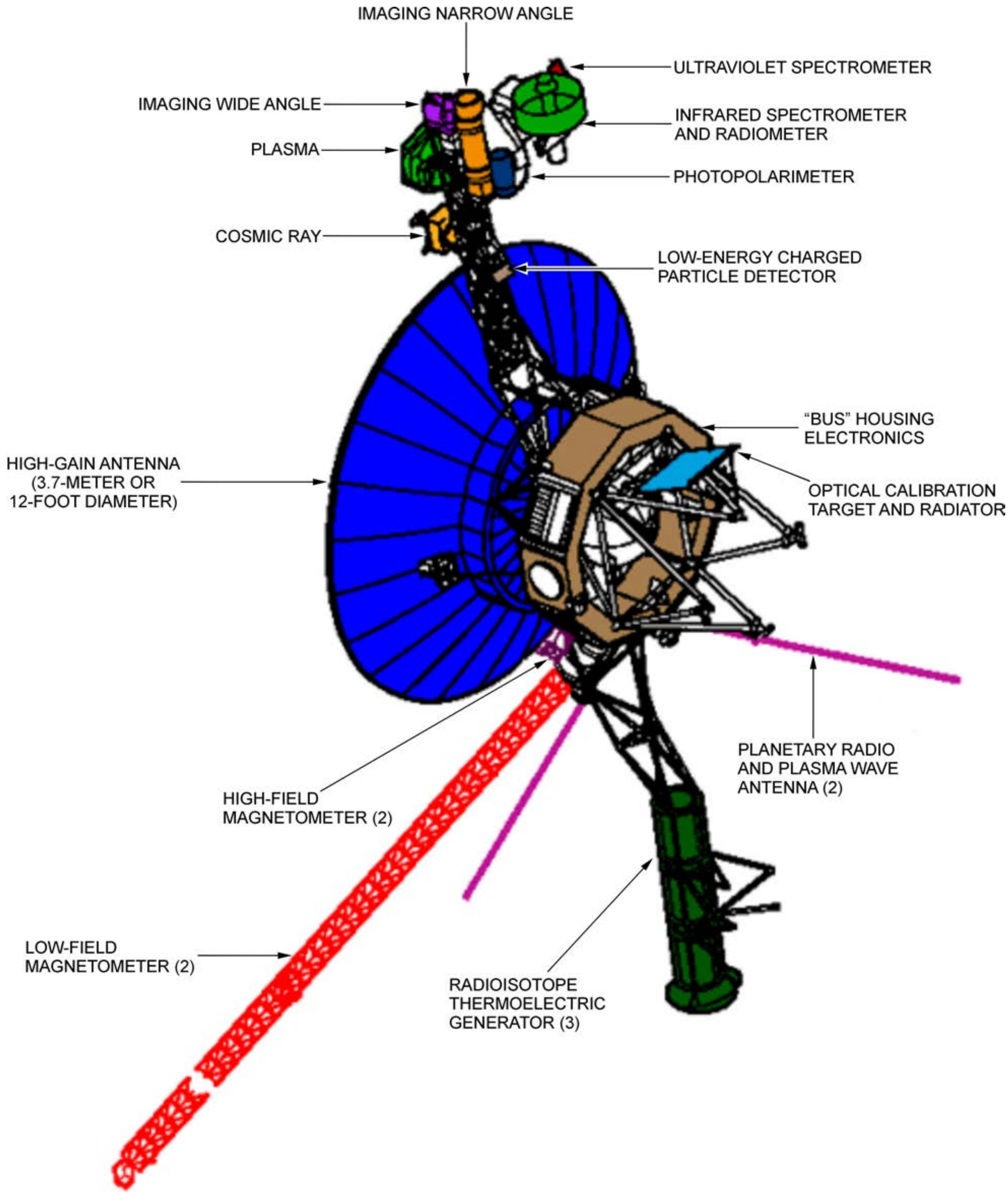
Figure 15P-8 Explorer 1

INTERSTELLAR MISSION



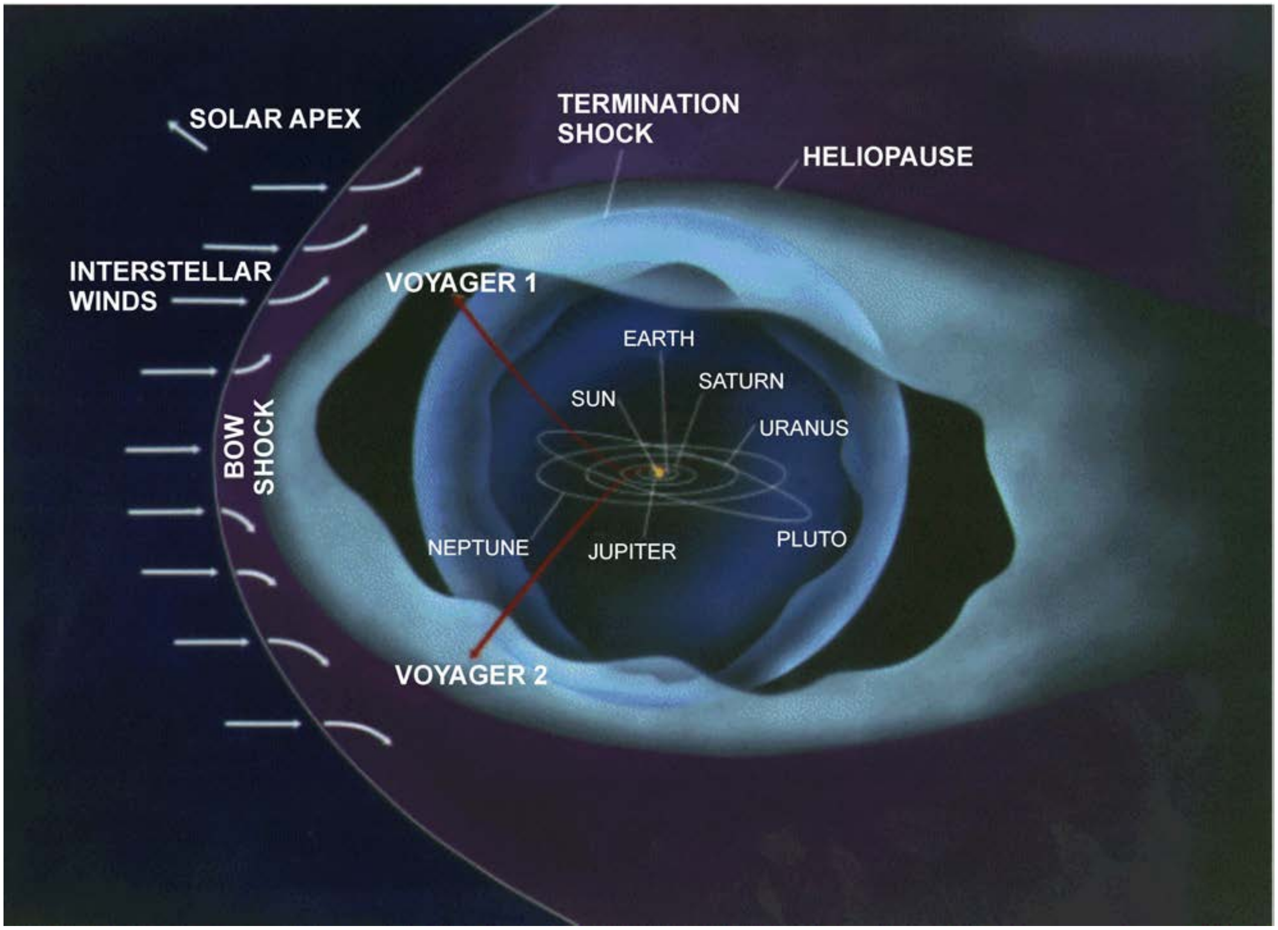
"Voyager: The Intersteller Mission", by NASA, 2004, Planetary Voyage. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/science/heliocentric.html

Figure 15Q-1 Planetary Voyage



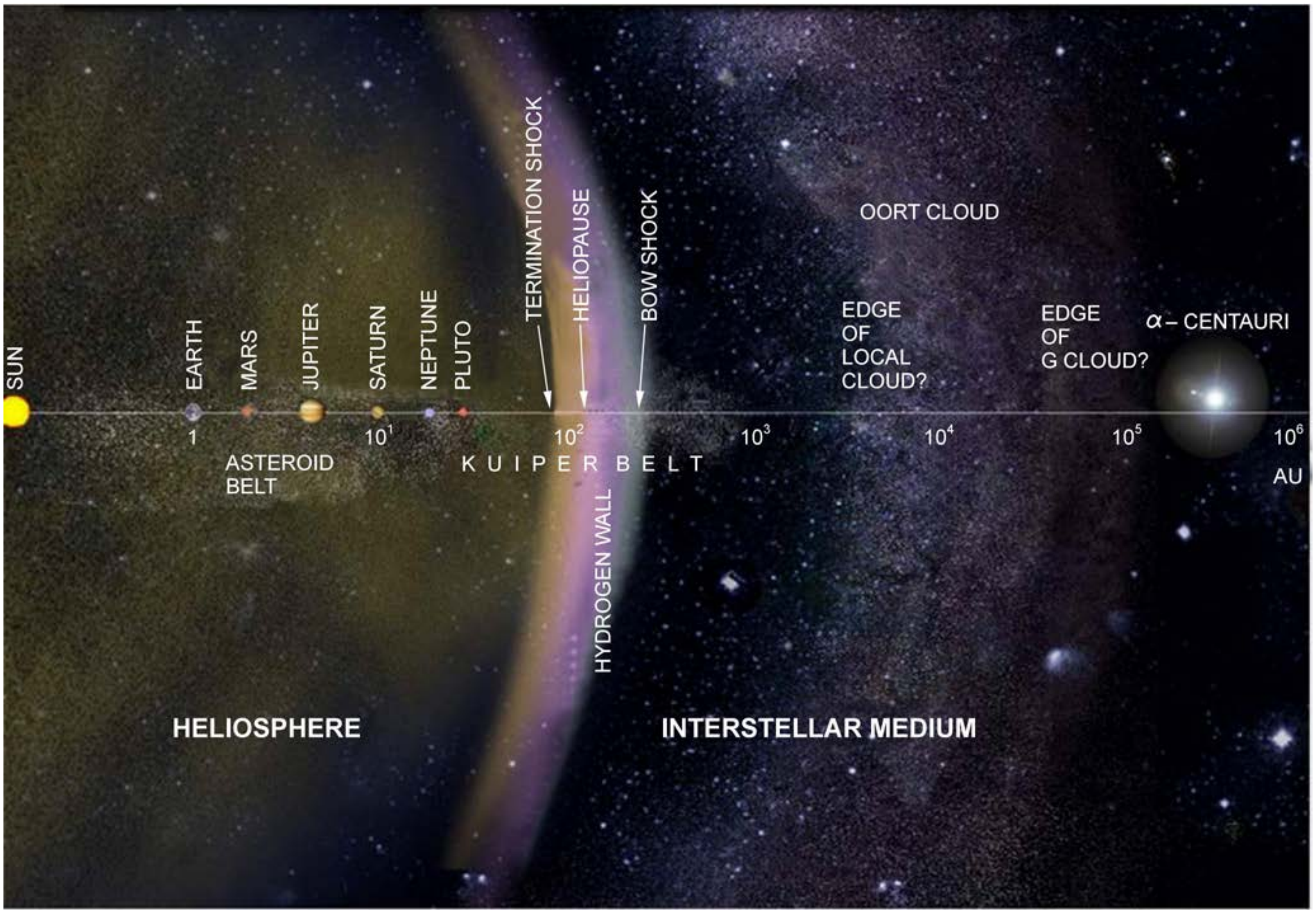
"Voyager: The Intersteller Mission", by NASA, 2004, Voyager Spacecraft. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/spacecraft/instruments.html

Figure 15Q-2 Voyager Configuration



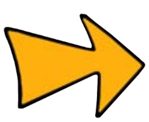
“Voyager: The Intersteller Mission”, by NASA, 2007, Overview. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/mission/mission.html

Figure 15Q-3 Voyager Interstellar Mission



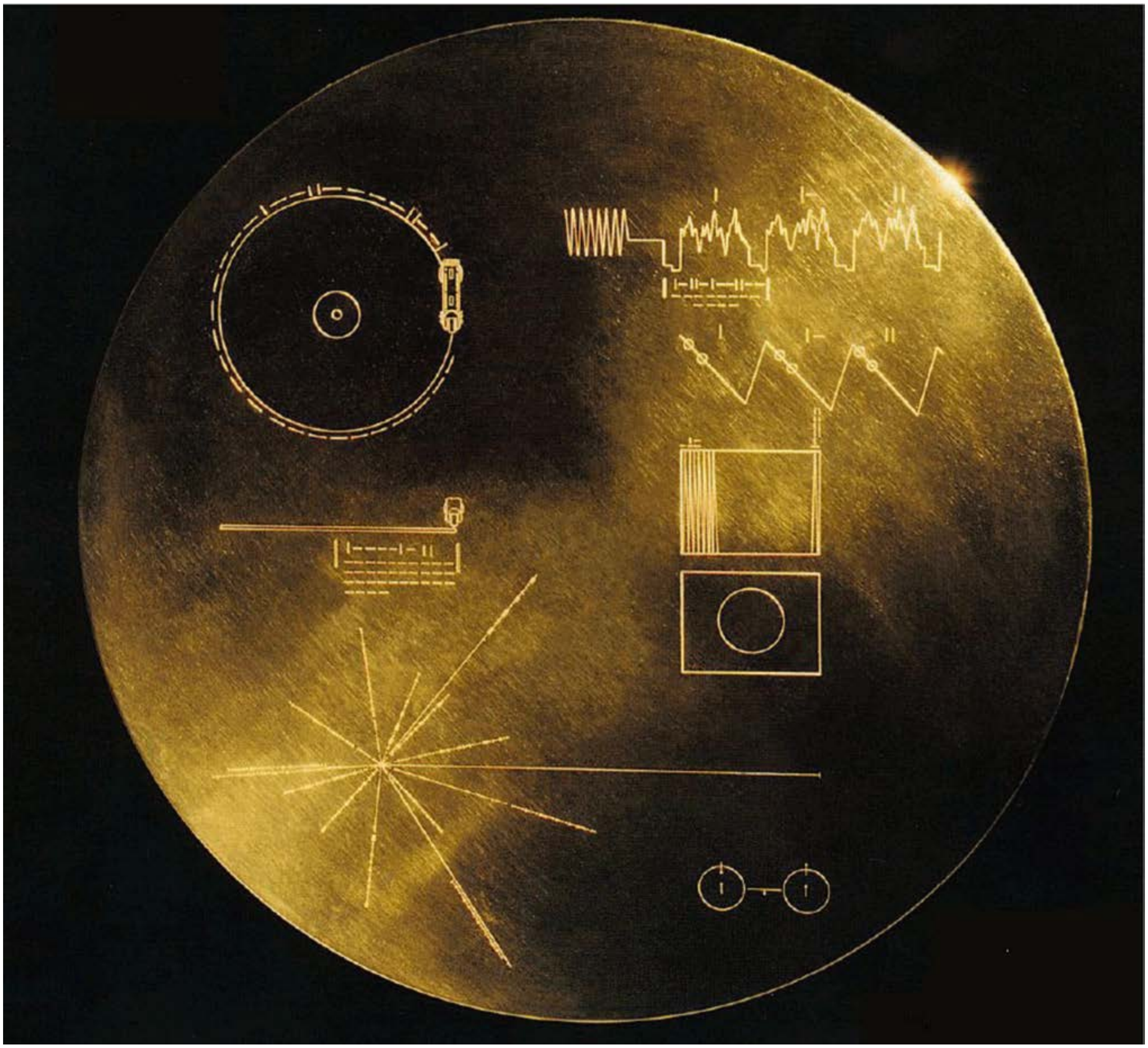
"Voyager: The Intersteller Mission", by NASA, 2004, Did You Know: Interesting Facts About the Voyager Mission. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/mission/didyouknow.html

Figure 15Q-4 Sol's Heliopause



For current distances of the Voyagers, cadets can check mission weekly reports at NASA website http://voyager.jpl.nasa.gov/mission/weekly-reports/index.htm.

The distance from earth to the sun (approximately 149 598 000 km – this dimension is not perfectly stable) is said to be one astronomical unit (AU). Such a huge unit of measure is useful when dealing with astronomical dimensions. The vertical dimension shown in Figure 15Q-4 is therefore approximately 5 AU. The horizontal dimension, however, includes all the space between earth's sun, Sol, and Alpha Centauri – Sol's closest neighbour – 277 600 AU. To cover this vast space, the horizontal scale was altered so that it increases as the viewer moves from left to right. The scale changes are marked on the central horizontal line, as 10^1,10^2,10^3 10^4,10^5 and 10^6. This means that the distance between each pair of marks on the horizontal line is ten times larger than the distance between the preceding pairs of marks. That is, Saturn's orbit is only 10 AU from the sun, 10^3 is one thousand AU from the sun, while 10^6 is one million AU from the sun – well past Alpha Centauri. This method (logarithmic representation) is necessary for representing astronomical distances.



"Voyager: The Intersteller Mission", by NASA, 2003, The Golden Record. Retrieved April 8, 2008, from http://voyager.jpl.nasa.gov/spacecraft/goldenrec1.html

Figure 15Q-5 The Golden Record

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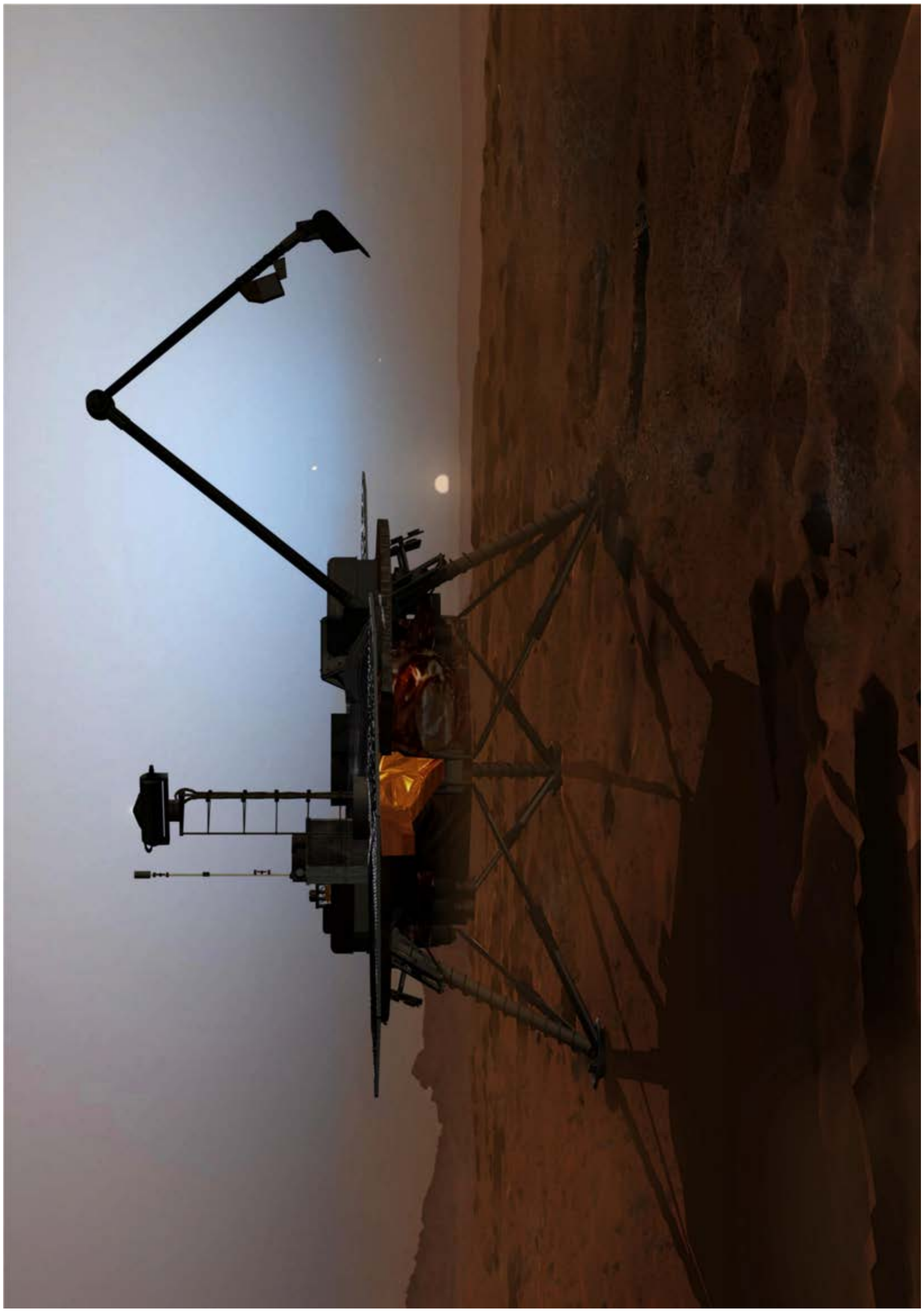
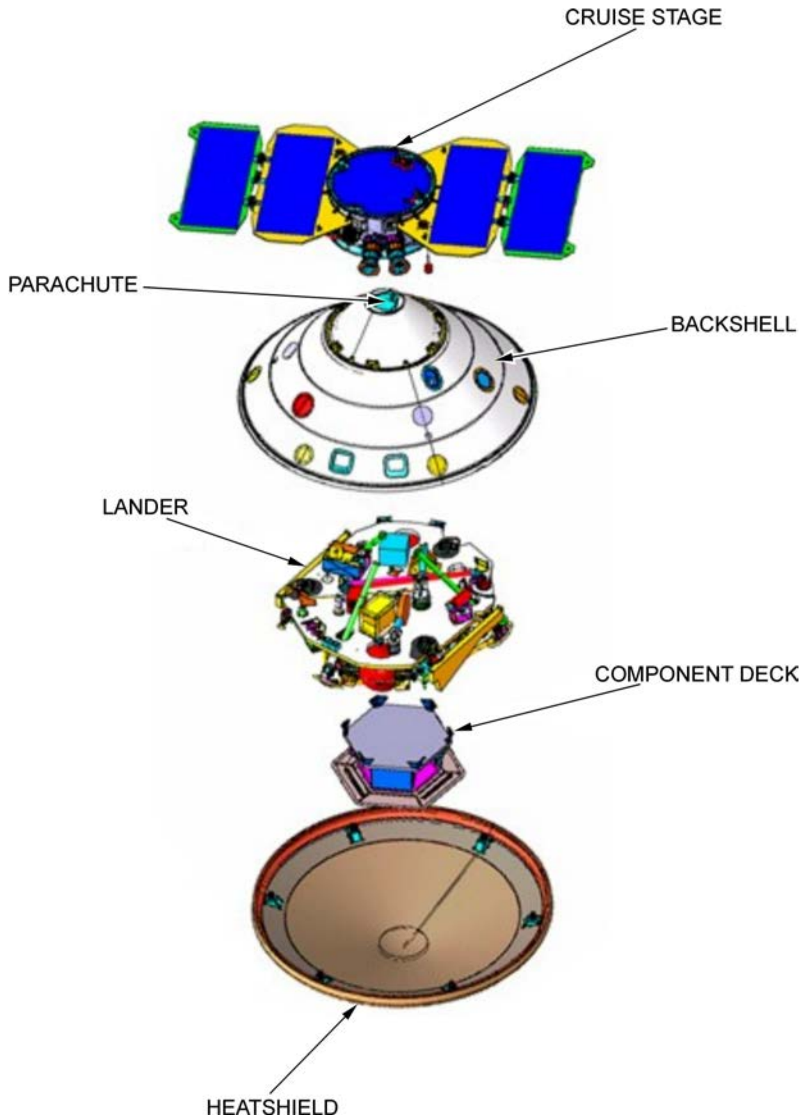
MARS MISSION



"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008 from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-1 Phoenix Mars Lander



"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008, from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

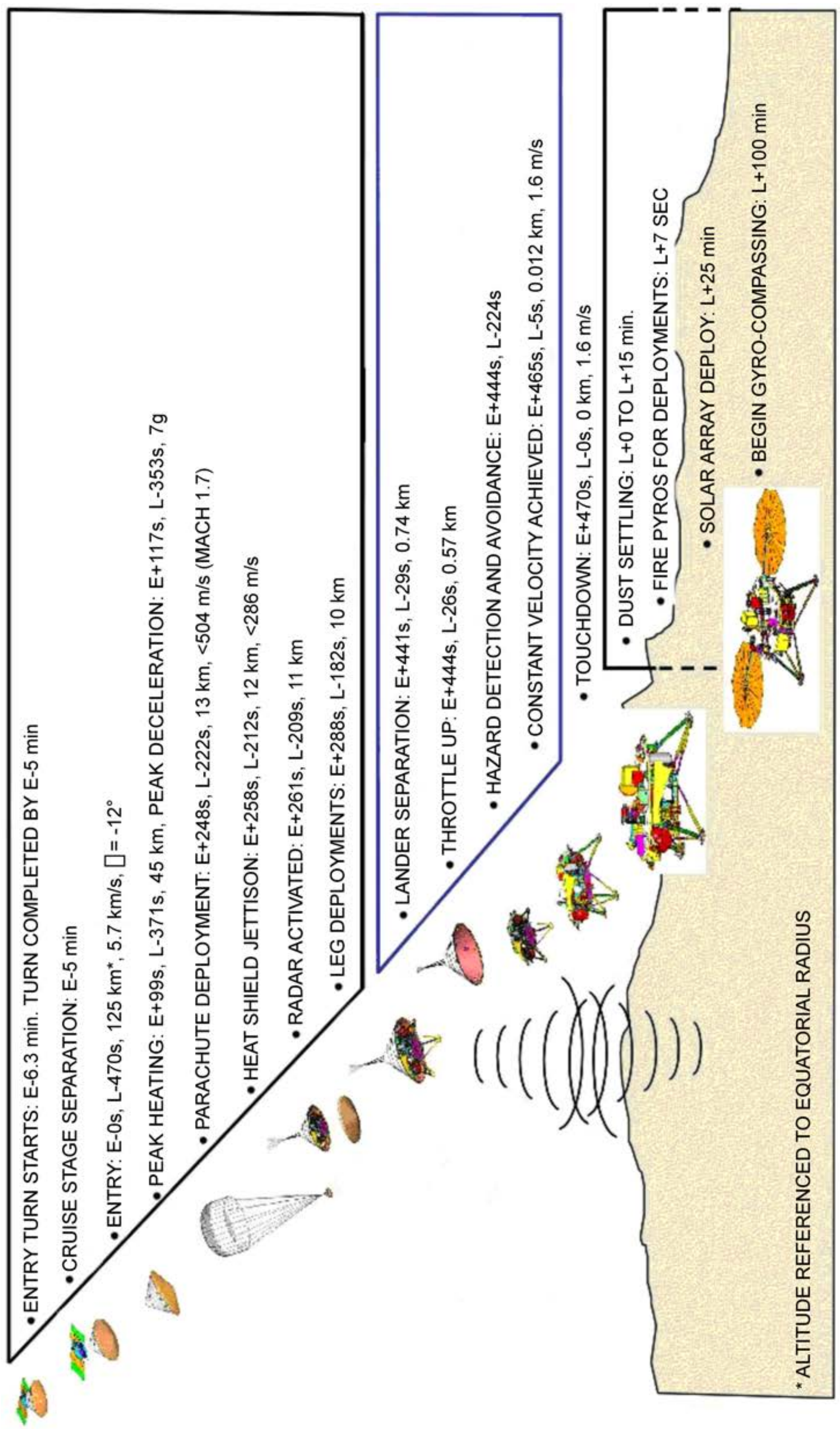
Figure 15R-2 Phoenix Revealed

"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008, from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-3 Testing the Spacecraft

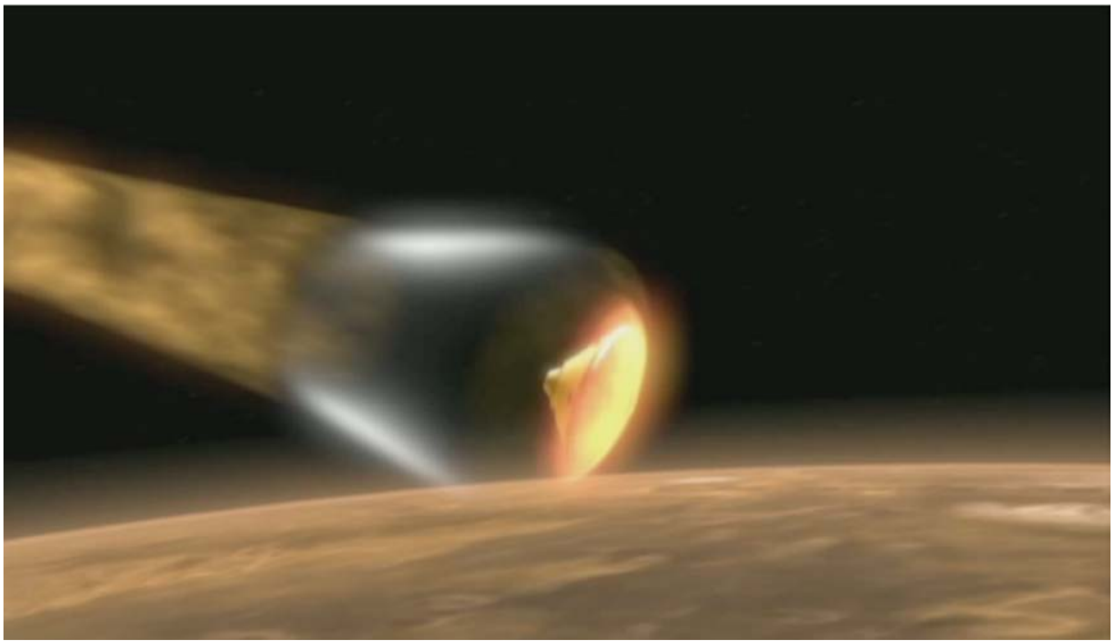
"Phoenix Mars Mission", by NASA 2008, The Spacecraft. Retrieved April 6, 2008, from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-4 Jettisoning the Cruise Stage at Entry Minus 5 Min



"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008 from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-5 Phoenix Arriving



"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008 from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-6 Entering the Martian Atmosphere at Entry Plus 99 Seconds

"Phoenix Mars Mission", by NASA, 2008, The Spacecraft. Retrieved April 6, 2008 from http://phoenix.lpl.arizona.edu/images.php?gID=301&cID=1

Figure 15R-7 Powered Landing on Mars at Entry Plus 470 Seconds

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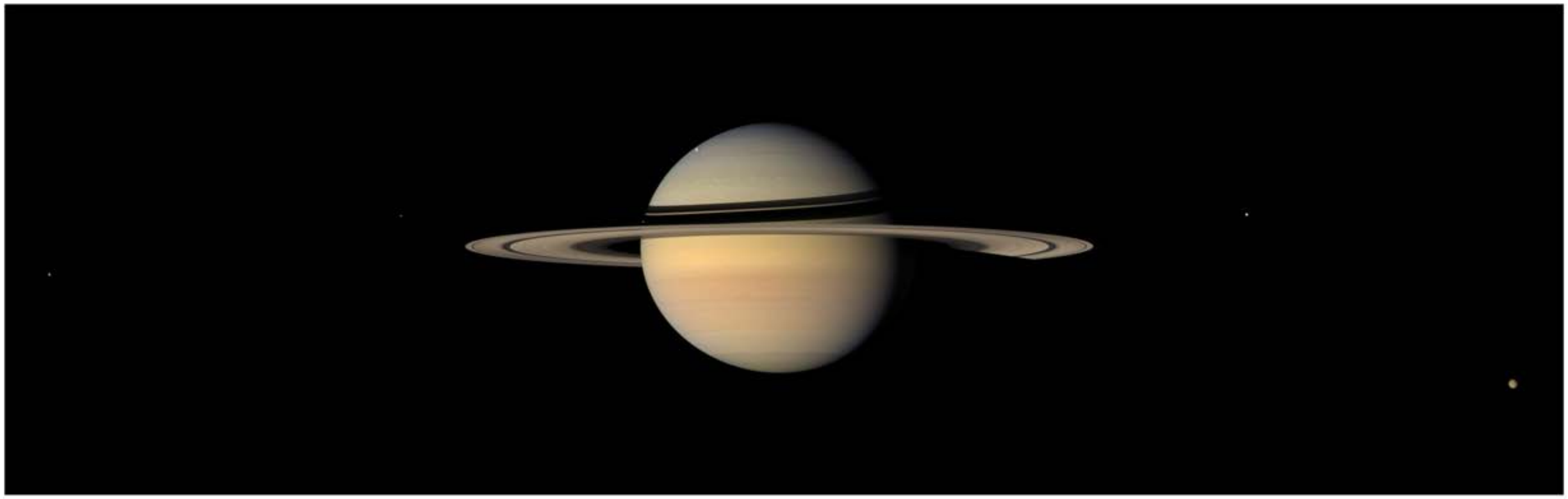
MOONS VIDEO WORKSHEET

Notes:
1. The information is encountered in the same order as the questions.
2. Read the questions carefully before beginning the MOONS video.

QUESTIONS

1. How long ago do scientists think that Earth's moon was formed? ______________________________
2. How many years did NASA's Galileo probe spend exploring Jupiter's moons? ______________________________
3. What lies under Europa's frozen crust? ______________________________
4. What year did the European Space agency launch Cassini-Huygens? ______________________________
5. How long did it take the Cassini-Huygens probe to travel to Saturn? ______________________________
6. What kind of scientist is the narrator, Athena Coustenis? ______________________________
7. What is Saturn's most distant moon? ______________________________
8. What year did Jean-Dominique Cassini discover Saturn's moon Iapetus? ______________________________
9. Half of Iapetus is dark as coal; what is the other half? ______________________________
10. What runs around the equator of Iapetus? ______________________________
11. What is the largest moon of Saturn? ______________________________
12. What year did the Cassini spacecraft release the Huygens probe to visit Titan? ______________________________
13. How long did Huygens operate on Titan's surface? ______________________________



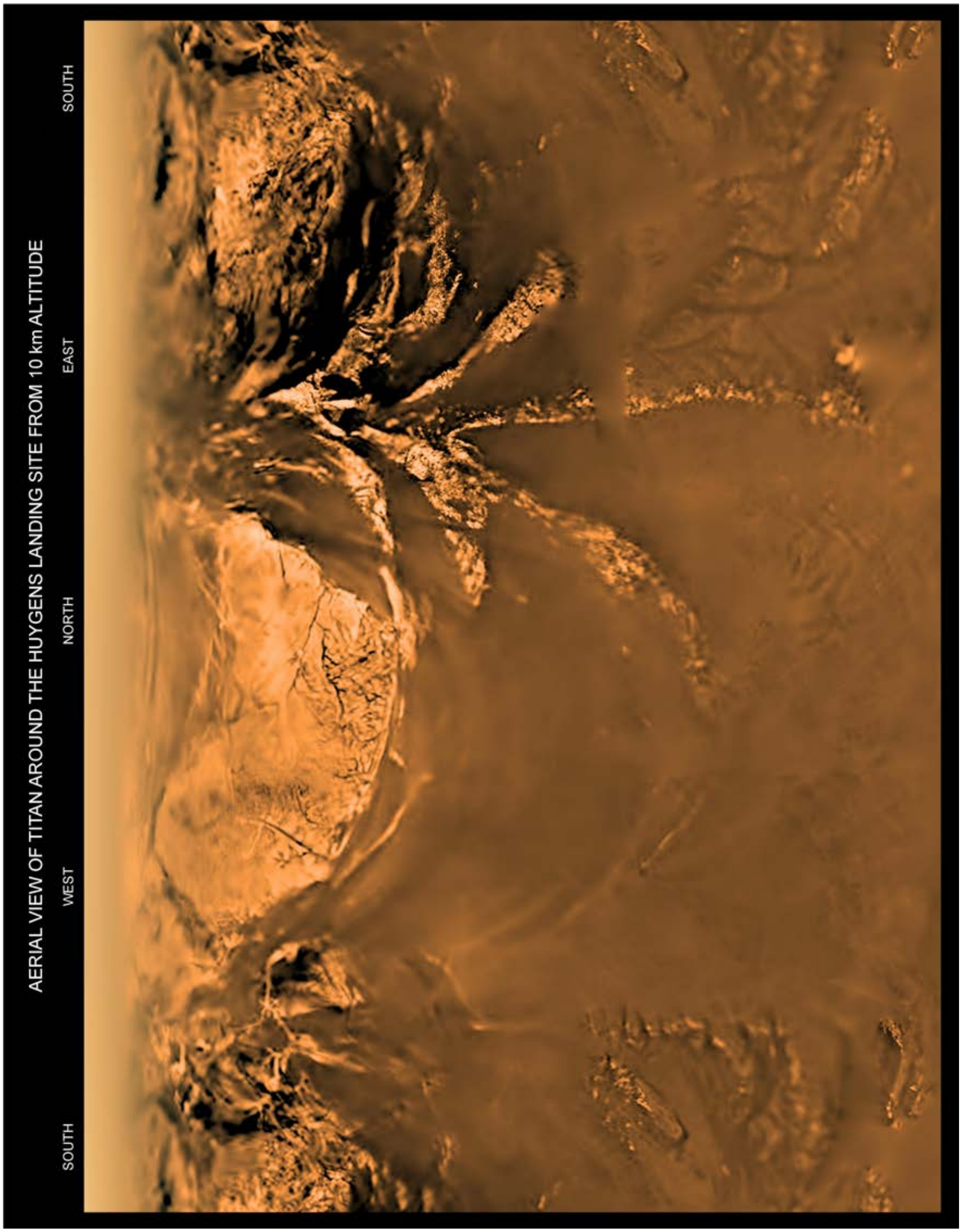
While on final approach for its September 2007 close encounter with Saturn's moon, Iapetus, Cassini spun around to take in a sweeping view of the Saturn System. Iapetus (1 468 km, or 912 miles across) is the only major moon of Saturn with a significant inclination to its orbit. From the other major satellites, the rings would appear nearly edge-on, but from Iapetus, the rings usually appear at a tilt, as seen here.

Moons visible in this image: **Dione** (1 126 km diameter) at center left, **Enceladus** (505 km diameter) near the left side ansa (or ring edge), **Mimas** (397 km diameter) a speck against the ring shadows on Saturn's western limb, **Rhea** (1 528 km diameter) against the bluish backdrop of the northern hemisphere, **Tethys** (1 071 km diameter) near the right ansa, and **Titan** (5 150 km diameter) near lower right.

The images were obtained on September 10, 2007, at a distance of approximately 3.3 million km from Saturn at a sun-Saturn-spacecraft, or phase, angle of 33 degrees. Image scale is about 195 km per pixel on the planet.

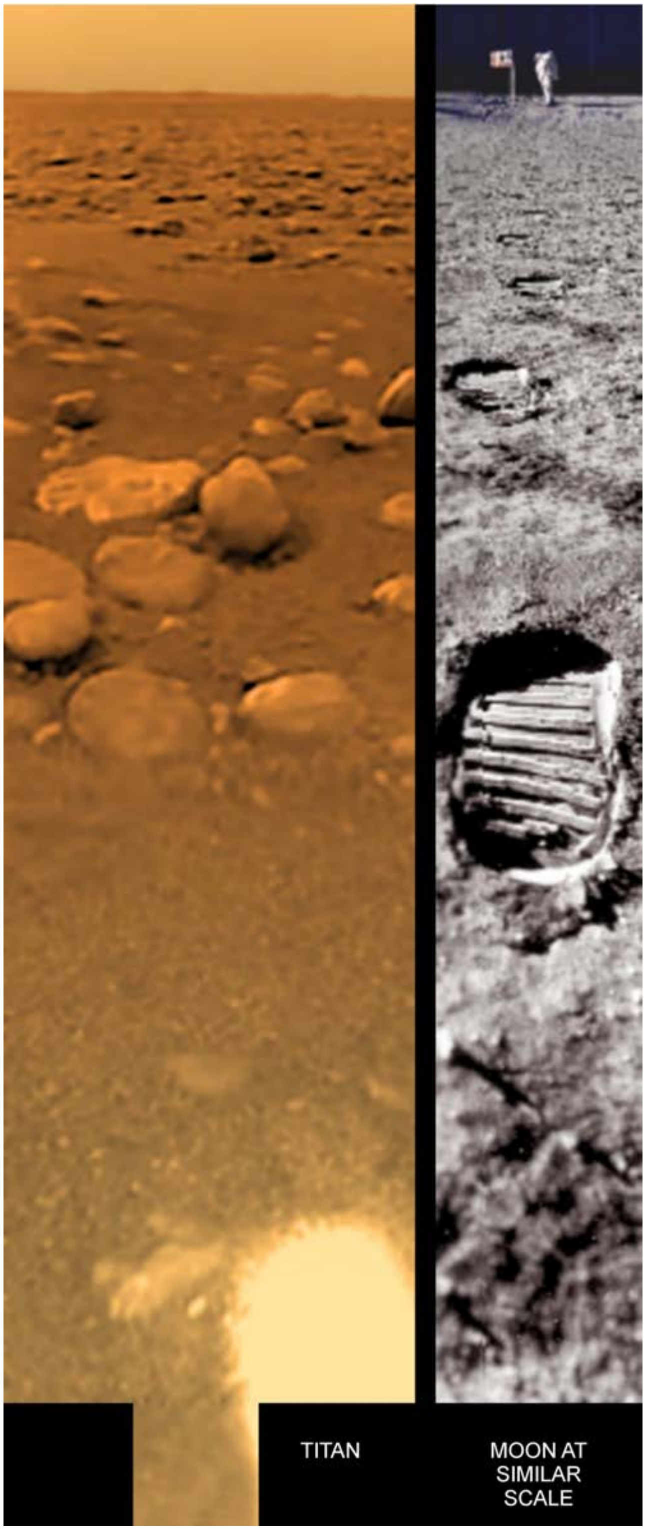
"JPL PHOTOJOURNAL", by NASA, 2007, PIA08387: The View from Iapetus. Retrieved April 6, 2008, from http://photojournal.jpl.nasa.gov/catalog/PIA08387

Figure 15S-1 Saturn, Enceladus and Titan



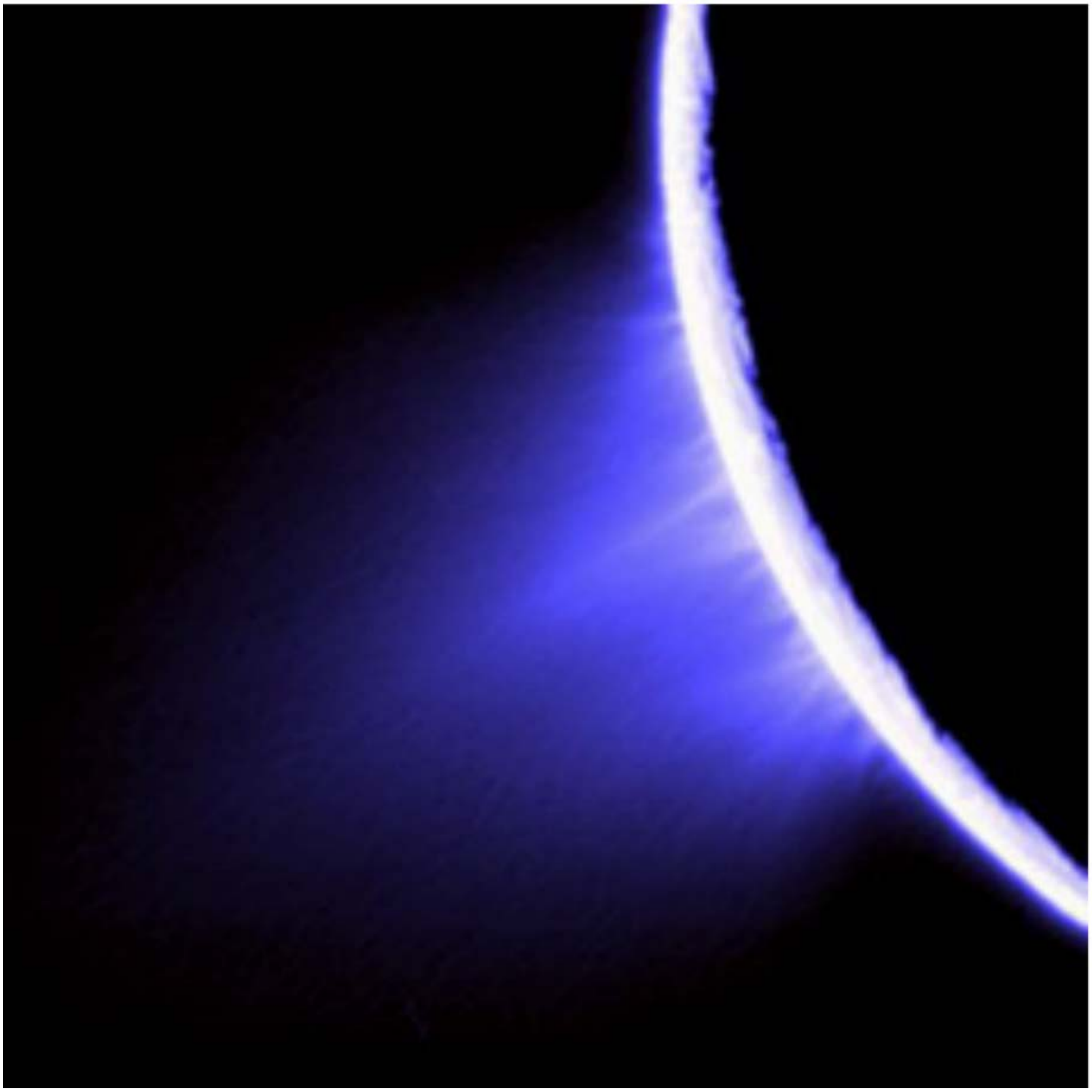
ESA Multimedia Gallery, 2008, Mercator Projection of Huygens's View. Retrieved April 6, 2008, from http://www.esa.int/esa-mmg/mmg.pl?b=b&keyword=titan%20huygens&single=y&start=25&size=b

Figure 15S-2 Huygen's Descent



"ESA Multimedia Gallery", 2008, Titan's Surface. Retrieved April 6, 2008, from http://www.esa.int/esa-mmg/mmg.pl?b=b&keyword=titan%20huygens&start=3

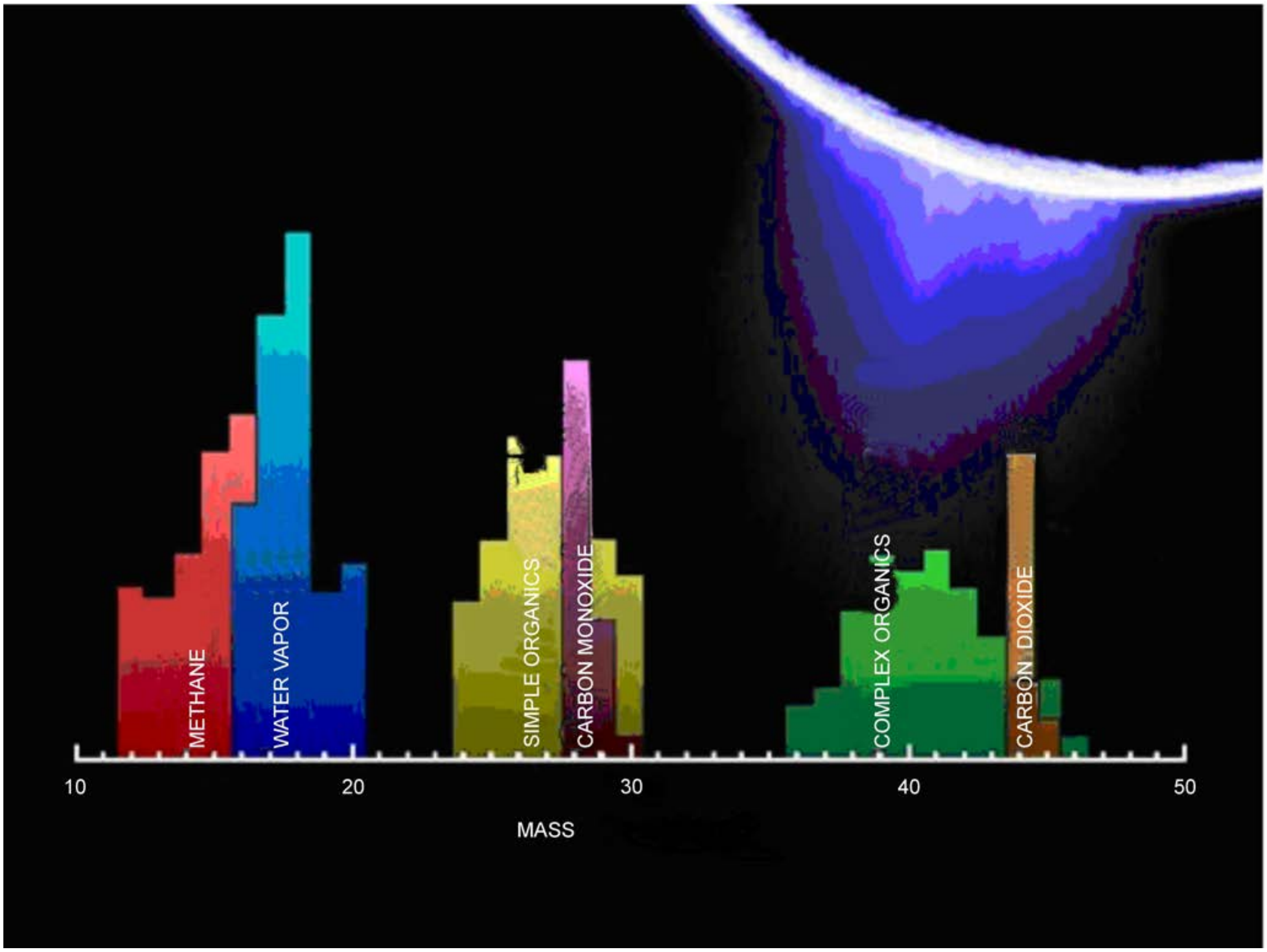
Figure 15S-3 Huygen's Resting Place



"JPL Cassini-Huygens Mission to Saturn & Titan", 2008, Jet Blue. Retrieved April 6, 2008, from http://saturn.jpl.nasa.gov/multimedia/images/image-details.cfm?imageID=2779

Figure 15S-4 The Fountains of Enceladus

Enceladus [en-SELL-ah-dus] is one of the innermost moons of Saturn. Enceladus reflects almost 100 percent of the sunlight that strikes it. Parts of Enceladus show craters 35 km in diameter. Other areas show regions with no craters indicating major resurfacing events in the geologically recent past. There are fissures, plains, corrugated terrain and other crustal deformations. All of this indicates that the interior of the moon may be liquid today, even though it should have frozen eons ago. It is postulated that Enceladus is heated by a tidal mechanism. It is disturbed in its orbit by Saturn's gravitational field and by the large neighbouring satellites Tethys and Dione. Enceladus reflects so much sunlight that its surface temperature is only -201 degrees C (-330 degrees F).



"Cassini: Unlocking Saturn's Secrets", NASA, 2008, Enceladus Plume Neutral Mass Spectrum. Retrieved April 6, 2008, from http://www.nasa.gov/mission_pages/cassini/multimedia/pia10356.html

Figure 15S-5 Composition of Enceladus' Water Plumes

ANSWERS TO *MOONS* VIDEO WORKSHEET

1. How long ago do scientists think that Earth's moon was formed? **4.5 billion years**
2. How many years did NASA's Galileo probe spend exploring Jupiter's moons? **8 years**
3. What lies under Europa's frozen crust? **A liquid ocean**
4. What year did the European Space agency launch Cassini-Huygens? **1997**
5. How long did it take the Cassini-Huygens probe to travel to Saturn? **7 years**
6. What kind of scientist is the narrator, Athena Coustenis? **Astrophysicist**
7. What is Saturn's most distant moon? **Phoebe**
8. What year did Jean-Dominique Cassini discover Saturn's moon Iapetus? **1671**
9. Half of Iapetus is dark as coal; what is the other half? **Bright as snow**
10. What runs around the equator of Iapetus? **An icy ridge**
11. What is the largest moon of Saturn? **Titan**
12. What year did the Cassini spacecraft release the Huygens probe to visit Titan? **2005**
13. How long did Huygens operate on Titan's surface? **Barely a few minutes**

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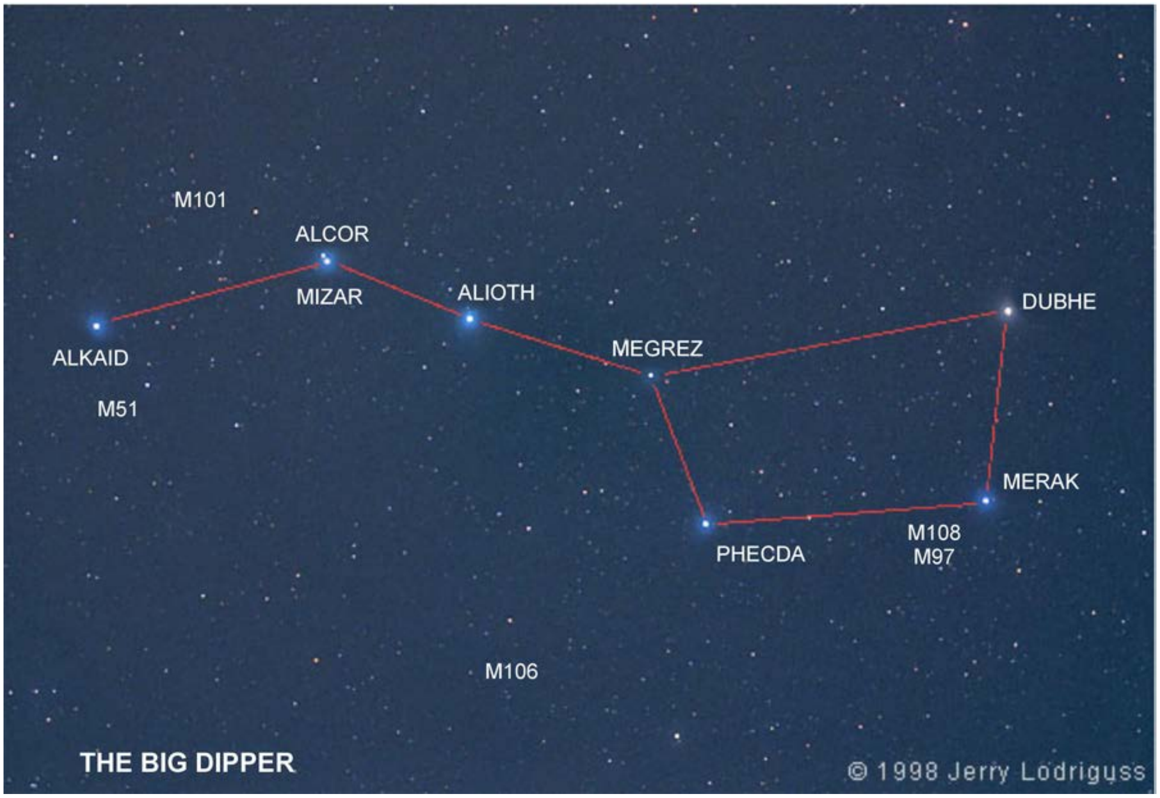
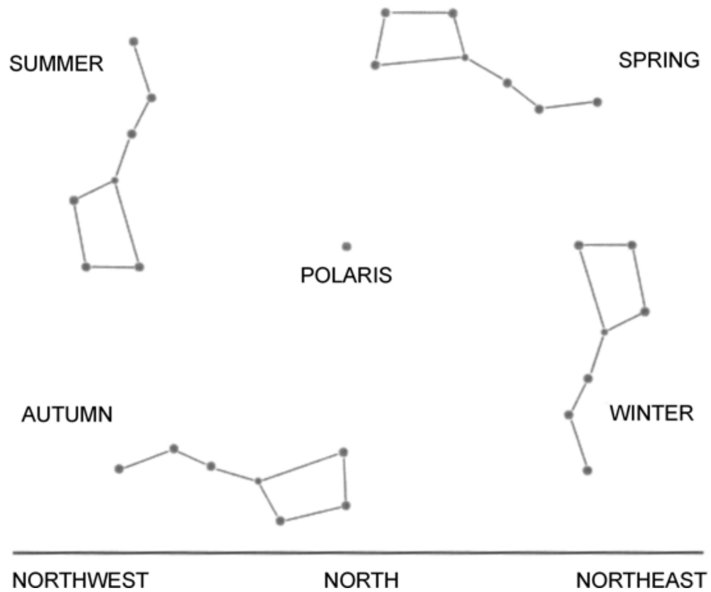
CONSTELLATIONS



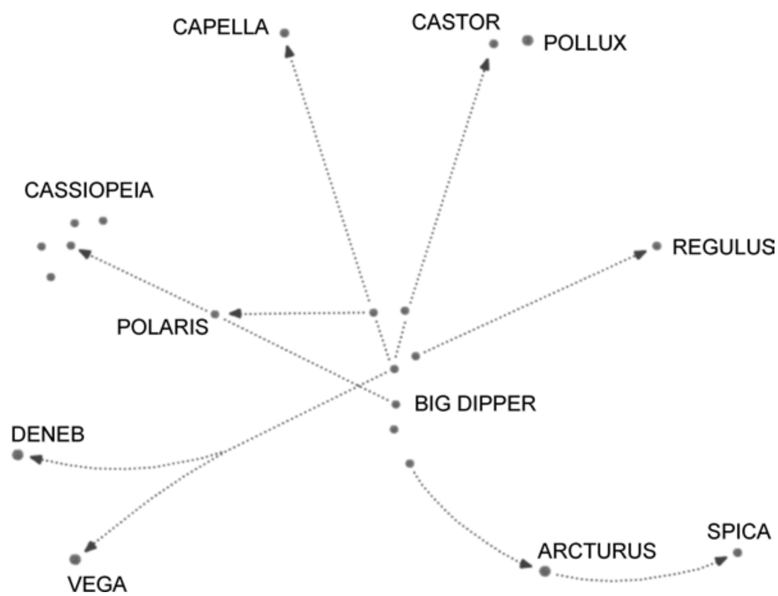
Catching the Light: Astrophotography by Jerry Lodriguss, 1998. Retrieved March 1, 2008, from http://www.astropix.com/HTML/C_SPRING/BIGDIP.HTM

Figure 15U-1 The Big Dipper in Constellation Ursa Major



T. Dickinson, NightWatch: A Practical Guide to Viewing the Universe, Firefly Books Ltd. (p. 31)

Figure 15U-2 Orientations of the Big Dipper



T. Dickinson, NightWatch: A Practical Guide to Viewing the Universe, Firefly Books Ltd. (p. 31)

Figure 15U-3 Big Dipper as the Key to the Night Sky

Constellations, by National Research Council of Canada. Retrieved March 1, 2008, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf

Figure 15U-4 Constellations

Constellations are patterns of stars partitioned and named long ago by our ancestors. Of the 88 constellations recognized by the International Astronomical Union approximately one quarter of these are in the southern sky and not visible from mid-northern latitudes. About half of the remaining constellations are faint and hard to distinguish. Many of the visible and well-known constellations are shown in this handout. All constellations, including Ursa Major (the Big Dipper), circle the sky every 24 hours, with Polaris – the North Star – at the centre of the circle.

SIGHTING OPPORTUNITIES

On February 8, 2008, the space shuttle Atlantis, flying mission STS-122, was delivering the European Space Agency's (ESA) Columbus Laboratory module to the International Space Station (ISS). This momentous event brought the ESA's Columbus Control Center in Oberpfaffenhofen, Germany online for the first time. Coincidentally, the Progress P28 supply ship had just arrived from the Baikonur Cosmodrome in Kazakhstan the previous day to replace Progress P27 which was then de-orbited to burn up in the earth's atmosphere. The sighting opportunities listed below show not only the ISS and Atlantis, but also a last glimpse of Progress P27 before final re-entry.

ONLY DAYS WITH SIGHTING OPPORTUNITIES ARE LISTED
THE FOLLOWING SHUTTLE SIGHTINGS ARE POSSIBLE FROM FRI FEB 08 TO SUN FEB 24

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
SHUTTLE	Fri Feb 08/07:17 PM	< 1	24	18 above WNW	24 above NW

ONLY DAYS WITH SIGHTING OPPORTUNITIES ARE LISTED
THE FOLLOWING PROGRESS SIGHTINGS ARE POSSIBLE FROM FRI FEB 08 TO SAT FEB 16

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
PROGRESS	Fri Feb 08/07:14 PM	1	48	20 above WNW	48 above NNW

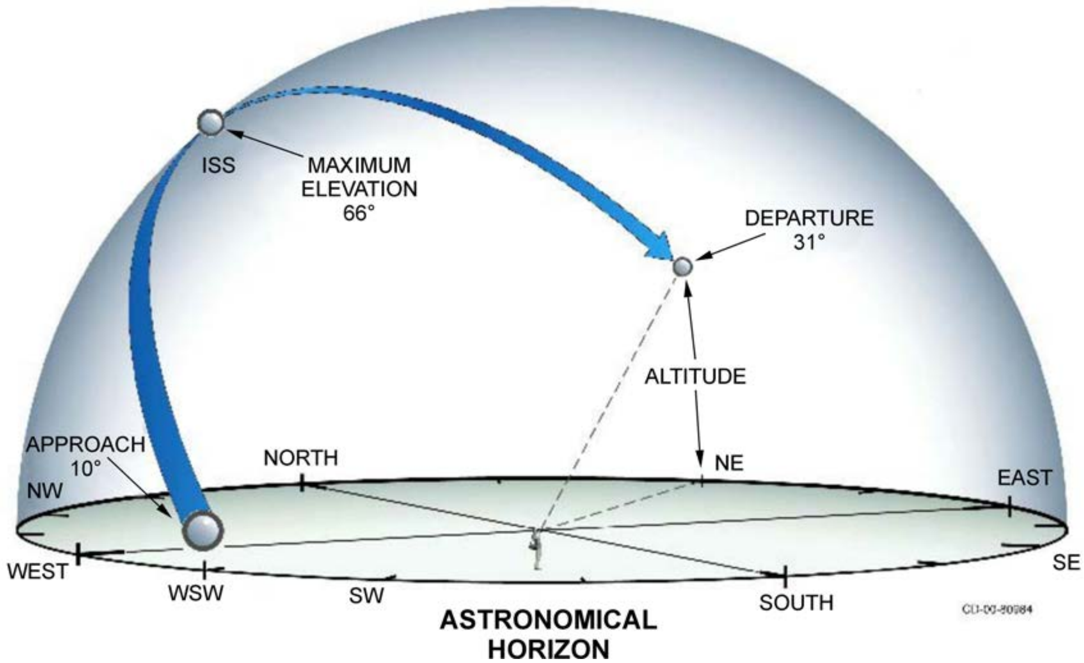
THE FOLLOWING ISS SIGHTINGS ARE POSSIBLE FROM FRI FEB 08 TO WED FEB 20

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
ISS	Fri Feb 08/07:04 PM	2	51	20 above WNW	51 above N

HUMANSPACEFLIGHT: Sighting Opportunities by NASA, 2003. Retrieved February 8, 2008, from http://spaceflight.nasa.gov/realdata/sightings/

Figure 15V-1 Sighting Opportunities

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
ISS	Tue Nov 14/06:22 AM	4	66	10 above WSW	31 above NE



HUMANSPACEFLIGHT: Sighting Opportunities by NASA, 2003. Retrieved March 1, 2008, from http://spaceflight.nasa.gov/realdata/sightings/GIF/large_sighting.jpg

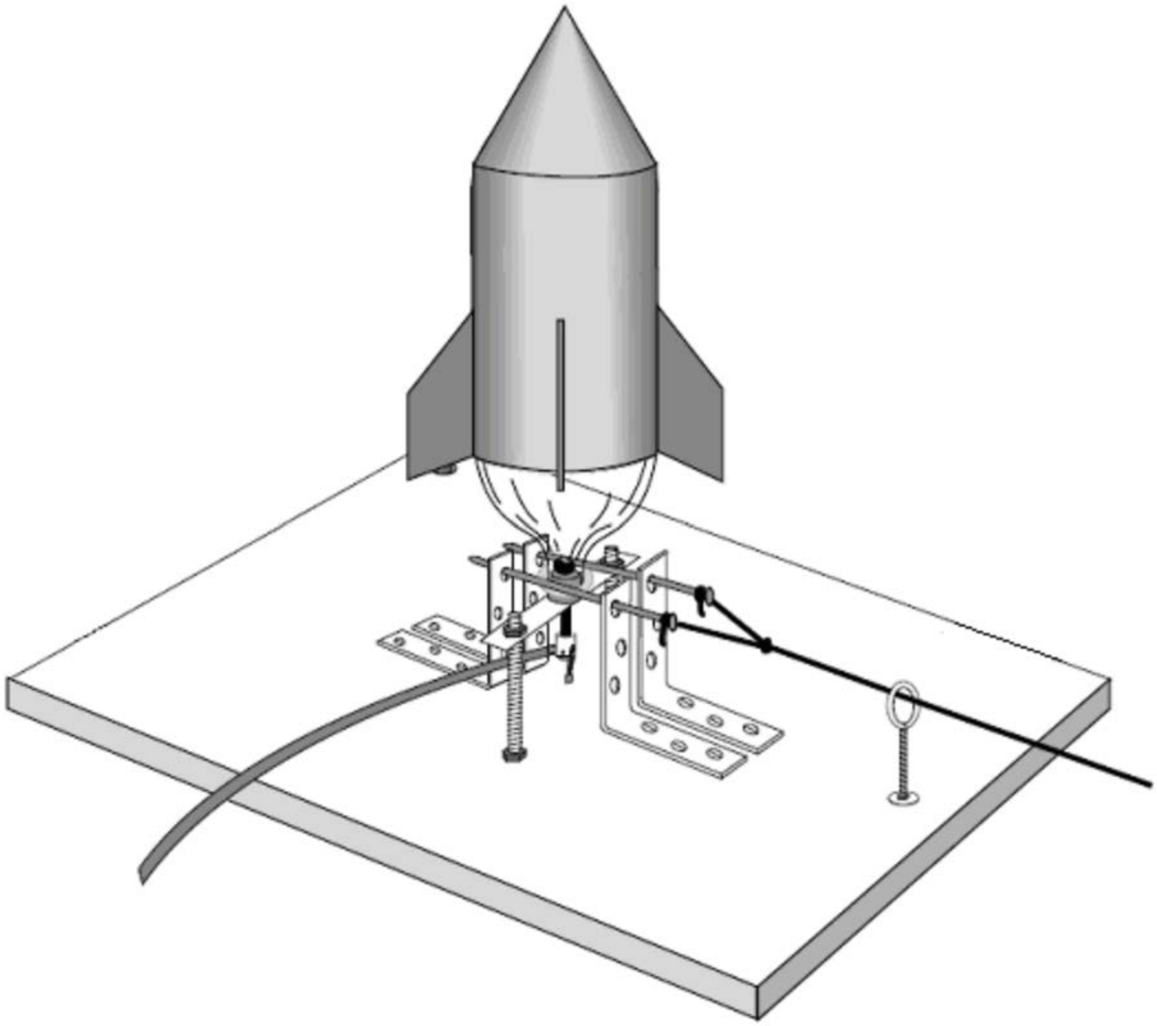
Figure 15V-2 Morning ISS Sighting

Viewing Tips

For best results, observers should look in the direction and at the elevation shown in the second column at the time listed. Telescopes are not practical because of the speed of the orbiting vehicles. However, a good pair of field binoculars may reveal some detail of the structural shape of the spacecraft. On a regular basis, the space shuttle must get rid of excess supply and waste water by dumping them overboard through water spray nozzles. Viewing the shuttle at these times through binoculars or a telescope can reveal an even more spectacular view of the spacecraft and the ice crystals that form as the water is sprayed overboard. Although you can sometimes use a flight timeline to find out when scheduled dumps occur, NASA TV is more accurate. Check the sightings list to see if a sighting opportunity and water dump overlap.

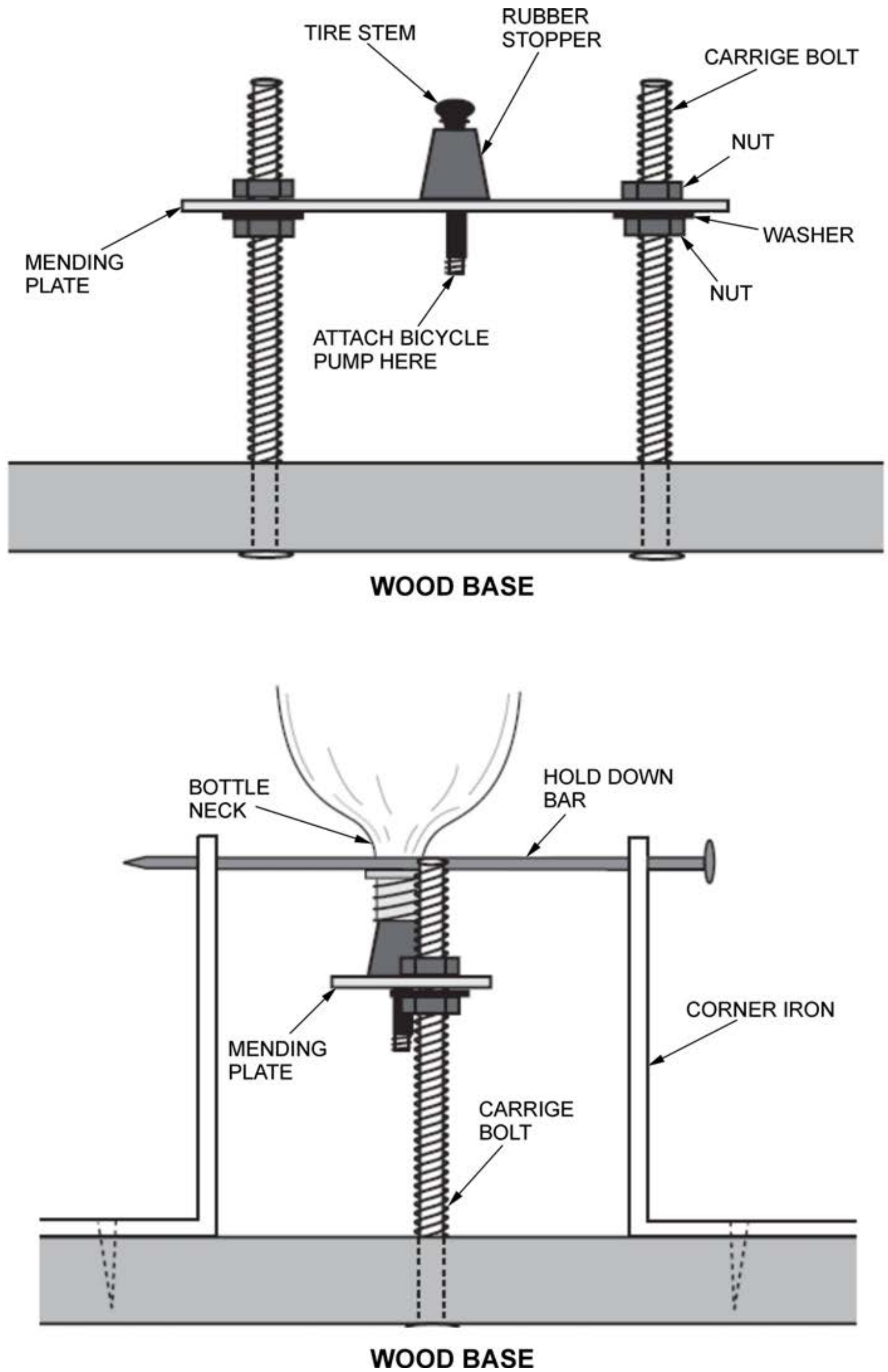
Shuttle/station docking missions provide an exciting opportunity to see a double pass. On the day or two days before docking and after undocking, the shuttle and station will appear to be chasing each other across the night sky. They will follow the same flight path varying by only a few minutes. If the distance is close enough, they will actually appear in the sky at the same time.

LAUNCHING PLATFORMS



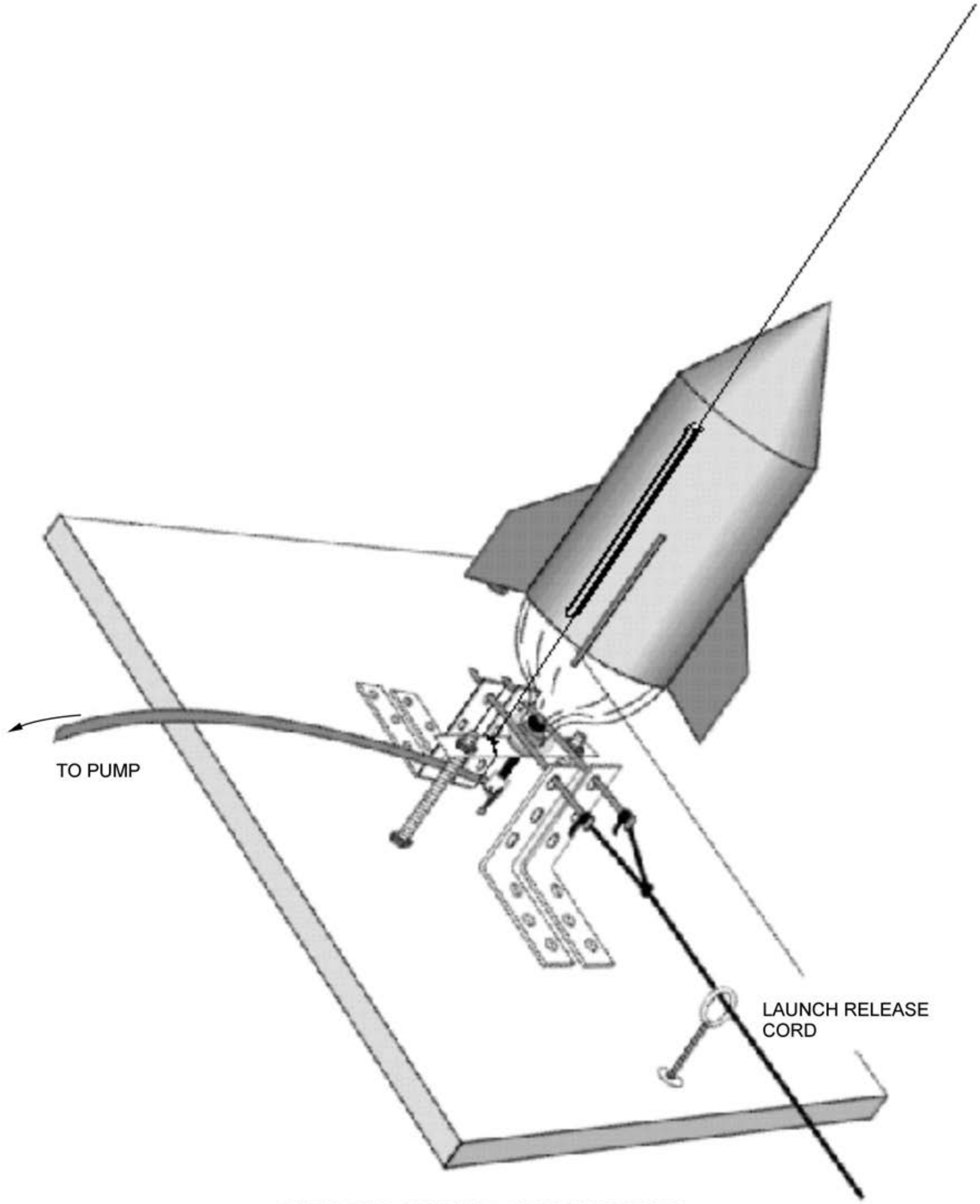
"Rockets: A Teacher's Guide with Activities in Science, Mathematics, and Technology", by NASA, 2003, Bottle Rocket Launcher. Retrieved April 12, 2008, from http://www.nasa.gov/pdf/153405main_Rockets.Guide.Bottle.Rocket.Launcher.pdf

Figure 15W-1 Parts of the Launch Pad



"Rockets: A Teacher's Guide with Activities in Science, Mathematics, and Technology", by NASA, 2003, Bottle Rocket Launcher. Retrieved April 12, 2008, from http://www.nasa.gov/pdf/153405main_Rockets.Guide.Bottle.Rocket.Launcher.pdf

Figure 15W-2 Details of the Launch Pad



COMPLETED LAUNCHER READY FOR FIRING

"Rockets: A Teacher's Guide with Activities in Science, Mathematics, and Technology", by NASA, 2003, Bottle Rocket Launcher. Retrieved April 12, 2008, from http://www.nasa.gov/pdf/153405main_Rockets.Guide.Bottle.Rocket.Launcher.pdf

Figure 15W-3 Launch Time

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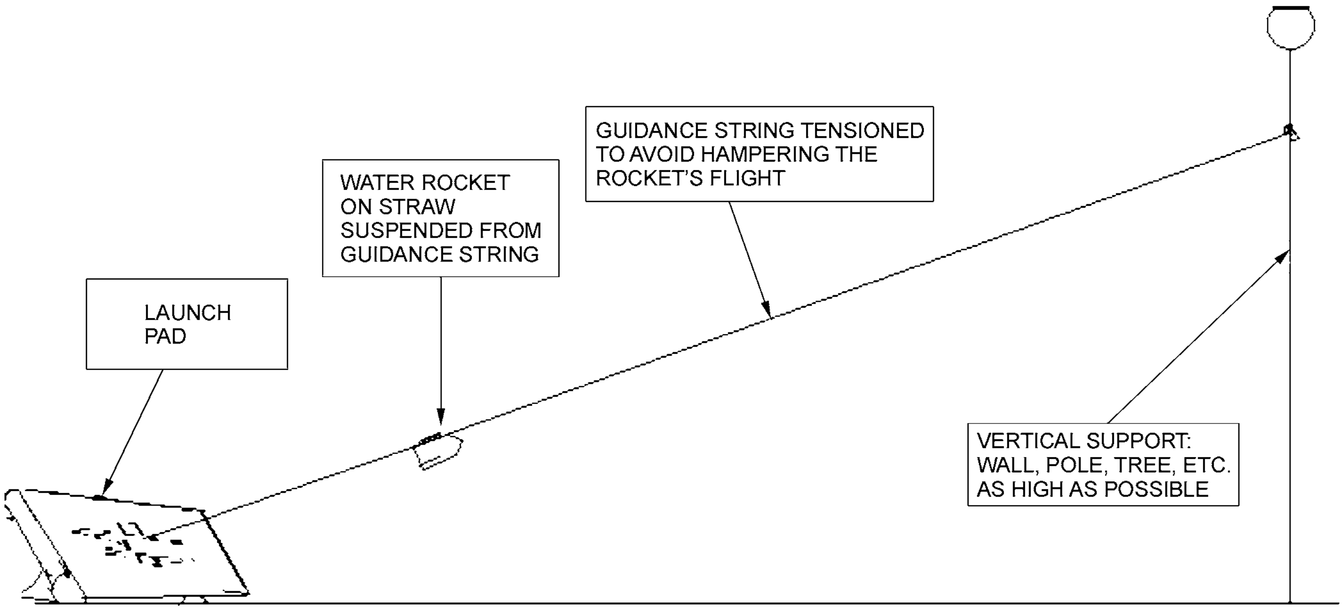
GUIDANCE SYSTEM



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 15X-1 String Guidance System

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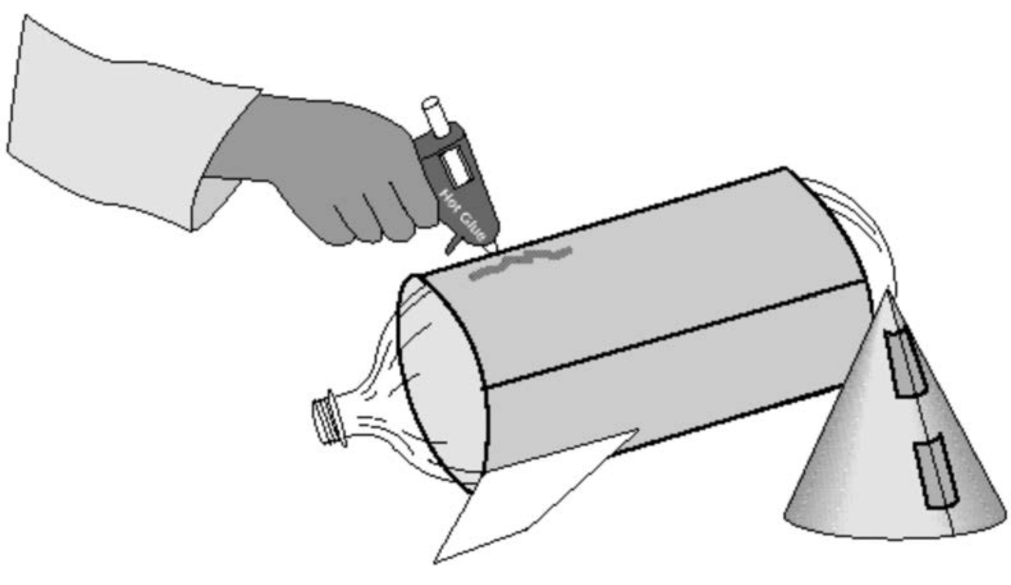
BUILDING A WATER ROCKET

Materials Required:

- One-litre soft-drink bottles with caps,
- Construction paper,
- Tape,
- Glue,
- Drill and bits, and
- Putty or modelling clay.

Hints For Construction:

- Do not allow glue to touch the plastic bottle as this may weaken the plastic and cause failure.
- Wrap and tape a tube of poster-board around the bottle.
- Cut out several fins of any shape and glue them to the tube.
- Form a nose cone and hold it together with tape or glue.
- Press a wad of modeling clay into the top of the nose cone for stability, if required.
- Tape the nose cone to upper end of bottle.
- Decorate your rocket.



"Rockets: A Teacher's Guide with Activities in Science, Mathematics, and Technology", by NASA, 2003, Bottle Rocket Launcher. Retrieved April 12, 2008, from http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Bottle_Rocket_Launcher.html

Figure 15Y-1 Building a Water Rocket

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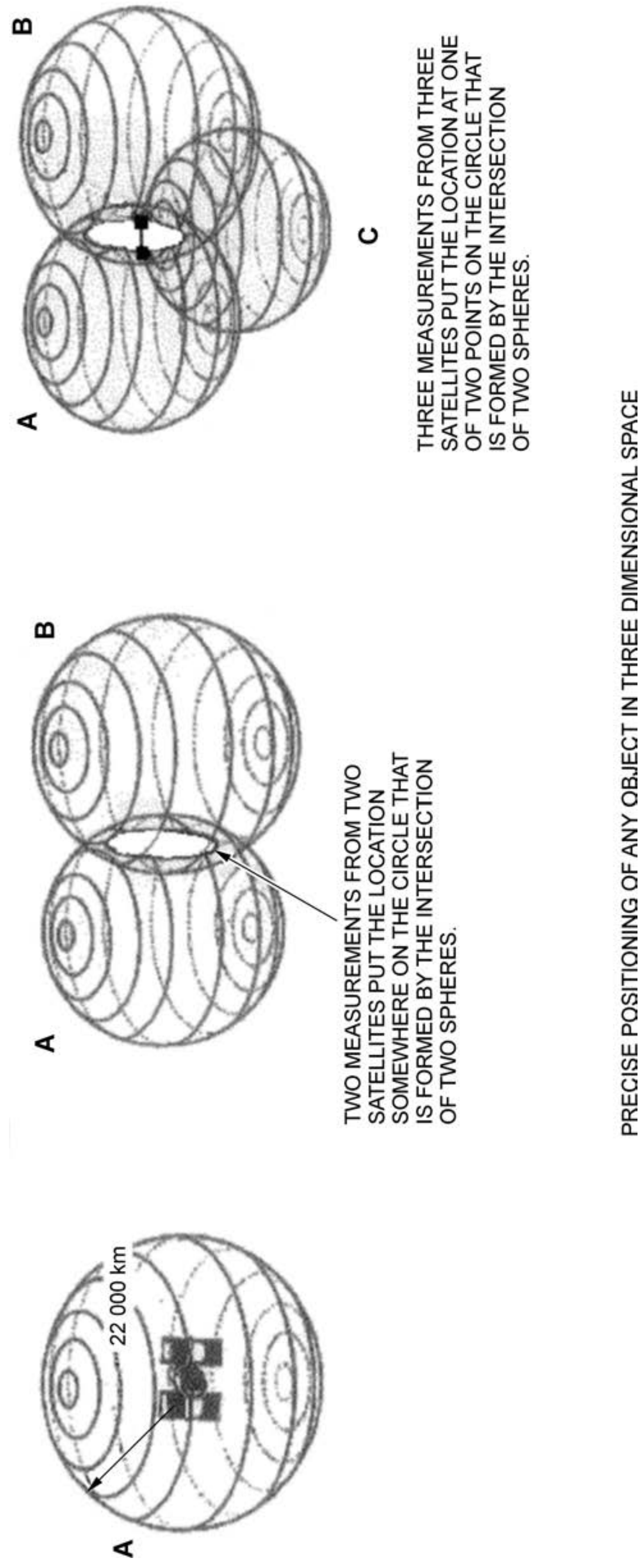
TRILATERATION



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 86)

Figure 15Z-1 Trilateration

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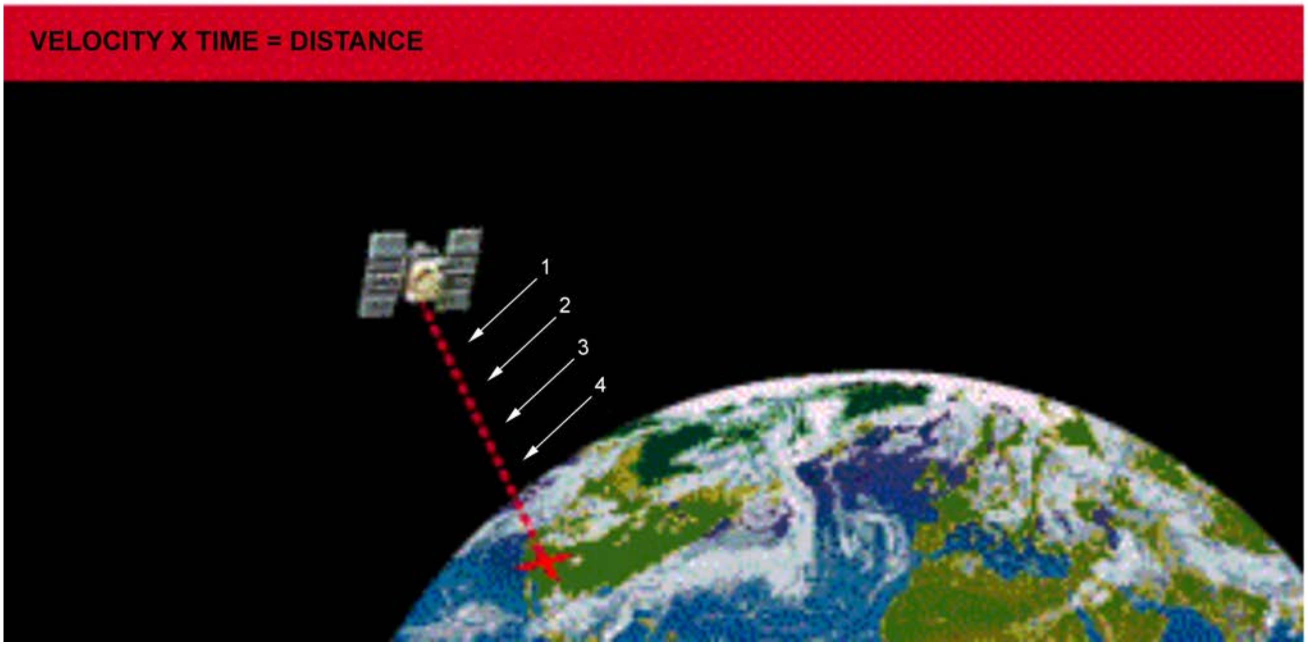
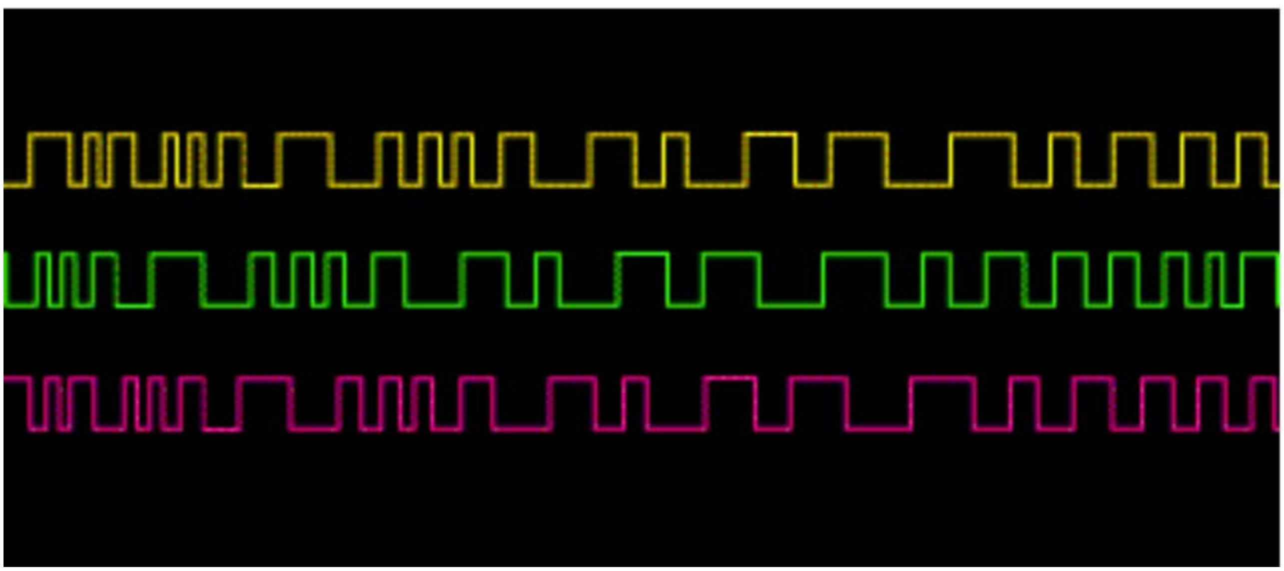
GPS SATELLITES



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15AA-1 Travelling Down



"GPS Tutorial", Trimple Navigation Limited, 2008, How GPS Works? Copyright 2008 by Trimple Navigation Limited. Retrieved April 11, 2008, from http://www.trimble.com/gps/howgps-triangulating.shtml

Figure 15AA-2 Coded Signals

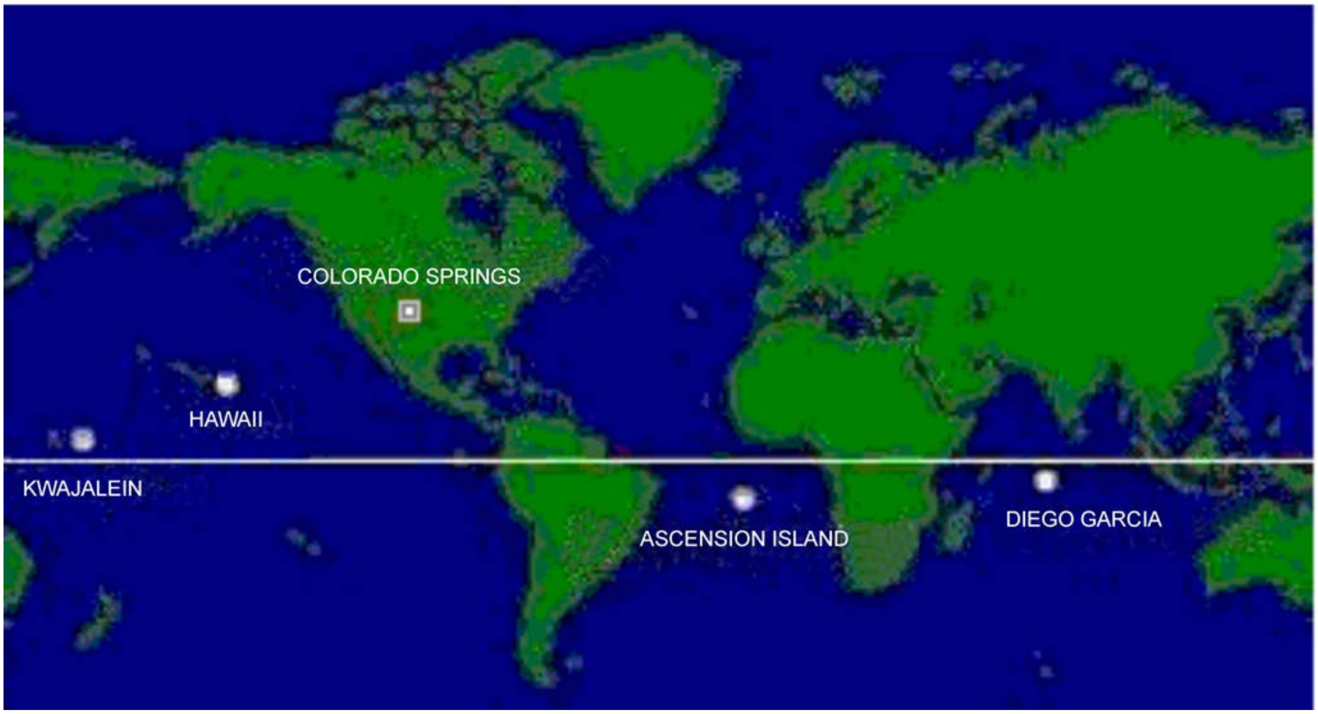
THE CHALLENGE OF TIMING

Timing is tricky.

Precise clocks are needed to measure travel time.

The travel time from a satellite directly overhead is about <u>0.06</u> seconds.

The time required to synchronize the receiver's internal coded pulses with the satellite's coded pulses is equal to the travel time.



"GPS Control Segment", Millennium Telecomm Corp (MTC), Control Stations, Copyright 2007 by Phoenix Tree Technology Corp. Retrieved April 15, 2008, from http://ufindit.com/GPS-stations.asp

Figure 15AA-3 GPS Control and Monitoring Stations

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THE MERIDIAN LINE LASER, OLD ROYAL OBSERVATORY, GREENWICH

NMM Royal Observatory, 2008, Meridian Line. Retrieved April 11, 2008, from http://www.nmm.ac.uk/server/show/nav.2904

Figure 15AB-1 The Meridian Line Laser, Old Royal Observatory, Greenwich

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SPACE SHUTTLE *ENDEAVOUR* (STS-118) AFTER UNDOCKING FROM THE ISS

National Aeronautical and Space Administration, STS-118 Build the Station, Build the Future, NASA (p. 54)

Figure 15AC-1 Space Shuttle *Endeavour* (STS-118) After Undocking From the ISS

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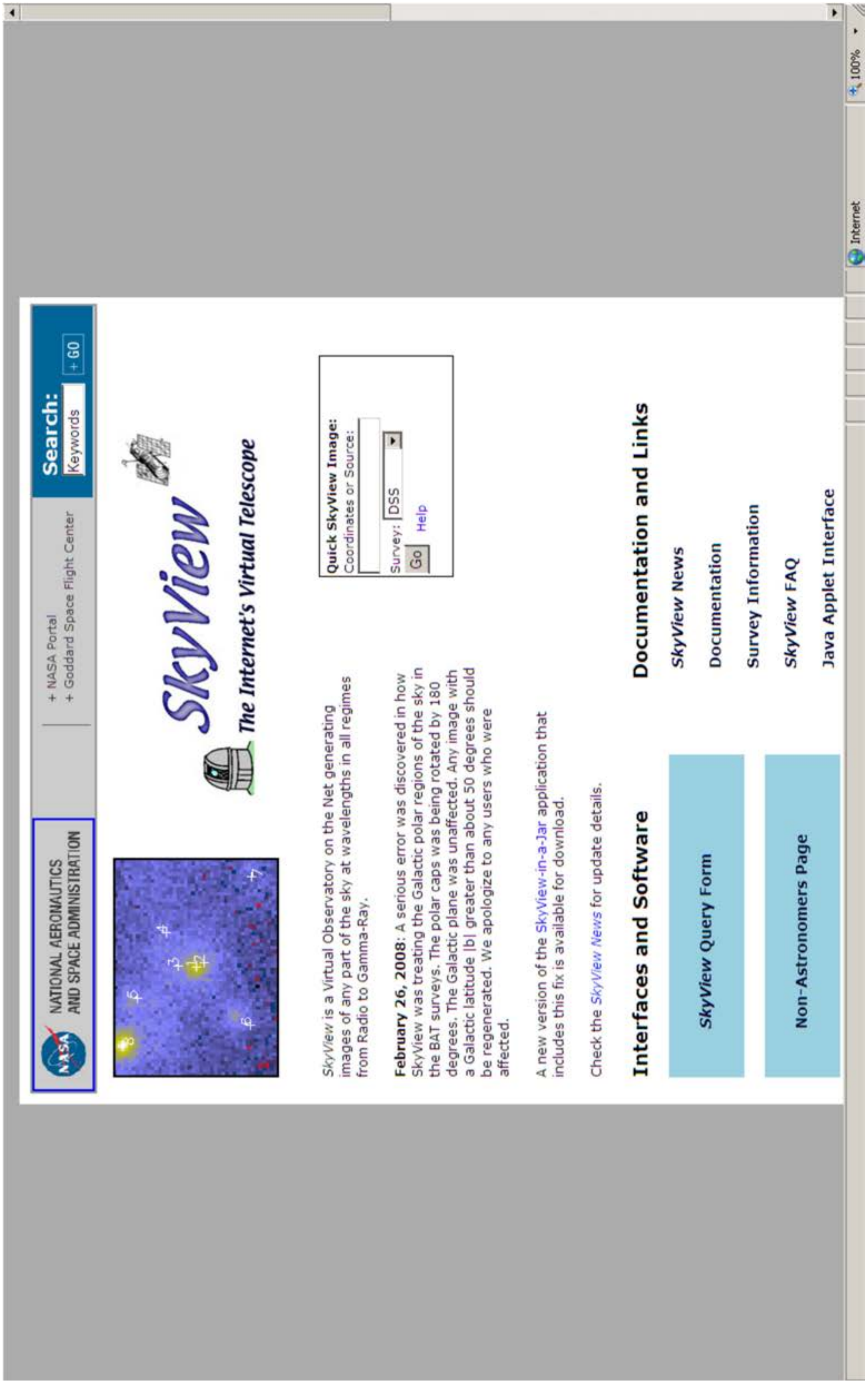
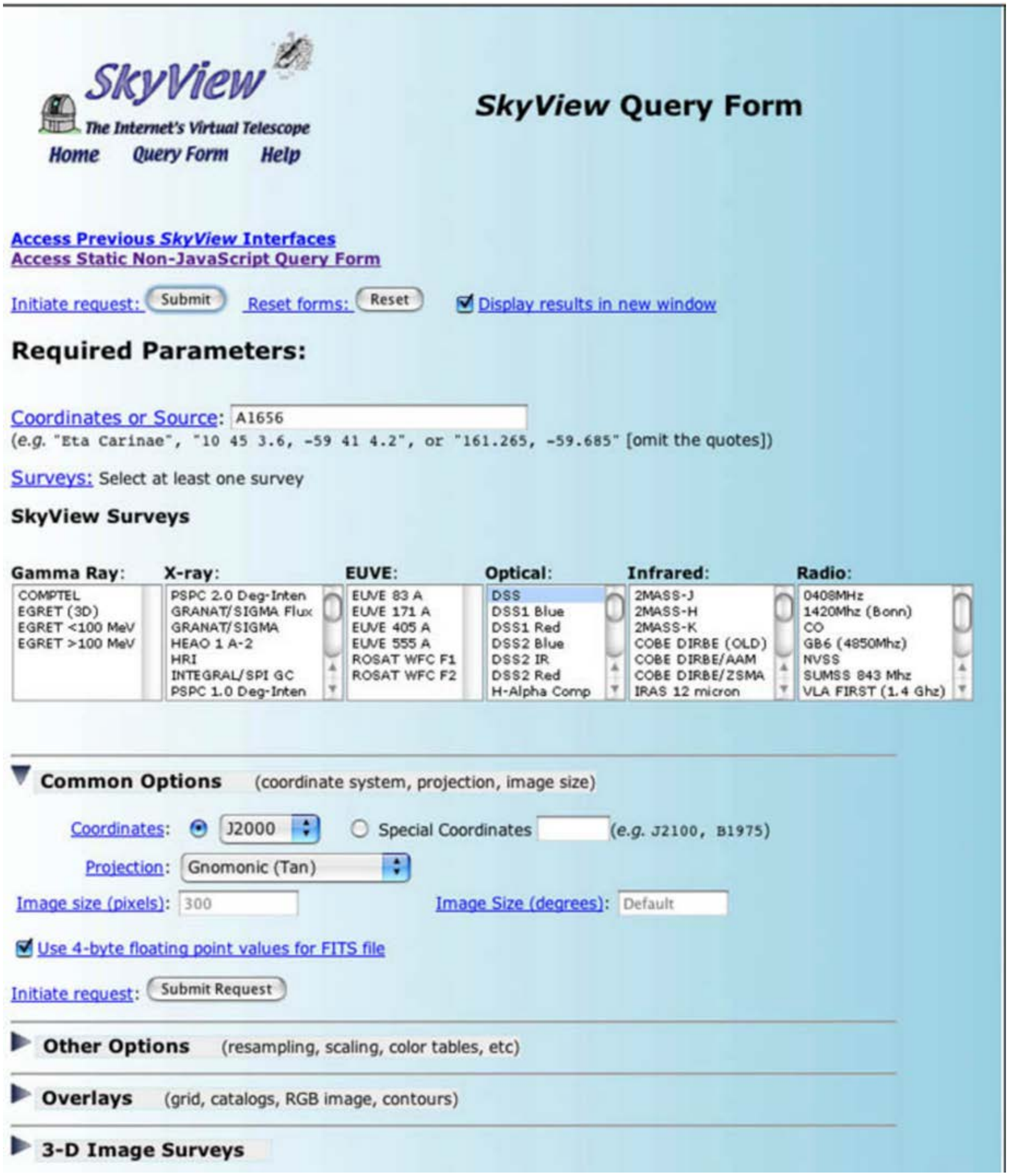
SKYVIEW



NASA SkyView, 2008, "SkyView: The Internet's Virtual Telescope". Retrieved March 19, 2008, from http://skyview.gsfc.nasa.gov/

Figure 15AD-1 SkyView Home Page



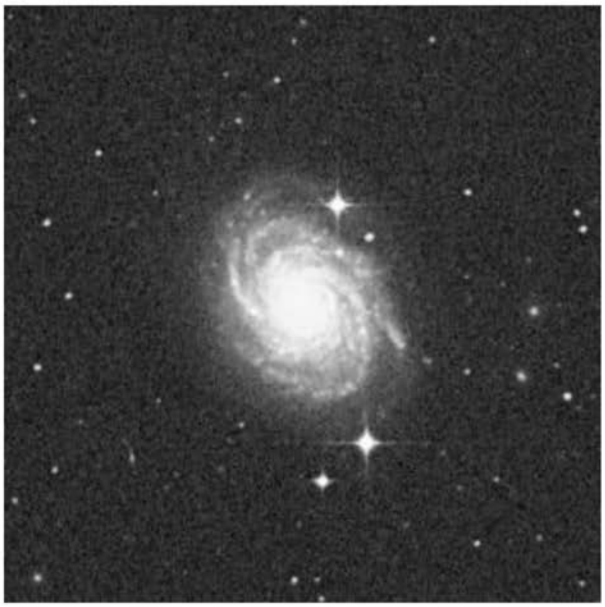
NASA SkyView, 2008, "SkyView: The Internet's Virtual Telescope". Retrieved March 19, 2008, from http://skyview.gsfc.nasa.gov/

Figure 15AD-2 SkyView Query Form

SkyView
The Internet's Virtual Telescope
Home Query Form Help

***SkyView* Images**

Digitized Sky Survey: Original Digitized Sky Survey

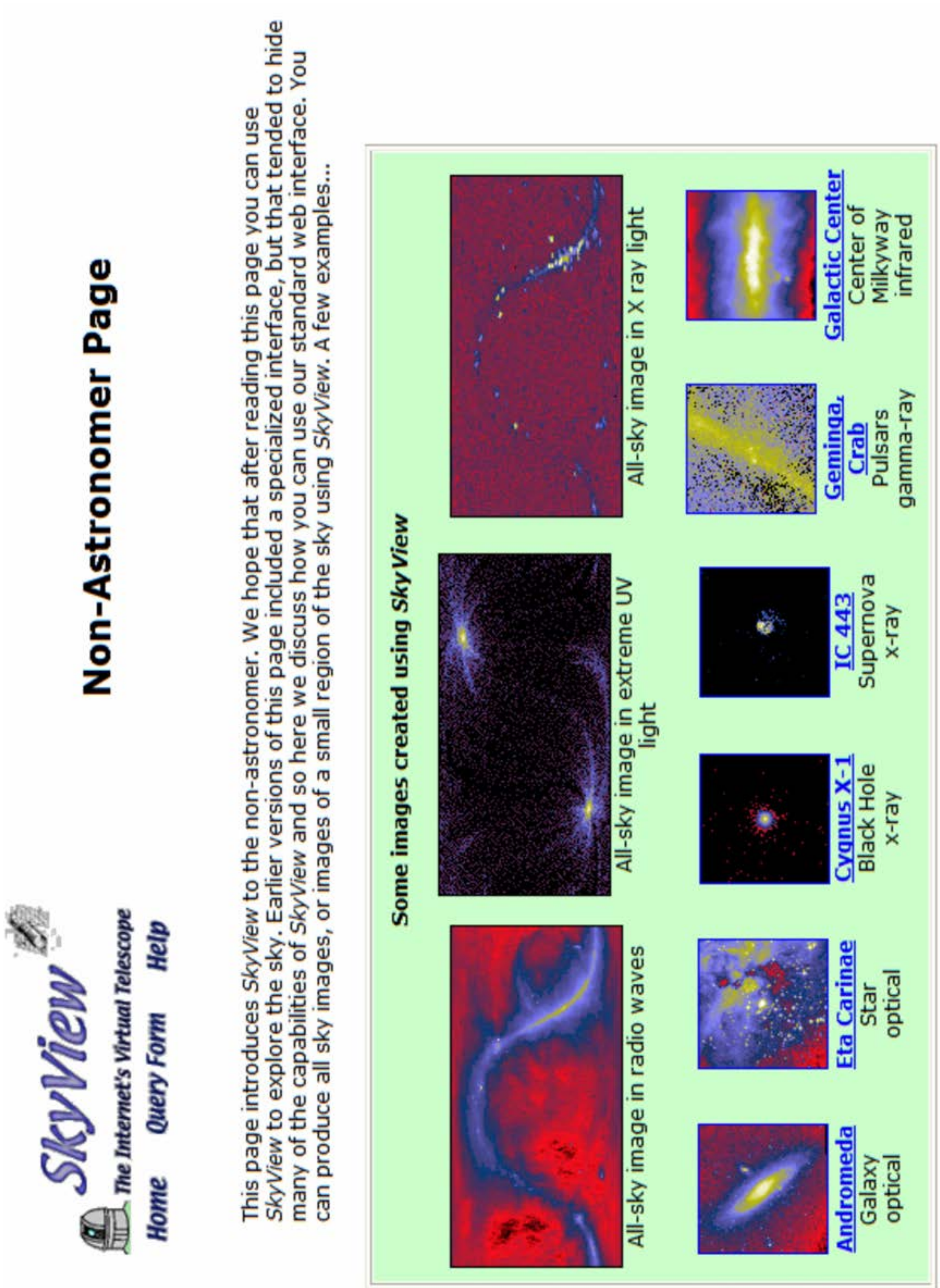


X, Y: 273,3 -> J2000.0: 12 00 09.78 -01 10 10.0

Image color table:	
Image scaling:	Log, values range from 4406.0 to 18483.0
Image size(degrees):	0.14166666 x 0.14166666
Image size(pixels):	300 x 300
Requested Center:	NGC 4030
Coordinate System:	J2000.0
Map projection:	TanProjecter

NASA SkyView, 2008, "SkyView: The Internet's Virtual Telescope". Retrieved March 19, 2008, from http://skyview.gsfc.nasa.gov/

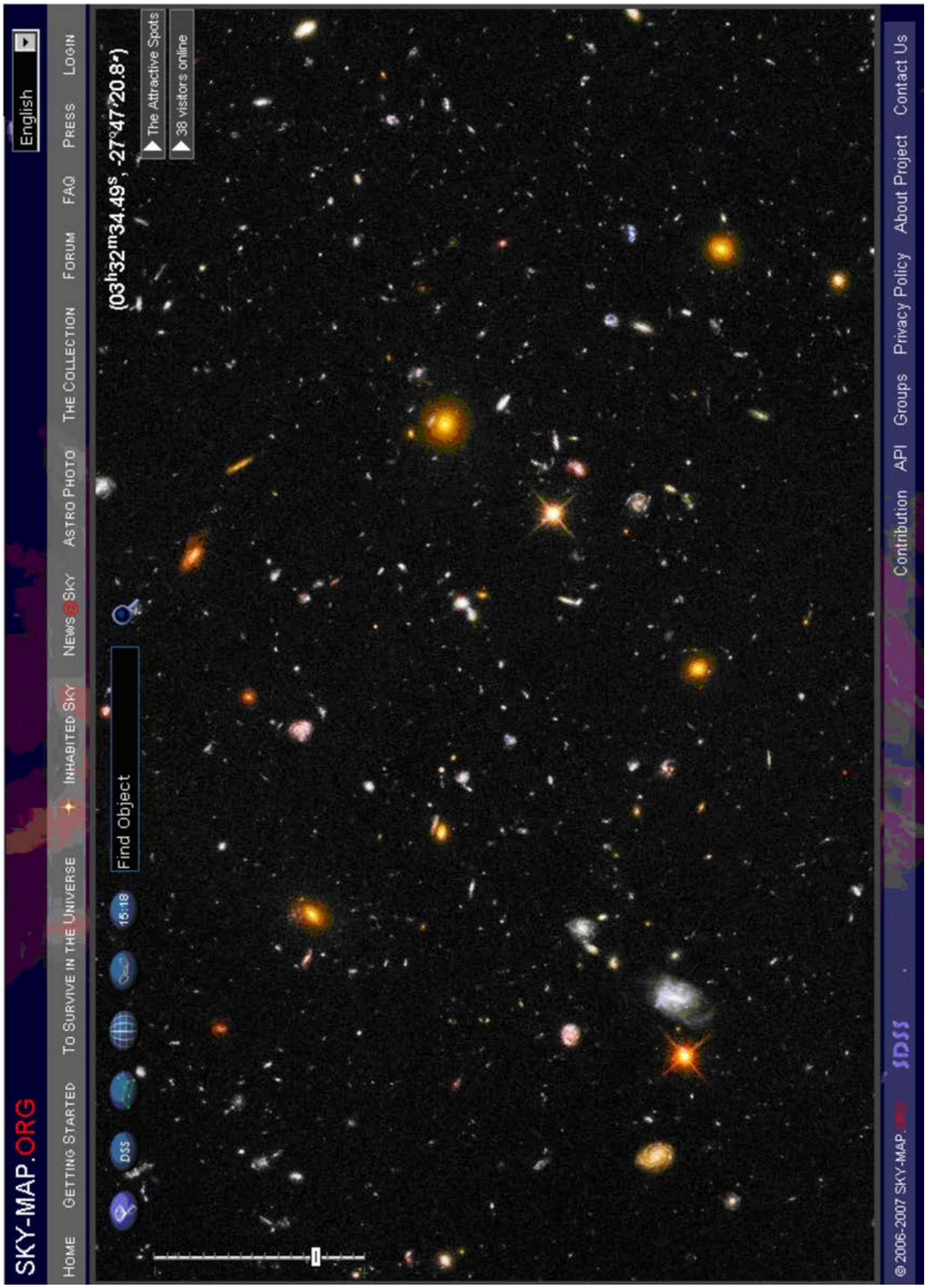
Figure 15AD-3 SkyView Image



NASA SkyView, 2008, "SkyView: The Internet's Virtual Telescope". Retrieved March 19, 2008, from http://skyview.gsfc.nasa.gov/

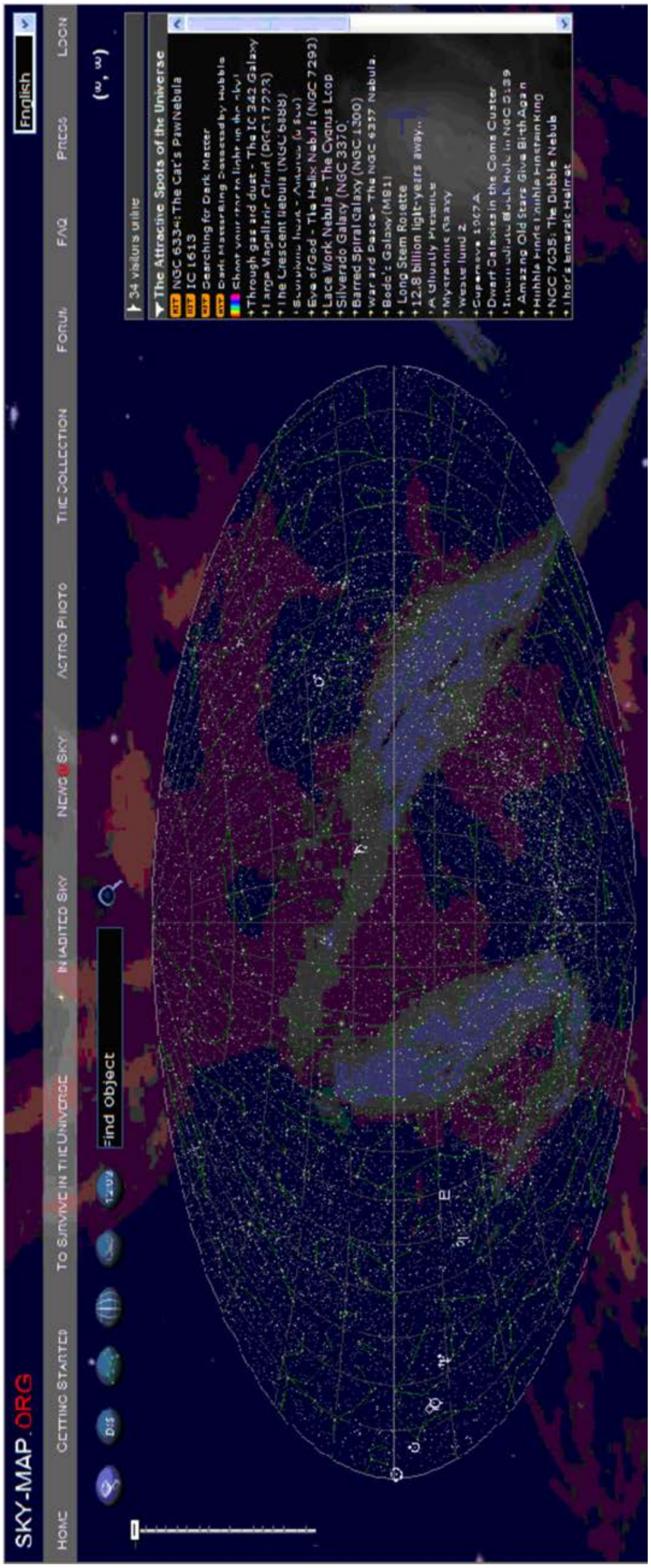
Figure 15AD-4 SkyView Non-Astronomers Page

SKY-MAP.ORG



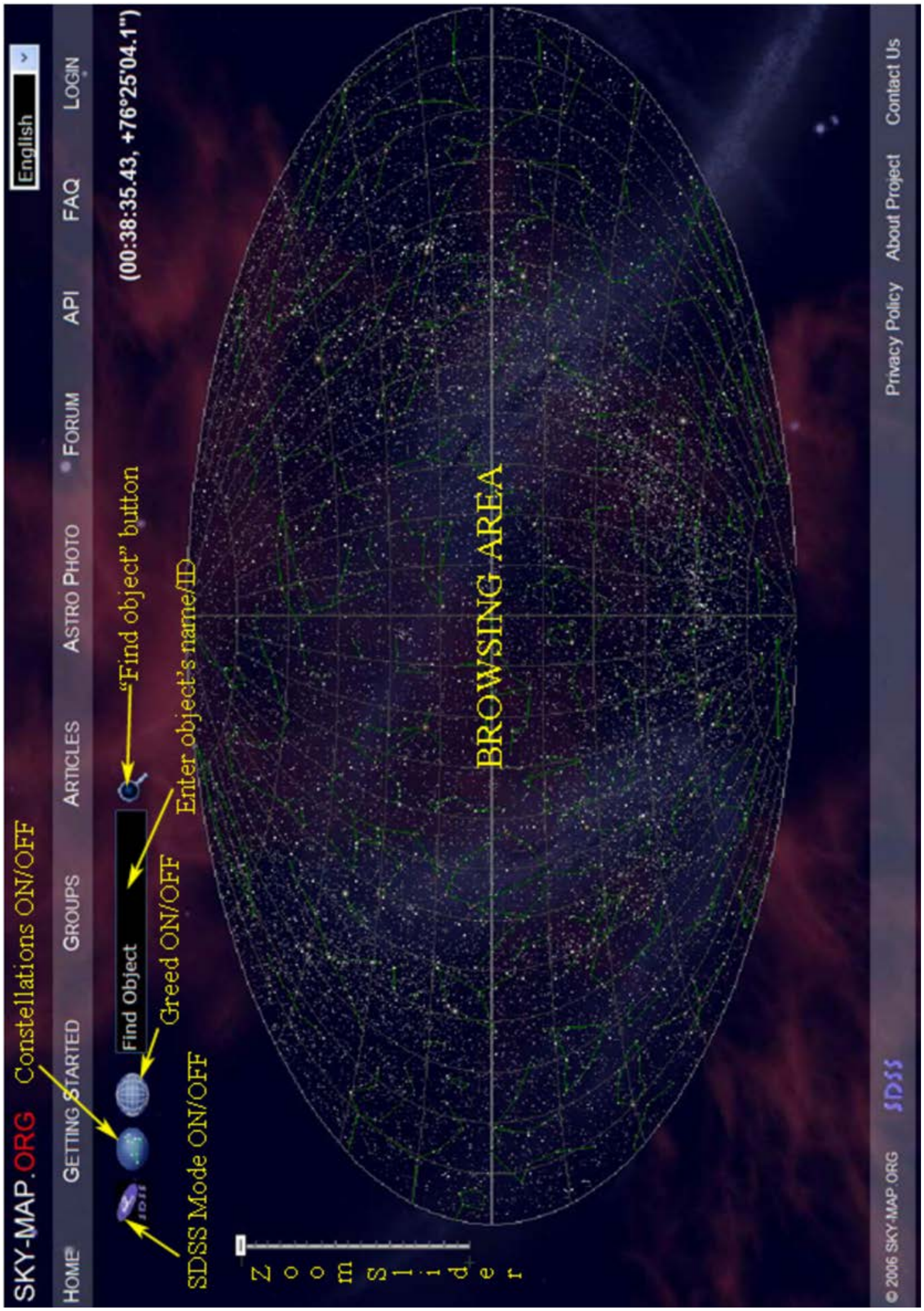
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-1 The View From the Hubble Space Telescope



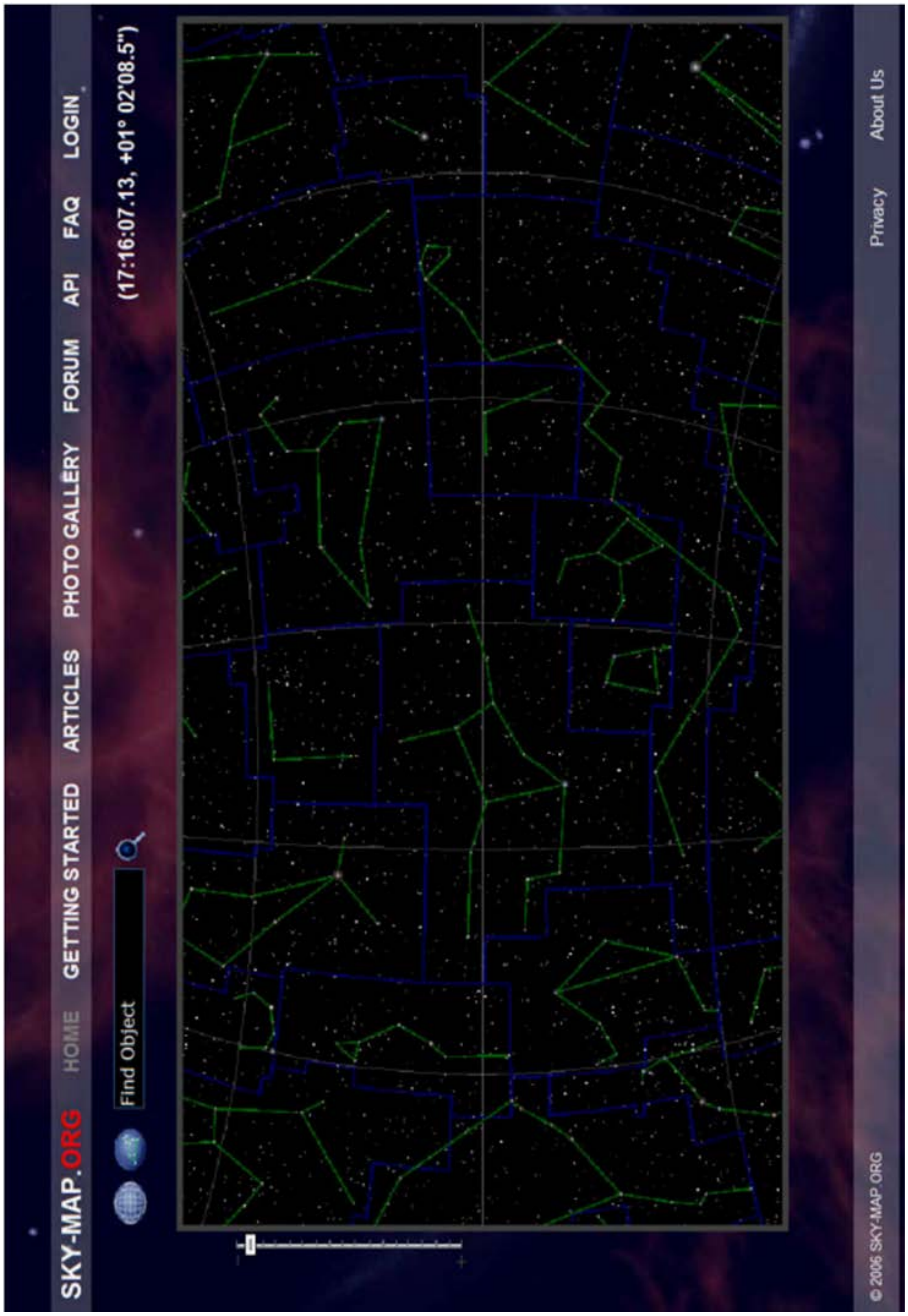
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-2 SKY-MAP.ORG Home Page



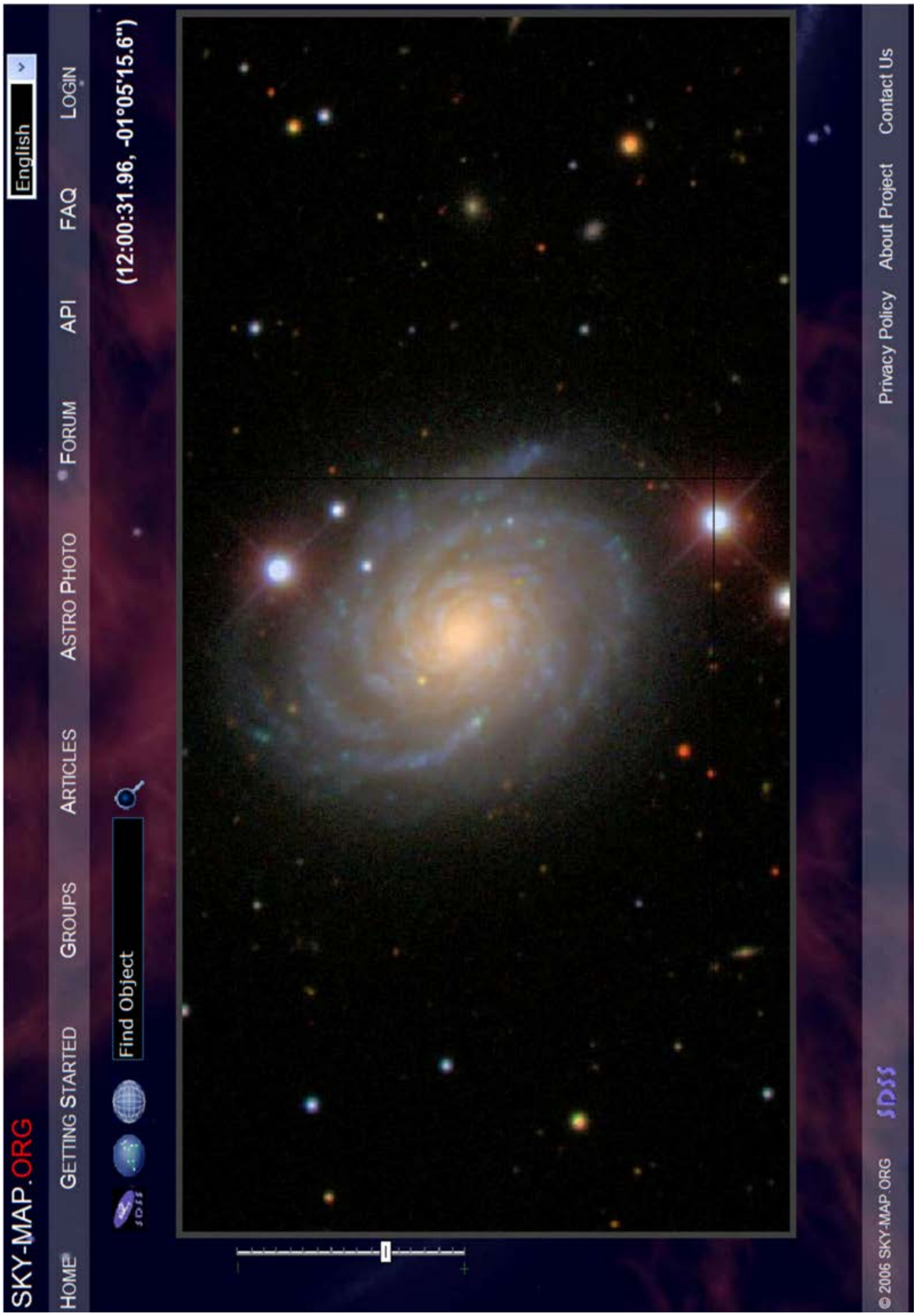
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-3 SKY-MAP.ORG Instruction Page



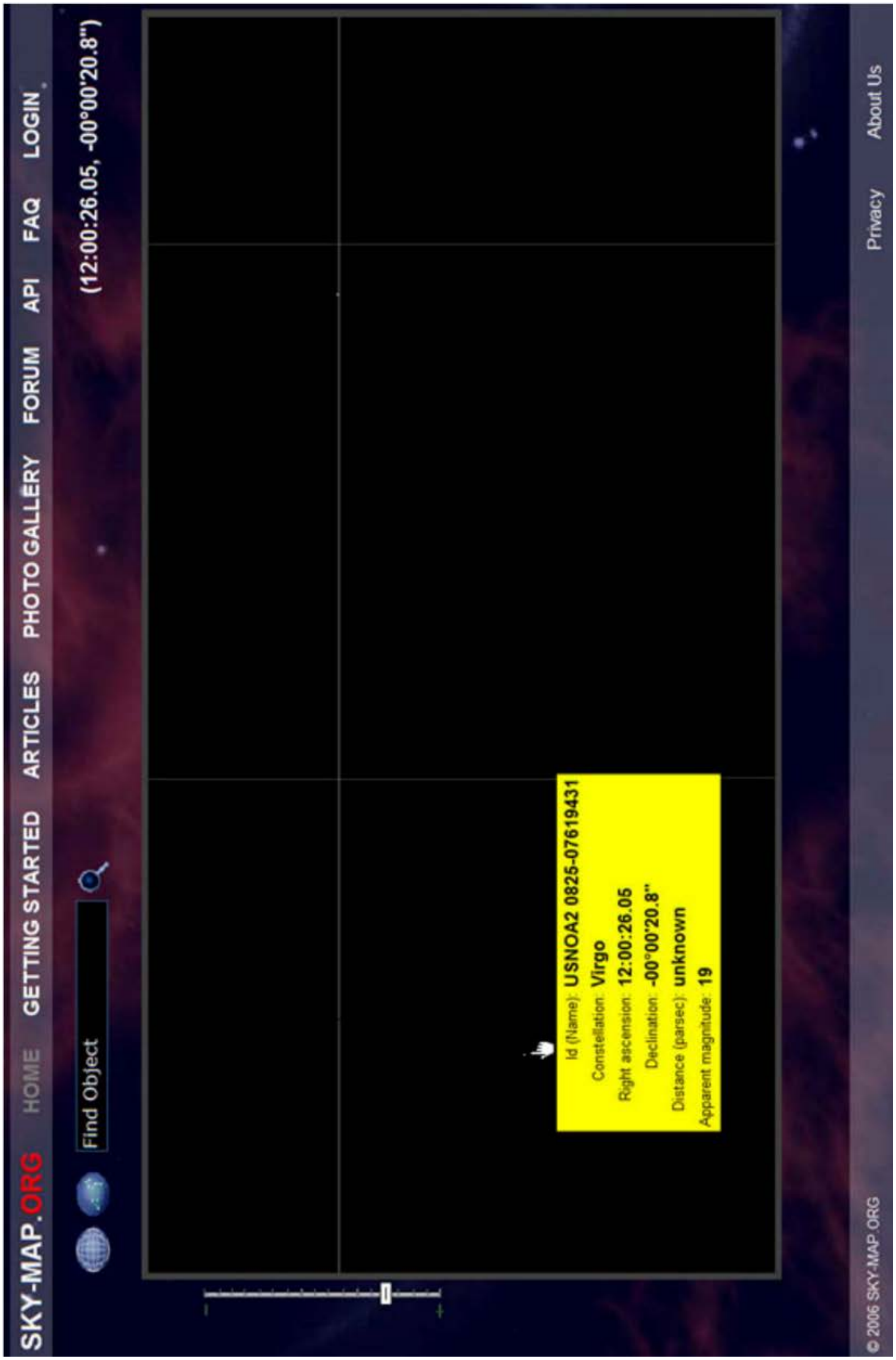
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-4 SKY-MAP.ORG Normal Mode



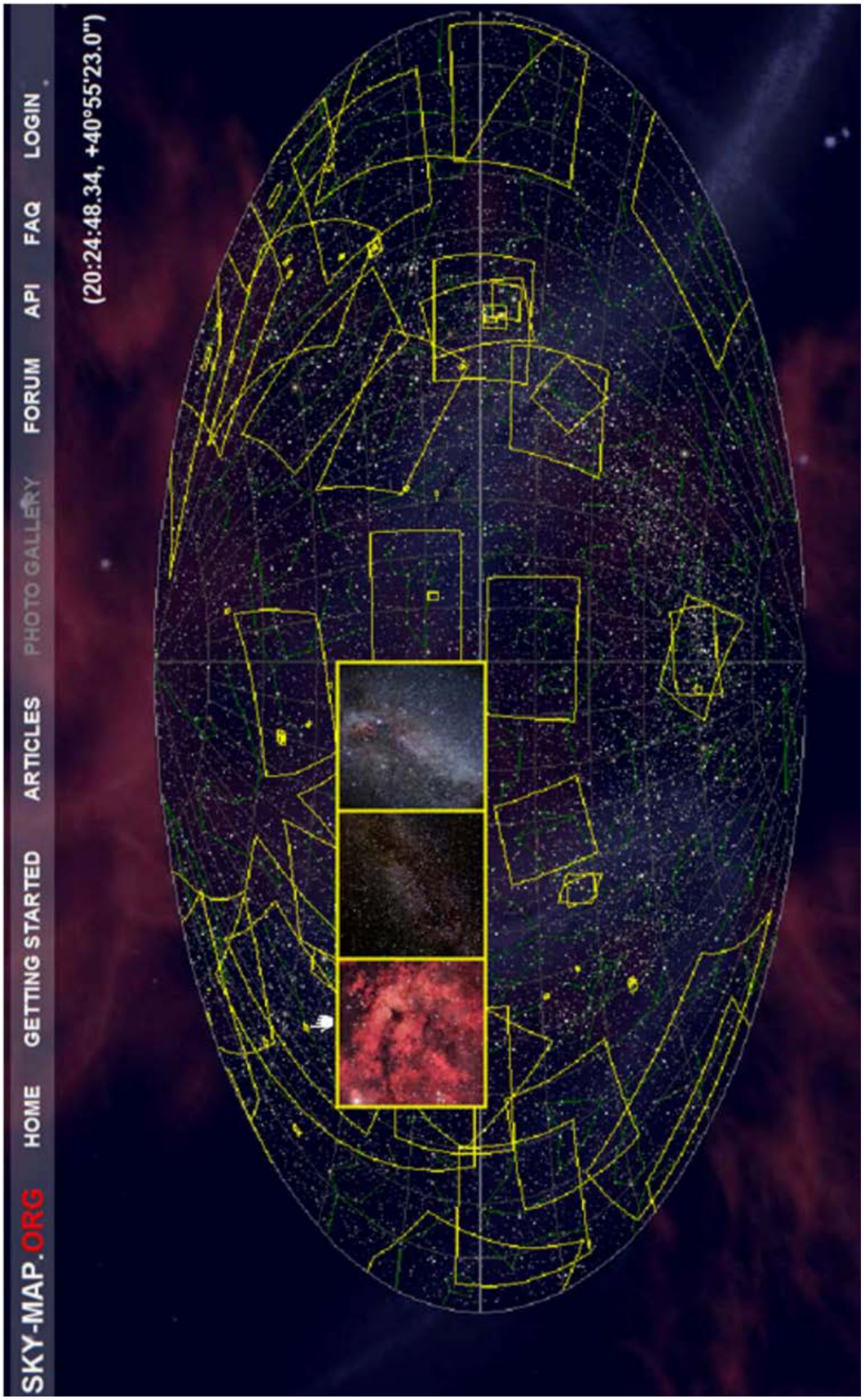
SKY-MAP.ORG, 2008, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-5 Spiral Galaxy in SDSS Mode



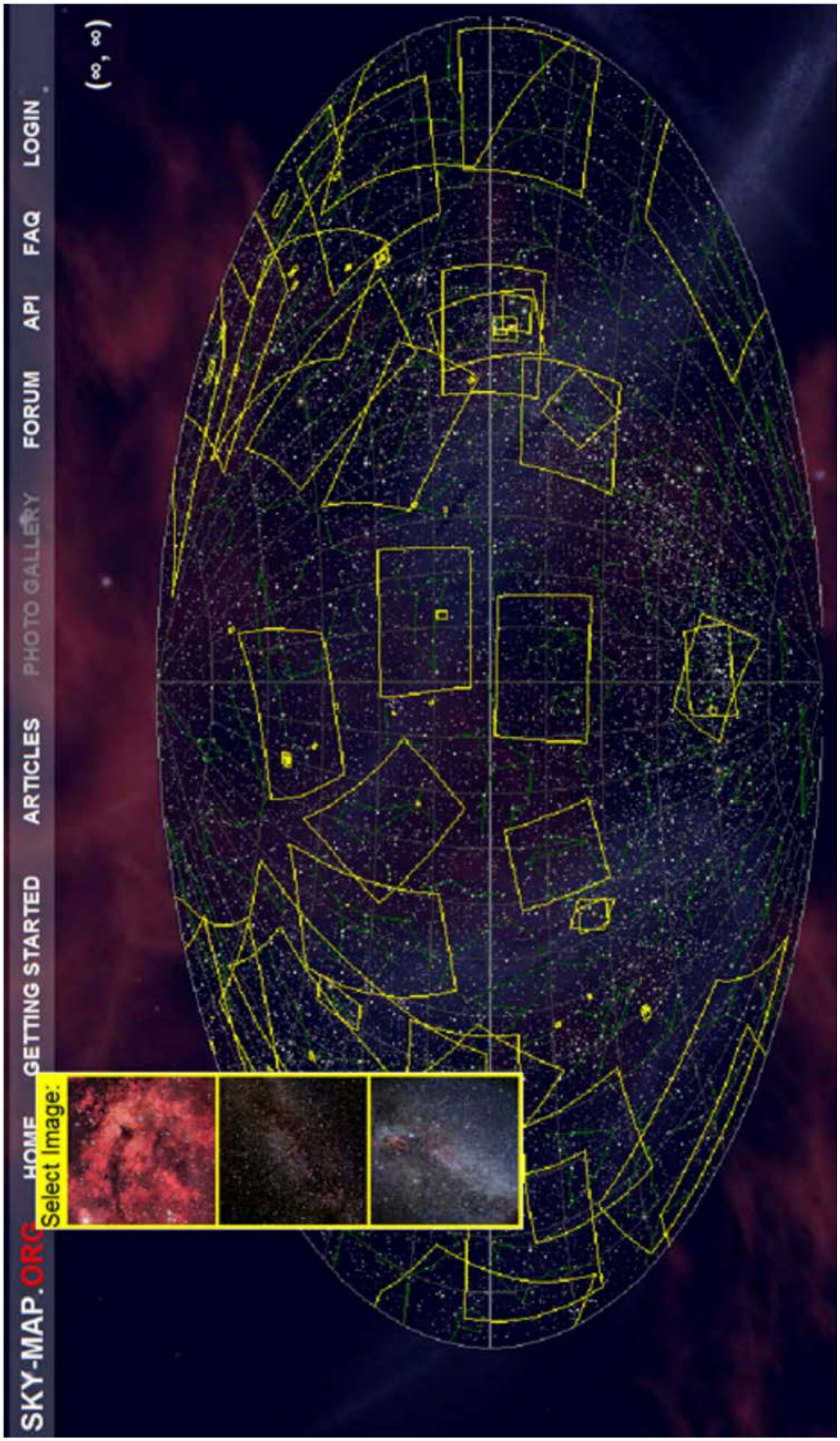
SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-6 Magnitude 19 in Virgo



SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-7 SKY-MAP.ORG Photo Gallery



SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-8 Image Selection

SKY-MAP.ORG, 2006, "SKY-MAP.ORG". Retrieved March 19, 2008, from http://sky-map.org/

Figure 15AE-9 Gamma Cygni Nebula Image Selected

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ASTRONOMY BASICS

For background information regarding many aspects of astronomy, Canada's National Research Council (NRC) Herzberg Institute of Astrophysics (NRC-HIA) offers Astronomy Basics at http://hia-iha.nrc-cnrc.gc.ca/public/astr_e.html.

Astronomy Websites of Interest

- Sloan Digital Sky Survey (SDSS) at http://www.sdss.org/background/
- SKY-MAP.ORG at http://sky-map.org/
- NASA's SkyView at http://skyview.gsfc.nasa.gov/
- NASA satellite sighting opportunities data at http://spaceflight.nasa.gov/realdata/sightings/
- Explore the Night Sky with Canada's National Research Council at http://www.nrc-cnrc.gc.ca/eng/education/astronomy/constellations/html.html

HINTS FROM THE LESSON EO C340.10 IDENTIFY ONLINE STARGAZING PROGRAMS

In this lesson SKY-MAP.ORG found galaxy NGC 4030 in constellation Virgo.

NGC 4030 is at celestial coordinates:

- Right ascension: 12 hours 00 minutes 23.40 seconds
- Declination: -01°06'03.0"

When online, this photographic plate can be found by entering the name NGC 4030 into the "Find Object" text box or by entering the coordinates as right ascension followed by a comma and then declination.

This celestial coordinate data is entered into the "Find Object" text box as one data field: 12 00 23.40, -01 06 03.0.

If coordinates are entered, however, considerable magnification must be applied to see NGC 4030. At this scale, it is magnitude 0 in the real sky, appearing as a bright star.

Star brightness is called magnitude. The lower the magnitude, the brighter the object. The brightest star visible in the night sky is Sirius, classified as magnitude −1.

Sirius, the brightest star, is found at coordinates 06 45 08.90, -16 42 58.0 in Normal Mode.

SDSS does not yet cover this part of the sky, but many astro photos of Sirius can be located through Sirius' Basic Information Window (BIW) by clicking on Sirius when its BIW is open.

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CHAPTER 16

PO 360 – RECOGNIZE ASPECTS OF AERODROME OPERATIONS

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO C360.01 – IDENTIFY TYPES OF AERODROMES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to review, clarify, emphasize and summarize the types of aerodromes.

INTRODUCTION

REVIEW

Review the following from EO M160.01 (Identify Major Aerodrome Components, A-CR-CCP-801/PF-001, Chapter 14, Section 1):

- an aerodrome is any area of land or water designed for the arrival, departure and movement of aircraft; and
- an airport is an aerodrome that possesses a certificate stating it has met all of the airport safety standards.

OBJECTIVES

By the end of this lesson the cadet shall have identified types of aerodromes.

IMPORTANCE

It is important for the cadets to be able to differentiate types of aerodromes. Aerodrome type is critical as it directly affects all aspects of operations at the aerodrome. The aerodrome type dictates operational requirements in terms of facilities, equipment and human resources.

Teaching Point 1	**Review the Definitions of Aerodrome and Airport**
Time: 5 min	Method: Interactive Lecture

AERODROME

An aerodrome is defined by the Aeronautics Act (1985) as:

"Any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith."

> Any area designated or set aside for aircraft to use can be considered an aerodrome.

AIRPORT

An airport is an aerodrome for which a certificate has been issued under Subsection 302 of the Canadian Aviation Regulations (CARs). This is done by ensuring the site is inspected periodically for compliance with Transport Canada standards. Certified aerodromes must also maintain an Airport Operations Manual and conduct operations in accordance with the manual.

> An aerodrome that has been certified by Transport Canada is considered an airport.

There are three situations in which an aerodrome must be certified. They include:

- an aerodrome located within the built-up area of a city or town;
- a land aerodrome used for scheduled passenger service; or
- any aerodrome that the Minister of Transportation (the Minister) deems to be of public interest.

The only exemptions are:

- military aerodromes, and
- aerodromes for which the Minister has written an exemption.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is an aerodrome?

Q2. What is an airport?

Q3. When must an aerodrome be certified?

ANTICIPATED ANSWERS

A1. Any area designed, prepared, equipped or set apart for aircraft to use.

A2. An aerodrome that has been certified by Transport Canada.

A3. An aerodrome must be certified if:

- it is located within the built-up area of a city or town;
- it is a land aerodrome used for scheduled passenger service; or
- the Minister of Transportation deems it to be in the public interest.

Teaching Point 2	**Explain Types of Aerodromes**
Time: 5 min	Method: Interactive Lecture

PUBLIC AERODROMES

A public aerodrome is open to the general public for use and does not require prior permission from the aerodrome operator. Most airports operated by any level of government (municipal, provincial, or federal), are open for public use.

PRIVATE AERODROMES

A private aerodrome may have restrictions on its use, depending on the aerodrome operator. Examples of restrictions include:

- specific aircraft types (eg, ultralights, gliders),
- club members,
- company aircraft, and
- friends.

Prior Notice Required (PNR)

If an aerodrome is listed as PNR, then the aircraft operator must notify (contact) the aerodrome operator before using the aerodrome. This allows the aerodrome operator to provide the most current information on the aerodrome to the aircraft operator.

Prior Permission Required (PPR)

If an aerodrome is listed as PPR, then the aircraft operator must receive permission from the aerodrome operator before using the aerodrome. All military aerodromes are listed as PPR for civilian aircraft.

If an aircraft is in distress (experiencing an emergency), any aerodrome may be used for a safe landing – public or private.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is a public aerodrome?

Q2. What does PNR stand for?

Q3. What does PPR stand for?

ANTICIPATED ANSWERS

A1. An aerodrome that is open to the general public and does not require permission in advance from the aerodrome operator to use.

A2. Prior Notice Required.

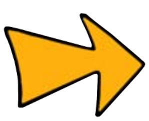
A3. Prior Permission Required.

Teaching Point 3	**Explain Canadian Military Aerodromes**
Time: 5 min	Method: Interactive Lecture

All Canadian military aerodromes require PPR for civilian aircraft, except in the case of an emergency. PPRs may be obtained on an "as needed" basis, or for recurring use by way of a written agreement. Authority to grant the PPR rests with the base/wing commander, although that authority is often delegated further to the base/wing operations officer. Before approving a PPR, the base/wing commander will take into account such factors as:

- impact on flying operations,
- air traffic congestion,
- ramp space availability,
- security risks,
- administrative and technical facilities, and
- competition with civil facilities.

For further details on authorization for civil aircraft to use Canadian military aerodromes, refer to CFAO 55-6 *Authorization for Civil Aircraft to use DND Aerodromes*.



As the operational tempo increases at most Canadian military aerodromes, it is growing more difficult for civilian operators to get permission to land or operate.

As a result of Canada's participation in the British Commonwealth Air Training Plan (BCATP) during WWII, many air bases were built across the country, all with a very similar design (three runways, arranged in a triangle). As the military began disposing of these air bases after the war, many municipalities took over their operations and have kept them operational. In other cases, the air bases were simply abandoned, and in a few cases, private operators took them over.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What do civilian aircraft require prior to landing at a Canadian military aerodrome?

Q2. Why did the military build many air bases during WWII?

ANTICIPATED ANSWERS

A1. Permission.

A2. Due to Canada's participation in the BCATP.

Teaching Point 4	**Explain Types of Civilian Aerodromes**
Time: 10 min	Method: Interactive Lecture

PRIVATE AERODROMES

The most common type of aerodrome in Canada is a private aerodrome (often called a farmer's field). Usually consisting of just a single grass runway, these aerodromes can be found in almost every part of the country, often just miles apart. They are primarily used by the owners of light single-engine aircraft. Usually, the owner lives at the aerodrome, making it very convenient to go flying.

These aerodromes generally offer little to no service to visiting aircraft, and are usually listed as PPR or PNR. They are not certified.

MUNICIPAL AERODROMES

Many municipalities in Canada (large towns and small cities) are involved in the operation of an aerodrome located in (or just outside) the city limits. These aerodromes usually have a hard-surface runway and provide year-round operations. Generally, a municipal aerodrome is for public use.

A municipal aerodrome typically provides the following types of services:

- aircraft storage,
- fuel sales, and
- a multi-purpose terminal building.

Small aviation businesses may operate from a municipal aerodrome. They may include any of the following:

- flight training unit (FTU),
- air charter operator, and
- aviation maintenance facility.

REGIONAL AERODROMES

An aerodrome can be considered to be a regional airport if:

- it has scheduled passenger traffic;
- it is not a national, provincial, or territorial capital; and
- it has a scheduled passenger traffic volume of less than 200 000 passengers per year for three consecutive years.

Regional airports often serve as the starting/ending point in a passenger's air travel. Passengers prefer to fly from the closest regional airport to their home, especially for domestic flights.

INTERNATIONAL AERODROMES

International airports form the backbone of a country's air transportation system. Many flights that originate from a regional airport terminate at an international airport, where passengers can make connections to other regional airports domestically or to international destinations.

At most international airports, cargo flights are more frequent than at a regional airport.

> International airports serve 94 percent of the total annual passenger/cargo traffic in Canada.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. Who is the main user of a private aerodrome?

Q2. What types of services are generally offered at a municipal aerodrome?

Q3. What types of aviation businesses may be found at a municipal aerodrome?

ANTICIPATED ANSWERS

A1. Owners of small single-engine aircraft.

A2. The following services are generally offered at a municipal aerodrome:

- aircraft storage,
- fuel sales, and
- multi-purpose terminal building.

A3. The following aviation businesses may be found at a municipal aerodrome:

- flight training unit (FTU),
- air charter operator, and
- aviation maintenance facility.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is an aerodrome?

Q2. What do civilian aircraft require prior to landing at a military aerodrome?

Q3. Who is the main user of a private aerodrome?

ANTICIPATED ANSWERS

A1. Any area designed, prepared, equipped or set apart for aircraft to use.

A2. Permission.

A3. Owners of small single-engine aircraft.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing the different types of aerodromes forms the basis of aerodrome operations. The similarities and differences between the different types of aerodromes is a key aspect of appreciating the operational requirements of the aerodrome. This is particularly true when it comes to discerning the requirements for facilities, equipment, and human resources.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO C360.02 – EXPLAIN ASPECTS OF AERODROME LIGHTING

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handout located at Annex A for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to clarify, emphasize and summarize aspects of aerodrome lighting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have explained aspects of aerodrome lighting.

IMPORTANCE

It is important for the cadets to know about aerodrome lighting as most aerodromes have some form of lighting in place. Lights indicate the edges of the movement areas and are inspected daily by aerodrome personnel. Approach lighting systems occupy significant space and care must be taken not to cause damage when working near them.

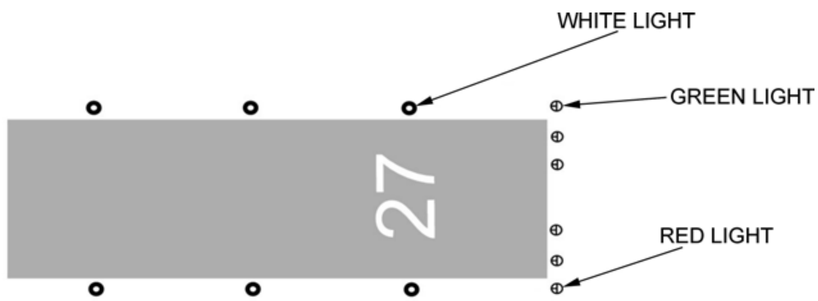
Teaching Point 1	Explain Manoeuvring Lighting
Time: 20 min	Method: Interactive Lecture

MANOEUVRING LIGHTING

Runway Lighting

Edge lights are located along the runway. These lights are white in colour (white light bulb with a clear lens) and provide assistance in identifying the edge of the runway. The lights are spaced evenly along each edge with no more than 60 m (200 feet) between the lights. Each row of lights is the same distance from the runway centreline and may be located along the edge of the runway or no more than 1.5 m away from the edge, except in areas that experience significant accumulations of snow. In areas that experience significant accumulations of snow, edge lights may be placed up to 3 m from the runway edge.

The edge lights that cross the beginning of a runway are green while the lights at the end of a runway are red. This is accomplished by using a two-colour filter under the lens. The red side is located on the runway side so that when an aircraft is on the runway looking at the light, a red light is visible. The green filter is on the other side so that when the aircraft is approaching the runway, a green light is visible.



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16-2-1 Runway Lighting

Taxiway Lighting

Edge lights are placed along taxiways in the same way edge lights are placed along runways. The maximum spacing remains at 60 m (200 feet) and will be closer together along a curved section than along a straight section. Taxiway edge lights are blue in colour. The blue colour is created by using a blue lens instead of a clear lens.

Where a taxiway intersects a runway, two blue lights are placed on each side of the taxiway, adjacent to the runway, to indicate the intersection.

Apron Lighting

Apron edge lights are yellow in colour (created by using a yellow lens). Where a taxiway intersects an apron, two yellow lights are placed on each side of the taxiway, adjacent to the apron, to indicate the intersection.

Light Location	Colour
Runway Edge Lights	White
Taxiway Edge Lights	Blue
Apron Edge Lights	Yellow
Runway/Taxiway Intersection	Two blue
Taxiway/Apron Intersection	Two yellow
Runway Threshold (end of runway side)	Red
Runway Threshold (start of runway side)	Green

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16-2-2 Runway Lighting Colours

Unserviceable Area Markings

Certain ground markings indicate the status of aerodromes and pilots are required to comply with these markings.

A large cross, either white or yellow and at least 6.1 m in length, displayed at each end of a runway or taxiway indicates that that runway or taxiway is unserviceable. For night operations, any unserviceable portion of a runway is closed off by placing red lights at right angles to the centerline across both ends. In addition, the runway lights for the unserviceable area are turned off.

If an unserviceable portion of any manoeuvring area or taxiway is small enough that it can be bypassed by an aircraft with safety, red flags are used to outline the area. At night, the area is marked with red lights – sometimes flashing.

Approach Lighting System (ALS)

An ALS provides additional guidance to aid a pilot in finding the beginning of the runway during periods of low visibility. These lights are used as part of an instrument landing system (ILS) and aid the pilot in transitioning from the instrument portion of the approach to the visual portion.

The aerodrome operator must ensure that the systems are working properly by inspecting them on a regular basis. During the winter, the snow around the systems must be cleared to keep them visible.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What colour are runway edge lights?

Q2. What colour are taxiway edge lights?

Q3. What colour are apron edge lights?

ANTICIPATED ANSWERS

A1. White.

A2. Blue.

A3. Yellow.

Teaching Point 2 **Explain Navigational Lighting**

Time: 5 min Method: Interactive Lecture

AERODROME BEACON

An aerodrome beacon helps a pilot locate an aerodrome amidst all the other ground lights of a community. The beacon is a white light, visible for about ten nautical miles on a clear night, that rotates at a constant speed producing highly visible light flashes at regular intervals of about 2 – 3 seconds. The aerodrome beacon operates continuously during the night.

OBSTRUCTION LIGHTING

Obstruction lights are used to mark tall buildings and towers that might be flight hazards. These may be red lights that are either steady or flashing or they may be flashing white strobe lights.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why are aerodrome beacon lights used ?

Q2. How can an aerodrome beacon be recognized?

Q3. What are the possible colours of obstruction lights?

ANTICIPATED ANSWERS

A1. To help a pilot to locate an aerodrome amidst all the other ground lights of a community.

A2. An aerodrome beacon is a white light that rotates at a constant speed every 2 – 3 seconds.

A3. Red, either steady or flashing, or a flashing white strobe light.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What colour are runway edge lights?

Q2. What colour are taxiway edge lights?

Q3. How can an aerodrome beacon be recognized?

ANTICIPATED ANSWERS

A1. White.

A2. Blue.

A3. An aerodrome beacon is a white light that rotates at a constant speed every 2 – 3 seconds.

Hand out copies of Annex A to each cadet.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Aerodrome lighting can be complex systems that are crucial to the safe operation of the aerodrome. Personnel must know what the lights represent. Lighting systems are inspected daily to keep them in operational condition.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://www.tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C360.03 – CONSTRUCT A MODEL OF THE AIRSPACE AT AN AERODROME

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts located at Annexes B to D for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1–3 to introduce the parts of the Canadian Domestic Airspace (CDA).

An in-class activity was chosen for TP 4 as an interactive way to reinforce concepts of the CDA.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have constructed a model of the airspace at an aerodrome.

IMPORTANCE

It is important for the cadets to know about the CDA system as each airspace classification has a set of requirements and operating rules that make it unique. By understanding and adhering to these rules, pilots, ground crew, and aerodrome operations staff can operate safely.

Teaching Point 1 **Explain Parts of the Canadian Domestic Airspace (CDA) System**

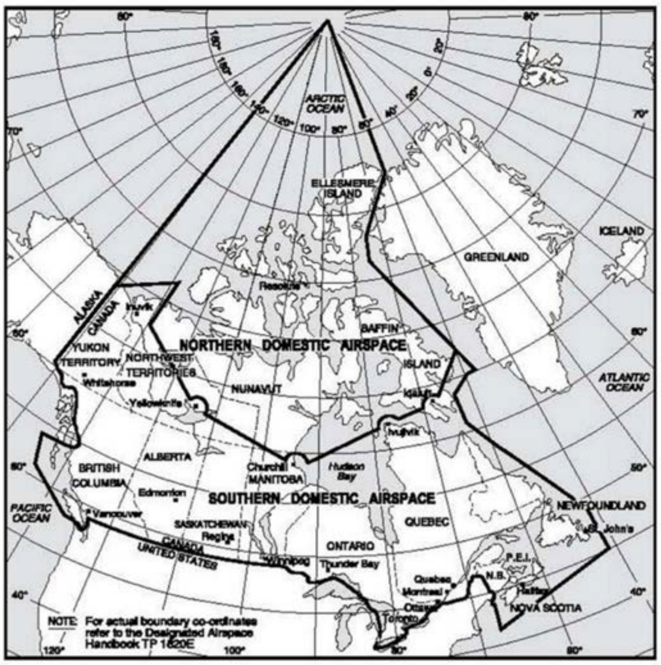
Time: 10 min Method: Interactive Lecture

Distribute photocopies of Annex B to the cadets.

CDA

CDA includes all airspace over Canadian land mass, the Canadian Arctic, Canadian Archipelago (group of islands) and those areas of the high seas within the airspace boundaries.

CDA is geographically divided into the Northern Domestic Airspace (NDA) and the Southern Domestic Airspace (SDA) (as illustrated in Figure 16-3-1). CDA is also divided vertically into high and low level airspace (as illustrated in Figure 16-3-2).



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 182)

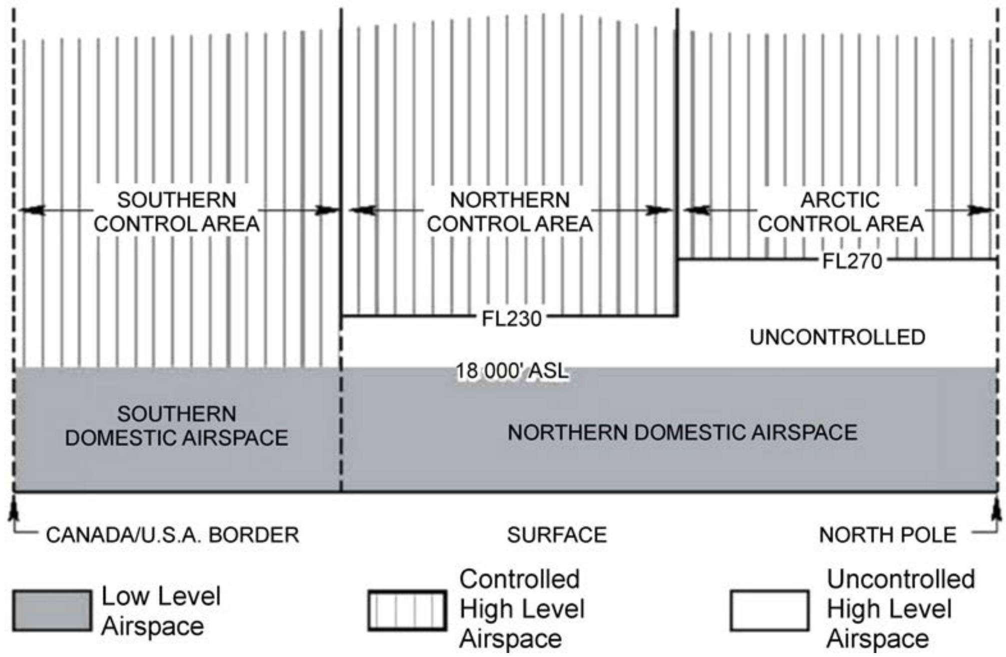
Figure 16-3-1 Boundaries of CDA, NDA, and SDA

NDA

The magnetic north pole is located near the centre of the NDA. Near the pole, the lines of magnetic force dip downwards, almost becoming vertical. This causes the horizontal compass needle to produce unreliable readings. In this region, runway headings are given in degrees true, and true track (the direction the aircraft is travelling) is used to determine cruising altitudes.

SDA

In the SDA, further away from the magnetic north pole, compass readings are reliable as the lines of magnetic force become horizontal. In this region, runway headings are given in degrees magnetic, and magnetic track is used to determine cruising altitudes.



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 184)

Figure 16-3-2 Vertical Divisions of Airspace

High Level Airspace

High level airspace consists of all airspace above 18 000 feet above sea level (ASL). Aircraft operating in this airspace must be operating in accordance with instrument flight rules (IFR); these are rules that govern the procedures for conducting flight under instrument meteorological conditions (IMC). Traffic operating in accordance with visual flight rules (VFR), which govern the procedures for conducting flight under visual conditions, is excluded from high level airspace.

This is the airspace in which the en route portions of most flights by the following aircraft occur:

- commercial passenger and cargo jets (eg, Boeing 767, Airbus 340), and
- business jets (eg, Citation, LearJet).

Low Level Airspace

Low level airspace consists of all airspace below 18 000 feet ASL. This is the airspace used by general aviation and most commercial turbo-prop aircraft. This is the general classification of airspace used for takeoffs and landings.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How is CDA geographically divided?

Q2. How is CDA vertically divided?

Q3. Low level airspace is the airspace below what altitude?

ANTICIPATED ANSWERS

A1. Northern and Southern Domestic Airspace.

A2. High and low level airspace.

A3. Below 18 000 feet ASL.

Teaching Point 2	**Explain Types of Airspace**
Time: 10 min	Method: Interactive Lecture

CONTROLLED AIRSPACE

Controlled airspace is the airspace in which air traffic control service is provided. Depending on the specific classification of the airspace, some or all aircraft may be subject to air traffic control. Types of low level controlled airspace include:

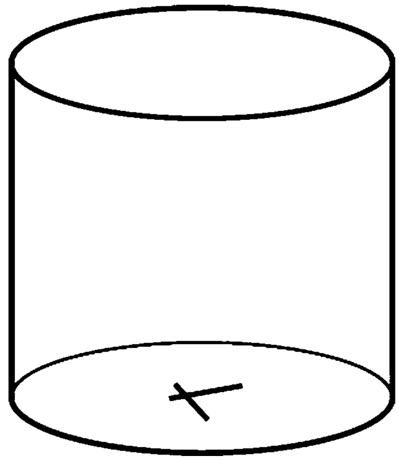
- low level airways,
- control zones,
- terminal control areas,
- transition areas,
- control area extensions, and
- military terminal control areas.

Control Zones (CZs)

CZs are designated around certain aerodromes to keep IFR aircraft within controlled airspace during approaches and to facilitate the control of VFR and IFR traffic. CZs vary in size, with the most common radii being three, five, or seven nautical miles. They are usually capped at 3 000 feet above aerodrome elevation (AAE). CZs will be classified as B, C, D or E depending on the classification of the surrounding airspace.

Military CZs usually have a 10 nautical mile radius and are capped at 6 000 feet AAE.

One can visualize a CZ as a vertical cylinder, with the base of the cylinder centred on the aerodrome (as illustrated in Figure 16-3-3).



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16-3-3 A Control Zone

Terminal Control Areas (TCAs)

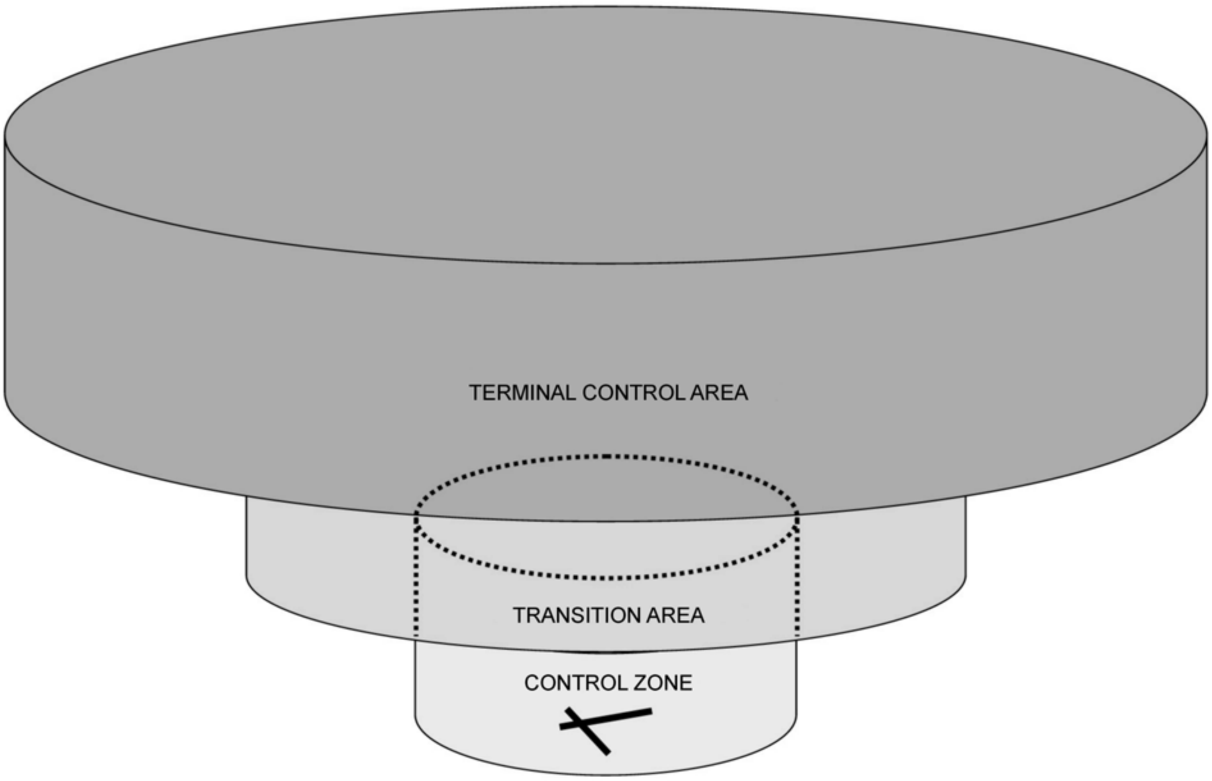
TCAs are established at high volume traffic aerodromes to provide an IFR control service to arriving, departing and en route aircraft. The TCA operating rules are established by the classification of the airspace. These rules are based on the level of ATC service that is appropriate for the number and type of aircraft using the airspace as well as the nature of the operations being conducted.

A TCA expands the controlled airspace surrounding a major aerodrome.

Transition Areas

Transition areas are established when it is necessary to provide additional controlled airspace for the IFR operations, specifically to control all of the airspace used by aircraft during takeoff and landing. Transition areas are of defined dimensions, generally based at 700 feet above ground level (AGL), and extend upwards to the base of overlying controlled airspace. The area provided around an aerodrome will normally be a 15 nautical mile radius of the aerodrome centre.

> The airspace surrounding an aerodrome is best visualized as an "upside down wedding cake" (as illustrated in Figure 16-3-4).



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16-3-4 Control Zone, Terminal Control Area, and Transition Area

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the typical radius of a CZ?

Q2. Where are TCAs established?

Q3. At what height does a transition area usually begin?

ANTICIPATED ANSWERS

A1. Three, five, or seven nautical miles (10 nautical miles for a military control zone).

A2. At high volume traffic aerodromes.

A3. At 700 feet AGL.

Teaching Point 3	**Explain Classes of Airspace**
Time: 10 min	Method: Interactive Lecture

AIRSPACE CLASSIFICATIONS

CDA is divided into seven classes, each identified by a single letter: A, B, C, D, E, F, or G. Flight within each class is governed by specific rules applicable to that class.

Class A

Class A airspace is designated where an operational need exists to exclude VFR aircraft. All operations must be conducted under IFR and are subject to Air Traffic Control (ATC) clearances and instructions. An ATC clearance gives authorization to proceed within controlled airspace and an ATC instruction is a directive issued by an ATC unit for air traffic control purposes.

All high level controlled airspace is designated as Class A.

Class B

Class B airspace is designated where an operational need exists to provide air traffic control service to IFR and to control VFR aircraft.

All low level controlled airspace above 12 500 feet ASL or at and above the minimum en route altitude (MEA), whichever is higher, up to but not including 18 000 feet ASL will be Class B airspace. Control zones and associated terminal control areas may also be classified as Class B airspace.

Class C

Class C airspace is controlled airspace in which both IFR and VFR flights are permitted.

Airspace classified as Class C becomes Class E airspace when the appropriate ATC unit is not in operation. Terminal control areas and associated control zones may be classified as Class C airspace.

Class D

Class D airspace is controlled airspace in which both IFR and VFR flights are permitted, but VFR flights must establish two-way communication with the appropriate ATC agency prior to entering the airspace.

Airspace classified as Class D becomes Class E airspace when the appropriate ATC unit is not in operation. A terminal control area and associated control zone could be classified as Class D airspace.

Class E

Class E airspace is designated where an operational need exists for controlled airspace but does not meet the requirements for Class A, B, C, or D.

Low level airways, control area extensions, transition areas, or control zones established without an operating control tower may be classified as Class E airspace.

Class F

Class F airspace is an area in which activities must be restricted, or limitations imposed upon aircraft operations that are not a part of those activities. Typical uses for Class F airspace include:

- military practice areas,
- fire-bombing,
- parachute jumping,
- flight training,
- soaring,
- hang gliders, and
- air shows.

Class F airspace is sometimes known as special use airspace. It may be classified as Class F advisory, or as Class F restricted, and can be controlled airspace, uncontrolled airspace, or a combination of both.

Class G

Class G airspace is airspace that has not been designated Class A, B, C, D, E or F and in which ATC has neither the authority or responsibility for exercising control over air traffic.

To help the cadets remember:

- Classes A to E are controlled airspace,
- Class F may be controlled or uncontrolled, and
- Class G airspace is uncontrolled.

The difference between Class C and Class D is that an ATC clearance is needed to enter Class C, but two-way communication is all you need to enter Class D.

Distribute photocopies of Annex C to the cadets.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What happens to Class C airspace when the ATC unit is not in operation?

Q2. What is another name for Class F airspace?

Q3. Which airspace is uncontrolled?

ANTICIPATED ANSWERS

A1. It becomes Class E airspace.

A2. Special use airspace.

A3. Class G airspace.

Teaching Point 4	**Have the Cadet, as a Member of a Group of No More Than Four, Construct a Model of the Airspace at an Aerodrome**
Time: 55 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadet to construct a model of the airspace at an aerodrome.

RESOURCES

- Checklist located at Annex D.

- Coloured construction paper,
- Transparent tape,
- Scissors,
- Coloured markers, and
- Glue.

Other materials may be used in addition to this list if available. The amount of materials that are needed will depend on class size and the number of groups.

ACTIVITY LAYOUT

Group the tables/desks together to form a large work surface to support the base of the model.

ACTIVITY INSTRUCTIONS

1. Distribute the checklist located at Annex D to each cadet.
2. Divide the cadets into groups of four.
3. Inform the cadets of the materials available for them to use.
4. Inform the cadets they are all to start with a base of two large pieces of construction paper taped together.
5. Have each group create their own model aerodrome airspace using the checklist located at Annex D, ensuring all the required components are included.

While it is not important for the model to be built exactly to scale, care should be taken to construct items that are the correct size, relative to the other components of the aerodrome.

While cadets are encouraged to be creative with the materials provided, recommend the following:

- Brown or green paper should be used for the base.
- Black or grey paper should be used for pavement.
- Airspace can be created by cutting a strip of construction paper and taping the ends together to create a cylinder.
- Airspace areas can be stacked vertically by cutting and taping a circle of construction paper to the cylinders.
- Different colours of paper should be used for each classification of airspace.
- Coloured markers can be used for adding specific details to components.
- Groups that finish early can improve their model by adding a second aerodrome to the model with airspace that overlaps the first aerodrome's airspace, creating an irregular shape for the airspace areas.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the construction of a model of the airspace at an aerodrome will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Each airspace classification has a set of requirements and operating rules that make it unique. These rules allow pilots, ground crew, and aerodrome operations staff to operate safely.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://www.tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C360.04 – IDENTIFY HOW EQUIPMENT IS USED AT AN AERODROME

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of figures located at Annex E.

Photocopy the activity sheet located at Annex F for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to clarify, emphasize and summarize the equipment used at an aerodrome.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified how equipment is used at an aerodrome.

IMPORTANCE

It is important for the cadets to be able to identify the equipment at an aerodrome and how it is used to understand aerodrome operations. At most aerodromes each vehicle has a specific purpose and, to carry out specialized tasks, certain vehicles have additional equipment added to them.

Teaching Point 1 — **Explain How Trucks Are Used at an Aerodrome**

Time: 15 min — Method: Interactive Lecture

One of the most common vehicles found at an aerodrome is a truck. The trucks found at an aerodrome can be broken down into three general categories:

- pickup truck,
- dump truck, and
- specialty truck.

Show the cadets Figures 16E-1, 16E-2 and 16E-3.

INSPECTIONS

Throughout the course of the day, aerodrome operations staff must conduct inspections of the following areas:

- runways,
- taxiways,
- aprons, and
- roads.

Most of the time, the only equipment required to conduct these inspections is a vehicle with a rotating amber beacon and a two-way radio. A car is usually the most economical vehicle for this kind of task.

While most of the regular inspections at an aerodrome can be conducted using a car, pickup trucks are required for some specific inspections. Specifically, the guidelines for conducting runway friction testing require the use of a pickup truck when using a portable decelerometer (a device that measures deceleration).

A pickup truck transports tools and equipment required to correct deficiencies more easily than a car.

There may also be areas of the aerodrome that need inspections, but that do not have proper roads. In these cases, a four-wheel drive pickup truck may be required to safely reach these areas.

MAINTENANCE

Pickup trucks are used extensively for ongoing maintenance tasks around an aerodrome. They are well-suited to carry the tools and equipment necessary to perform maintenance. Typical maintenance tasks that might be carried out include:

- replacement and repair of lights,
- fence repairs,
- sign repairs, and
- minor pavement and turf repairs.

CONSTRUCTION

During construction at an aerodrome, trucks of all shapes and sizes will be used. Flatbed trucks deliver materials and equipment to the site, as well as move them around the facilities. Dump trucks will be used wherever excavations or earth moving occurs. Pickup trucks will be used to move people, smaller tools and equipment around.

While most of these vehicles will not be owned by the aerodrome, the aerodrome operator will be responsible for ensuring that drivers are properly trained, that the vehicles are properly equipped (eg, two-way radio, rotating amber beacon/strobe light), and that the vehicles move about the aerodrome in a safe and efficient manner.

SNOW REMOVAL

At most Canadian aerodromes, winter is a busy time of year for trucks. All of the snow that falls on the movement areas and the road system has to be cleared in a timely manner to allow operations to continue with minimal disruption.

Show the cadets Figure 16E-4.

Snowplows are often attached to large trucks. Even pickup trucks can have a plow blade attached for clearing small areas. Piles of snow that accumulate can be moved using dump trucks. Dump trucks or pickup trucks may have hoppers in the back that can be used for spreading chemicals for melting ice or grit to increase traction.

PLATFORMS FOR SPECIALTY EQUIPMENT

Many specialized vehicles at an aerodrome are basic truck frames with the addition of special equipment. Examples of these include:

Show the cadets Figure 16E-5.

- de-icing trucks,
- fuel delivery,
- air stairs,
- rapid response emergency vehicles, and
- ground servicing equipment (eg, catering truck).

Show the cadets Figure 16E-6.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets match the vehicle pictures with the correct name and purpose.

RESOURCES

- Aerodrome vehicle handout located at Annex F, and
- Pen/pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute the handout located at Annex F.
2. Have the cadets complete the handout.
3. Provide assistance and guidance as required.
4. Correct the answers as a group using Annex G.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 2	**Describe Runway Maintenance Equipment and How it is Used at an Aerodrome**
Time: 5 min	Method: Interactive Lecture

There are several important pieces of equipment that are used extensively at aerodromes: sweepers, snowplows and snow blowers.

Equipment designed for aerodrome use is usually designed to be mounted on a special chassis. The chassis has a standardized mounting bracket and common hydraulic connections which allow different types of equipment to be mounted, depending on the task to be done.

SWEEPERS

Sweepers come in three main configurations:

- self-propelled,
- front mounted, and
- towed.

Show the cadets Figure 16E-7.

When there has been a light accumulation of snow or slush but not enough to require a snowplow, a sweeper can be used. Sweepers remove debris such as dirt or sand, to prevent foreign object damage (FOD) to propellers or turbine engines.

The rotating brush has bristles made of stainless steel or synthetic materials (usually nylon or polypropylene). Steel bristles cut through ice and snow effectively and synthetic bristles move wet snow or slush well.

Some sweepers have hot air blowers, which direct a steady stream of hot air onto the surface being swept. In addition to blowing away any small particles left behind by the brush, the hot air can melt small ice deposits.

SNOWPLOWS

Any aerodrome that expects snow will have a snowplow, either owned by the aerodrome, or contracted by a third party. A snowplow is the most effective way to remove snow from aircraft movement areas.

Show the cadets Figures 16E-8 and 16E-9.

SNOW BLOWERS

When a snowplow pushes snow to the side of a runway, it creates a pile of snow known as a windrow. The preferred method of removing the windrow is with a snow blower. The snow blower can move along the edge of the runway blowing the snow in the windrow over the runway edge lights and away from the runway.

Show the cadets Figures 16E-10 and 16E-11.

Similar to sweepers, snow blowers can be front mounted, rear mounted or self-propelled. The large self-propelled versions have two engines: one for driving, and the other for powering the snow blower. Rear mounted blowers are commonly attached to tractors.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What configurations do sweepers come in?

Q2. What are the differences between a highway snowplow and an aerodrome snowplow?

Q3. What is the primary purpose of a snow blower at an aerodrome?

ANTICIPATED ANSWERS

A1. Self-propelled, front mounted or towed.

A2. An aerodrome snowplow has a wider blade that is reversible (two-way).

A3. Removing windrows left behind by snowplows.

Teaching Point 3	**Describe Refuelling Equipment at an Aerodrome**
Time: 5 min	Method: Interactive Lecture

STATIONARY REFUELLING EQUIPMENT

At most public aerodromes, aviation fuel is available for purchase from the aerodrome operator, or from a third party (or parties at a large aerodrome). Fuel is dispensed in two main ways: from a stationary location or from a mobile refueller. A stationary refuelling system is made up of three main components: tanks, pumps and hoses.

Show the cadets Figures 16E-12 and 16E-13.

MOBILE REFUELLING EQUIPMENT

At a large aerodrome, or at an aerodrome with large aircraft, a stationary refuelling system is not a viable option. In these cases, refuelling is carried out by mobile refuelling equipment that brings fuel to the aircraft.

Show the cadets Figure 16E-14.

Commonly, the fuel is stored in large tanks in a remote location (known as a fuel farm) at the aerodrome. The mobile tanker is filled from the bulk tanks, driven to the aircraft and refuelling is carried out. The tanker can then move on to the next aircraft and repeat the process. When the tanker no longer carries enough fuel to service the next aircraft, it returns to the bulk tank and is refilled.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are the two main ways that fuel is dispensed to aircraft?

Q2. What is the name of the remote location where fuel is stored for mobile refuelling?

Q3. What are the three main components of a refuelling system?

ANTICIPATED ANSWERS

A1. From a stationary location or from a mobile refueller.

A2. A fuel farm.

A3. Tanks, pumps and hoses.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are three types of equipment used at an aerodrome?

Q2. Where is fuel stored at an aerodrome?

Q3. For inspection of which aerodrome facilities is a car usually the most economical vehicle?

ANTICIPATED ANSWERS

A1. Sweepers, snowplows and snow blowers.

A2. At a fuel farm.

A3. Runways, taxiways, aprons, and roads.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to be able to identify the equipment at an aerodrome and how it is used. Each piece of equipment has a specific purpose, and is outfitted with specialized equipment to help it perform the required tasks.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-148 (ISBN 0-9739866-0-3) Syme, E. R., & Wells, A. T. (2005). *Airport Development, Management and Operations in Canada: Second Edition*. Barrie, ON: Aviation Education Services.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C360.05 – IDENTIFY ASPECTS OF EMERGENCY RESPONSE AND AERODROME SECURITY

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Review the mandate of the Canadian Air Transport Security Authority (CATSA) at website reference C3-098 and update the information presented in the guide if necessary.

Obtain and photocopy an updated list of permitted and prohibited carry-on items from http://www.catsa-acsta.gc.ca for each cadet.

Create a slide of Annex H.

Photocopy the Aerodrome Security Definitions located at Annex I for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to clarify, emphasize and summarize aircraft and aerodrome emergencies, security, the role of CATSA, and types of screening at an aerodrome.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified aspects of emergency response and security at aerodromes.

IMPORTANCE

It is important for cadets to understand the operational requirements of aerodrome emergency response and security. Recognizing the role of CATSA and the types of screening performed will be relevant to cadets who travel through major Canadian aerodromes.

Teaching Point 1	Discuss Aircraft Emergencies
Time: 5 min	Method: Interactive Lecture

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

The primary responsibility of an ARFF service is to provide an escape route for the evacuation of passengers and crew when needed. This service is also known as:

- Crash, Fire and Rescue (CFR), and
- Emergency Response Services (ERS).

ARFF VEHICLES

ARFF must be able to respond within a specific time frame, carry the types and volumes of specified extinguishing agents (water and foam) and be able to dispense the agents.

Show the cadets Figure 16H-1.

ARFF vehicles are similar to standard fire trucks, but have been built specifically for aerodromes. They can handle rough terrain while accelerating quickly to their top speed. The use of turrets to dispense water and foam allows the operator to drive to the edge of the fire and begin dispensing extinguishing agents immediately. Two turrets (nose and roof) are standard equipment and are controlled by the operator inside the cabin. A turret can be combined with a piercing device on the end of a boom. This boom can be extended to the aircraft to create an opening in the aircraft skin and an extinguishing agent can then be delivered directly into the aircraft.

STANDBY REQUESTS

Local Standby. The level of response when an aircraft has or is suspected to have an operational defect that would cause serious difficulty for the aircraft to achieve a safe landing.

Full Emergency Standby. The level of response when an aircraft has or is suspected to have an operational defect that affects normal flight operations to the extent that there is possibility of an accident.

ON-SITE CRASHES

If a crash occurs at an aerodrome, the primary role of the ARFF service is to suppress any fire and provide a safe evacuation route out of the aircraft for the passengers. Many ARFF departments also include paramedics, vehicles and equipment to provide first aid and triage services to the passengers. In the event of a major crash, additional resources from the local area may be required.

OFF-SITE CRASHES

If an aircraft crash occurs near an aerodrome with ARFF, the ARFF services from that aerodrome may be dispatched to the scene. If ARFF services from an aerodrome are not readily available, local fire departments and paramedics will respond. Most aircraft crashes occur during takeoff and landing; the ERS for the municipalities surrounding an aerodrome, such as fire, paramedics and police services, will be prepared to respond to an off-site crash. ERS personnel receive special training on aircraft firefighting and passenger rescue techniques.

JOINT RESPONSES

Aerodromes with ARFF services may have an agreement with the surrounding municipalities to assist in off-site aircraft crashes. The agreement may also cover non-aviation related emergencies near the aerodrome. An example of this would be a fuel tanker crash and fire on a nearby highway. The foam extinguishing agent dispensed by ARFF vehicles can control this type of fire.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What does ARFF stand for?

Q2. How do ARFF vehicles dispense water and/or foam?

Q3. When do most aircraft crashes occur?

ANTICIPATED ANSWERS

A1. Aircraft Rescue and Fire Fighting.

A2. Through turrets.

A3. During takeoff and landing.

Teaching Point 2	**Discuss Aerodrome Emergencies**
Time: 5 min	Method: Interactive Lecture

AERODROME EMERGENCIES

In addition to aircraft emergencies, the aerodrome's emergency plan should include other non-aviation emergencies. Where possible, the ARFF unit is the responding agency. In other cases, local ERS such as fire, paramedics and police would respond. In all cases, simulated emergency exercises are held to test the emergency plan and provide training opportunities for all personnel.

Building Fires

A fire in a terminal building at a large aerodrome would be handled much the same way as a fire in any large building with lots of people (such as a shopping mall). In addition to fire extinguishers throughout the building (designed to put out and control small fires) there are usually water pipes, hoses and standpipe connections. As with any emergency in a location with large numbers of people, preparations to deal with injuries and casualties are necessary.

Bomb Threats

The emergency plan includes a section on bomb threats, both in the terminal and on-board an aircraft. In the terminal, suspicious or unattended baggage is treated seriously. Large international airports usually have personnel and equipment on site to respond. Many state-of-the-art baggage screening systems have isolation chambers that suspicious baggage can be routed to. This chamber is designed to contain an explosion and prevent injuries and damage.

In Canada, making a false declaration that could jeopardize the safety or security of an aircraft or aerodrome can result in a fine up to $5 000.

Medical Crises

Heart attacks, panic attacks and allergic reactions are common in areas where large numbers of people congregate. Large aerodromes have paramedics on site to deal with medical crises. Small aerodromes must ensure that aerodrome personnel have the appropriate first aid qualifications and training to deal with common crises until paramedics can arrive. Advances in technology have resulted in the development of Automated External Defibrillators (AEDs). These machines make it possible for non-medical personnel to restore heart rhythms to help save lives.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Who can help aerodrome ARFF units respond to emergencies?

Q2. How much could you be fined for making a false declaration that jeopardizes safety or security?

Q3. What machine can help increase the survival rate of heart attack victims?

ANTICIPATED ANSWERS

A1. Local ERS.

A2. $5 000.

A3. AED.

Teaching Point 3	**Explain Components of Aerodrome Site Security**
Time: 5 min	Method: Interactive Lecture

AERODROME SECURITY DEFINITIONS

Hand out a copy of Annex I to each cadet.

Restricted Area. A portion of an aerodrome where access is only granted to authorized persons.

Restricted Area Access Point. A location in a security barrier at which a control system is in place that controls access to a restricted area from a non-restricted area.

Screening. The checking, identification, observation, inspection or authorized search of persons, goods and other things in the possession or control of persons.

Security Barrier. A physical structure or natural feature used to prevent or deter access by unauthorized persons to a restricted area.

Sterile Area. A restricted area, including any passenger loading bridges attached to it. It is used to separate passengers who have been screened, or are exempt from screening, and other authorized persons from unauthorized persons at the aerodrome.

RESTRICTED AREAS

All aircraft movement areas (runways, taxiways and aprons) are restricted areas and only those who are authorized have access to these areas. Restricted areas also exist inside the terminal building. The area used by passengers between the time they are screened and the time they board the aircraft is a restricted area (specifically a sterile area). Other areas inside the terminal building that will be a restricted area include:

- aerodrome and airline operations,
- baggage-handling areas,
- ATC, and
- emergency response.

FENCES

The fences most commonly used as security measures at an aerodrome are chain-link fences erected around the perimeter of the aircraft movement areas. Access through the fence is provided by gates for vehicles and people or through buildings adjacent to the movement areas.

GATES

The gates found in aerodrome fencing can be categorized in several ways: routine, emergency, or occasional access points and vehicle or personnel access points. Additionally, they can be operated manually or mechanically. Gates designed to be operated mechanically should also be able to be opened manually in case of electrical failure. In all cases, a gate that remains open can become a major security problem.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is a restricted area?

Q2. In addition to identity, what must be confirmed prior to allowing access to a restricted area?

Q3. How can gates be operated?

ANTICIPATED ANSWERS

A1. A portion of an aerodrome where access is only granted to authorized persons.

A2. Authorization.

A3. Manually or mechanically.

Teaching Point 4	Explain Security Requirements at Different Types of Aerodromes
Time: 5 min	Method: Interactive Lecture

INTERNATIONAL AND REGIONAL AERODROMES

The security requirements at international and regional aerodromes are governed by Part Three–Aerodrome Security of the Canadian Aviation Security Regulations (CASR). It details identity verification systems and restricted area pass control. CASR Part Three requires that:

- access to restricted areas be controlled by an identity verification system;
- restricted area passes are only issued to those that require them on an ongoing basis, and deactivated when they are no longer required; and
- restricted areas can only be accessed through a restricted area access point.

MUNICIPAL AND PRIVATE AERODROMES

The measures that are implemented depend on the resources available, the types of security risks expected by the aerodrome operator and the level of risk that the aerodrome operator is willing to accept. Most aerodromes of this type will implement measures such as fences, gates, signs and locked doors to prevent unauthorized persons from inadvertently accessing restricted areas. Aerodromes with more resources and those that anticipate a higher degree of security related risks and incidents will implement more formal and stringent procedures.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What part of the CASR pertains only to international and regional airports?

Q2. How can access to restricted areas be controlled?

Q3. Where can a restricted area be accessed?

ANTICIPATED ANSWERS

A1. CASR Part Three – Aerodrome Security.

A2. By an identity verification system.

A3. At a restricted area access point.

Teaching Point 5	Explain the Role of the Canadian Air Transport Security Authority (CATSA)
Time: 5 min	Method: Interactive Lecture

CANADIAN AIR TRANSPORT SECURITY AUTHORITY (CATSA)

CATSA's mandate is to protect the public by securing critical elements of the air transportation system as assigned by the government. CATSA was established in April 2002 as part of a comprehensive aviation security initiative. It is a crown corporation that reports to Parliament through the Minister of Transportation. CATSA's many responsibilities include pre-board screening of passengers and their belongings (PBS), hold baggage screening (HBS) and non-passenger screening (NPS).

Updated information on the role and mandate of CATSA can be found at http://www.catsa-acsta.gc.ca.

Pre-Board Screening (PBS)

Distribute the list of permitted and prohibited carry-on items. The list of prohibited items and dangerous goods changes from time to time. An updated list can be obtained from http://www.catsa-acsta.gc.ca/english/travel_voyage/list.shtml.

Passengers and carry-on baggage must pass through screening devices before entering the sterile area. These devices provide a way for screening officers to identify passengers and baggage that should be subjected to a more thorough search. Objects that are not permissible can also be identified with these devices. Passengers and baggage may also be selected at random for a more in-depth search.

Hold Baggage Screening (HBS)

HBS is the screening of checked baggage using explosives detection systems at aerodromes. In 2006 CATSA announced full deployment of HBS at 89 airports across Canada. This state-of-the-art baggage system is multi-level and involves the screening of all checked baggage. HBS is in effect for all domestic and international flights.

Non-Passenger Screening (NPS)

CATSA screens individuals, goods and possessions requiring access to the restricted areas at aerodromes where it is responsible for screening services. Flight crews and airport workers such as caterers, maintenance workers and baggage handlers are randomly selected for screening at Canada's 29 largest airports. Over 1 000 screenings of non-passengers and any goods or possessions occur nationally, at random, on a daily basis.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What does PBS stand for?

Q2. What does HBS stand for?

Q3. What does NPS stand for?

ANTICIPATED ANSWERS

A1. Pre-board Screening.

A2. Hold Baggage Screening.

A3. Non-passenger Screening.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What are two common types of extinguishing agents carried by ARFF vehicles?

Q2. What is a restricted area?

Q3. What are three types of medical crises that are common where large numbers of people congregate?

ANTICIPATED ANSWERS

A1. Water and foam.

A2. A portion of an aerodrome where access is only granted to authorized persons.

A3. Heart attacks, panic attacks and allergic reactions.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Emergency response and aerodrome security are both necessary to ensure the safety of the travelling public. Both of these areas are complex, with challenges and solutions constantly evolving.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://www.tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

C3-098 Canadian Air Transport Security Authority. (2007). *Mandate*. Retrieved October 10, 2007, from http://www.catsa-acsta.gc.ca/English/about_propos/mandat.shtml.

C3-148 (ISBN 0-9739866-0-3) Syme, E. R., & Wells, A. T. (2005). *Airport Development, Management and Operations in Canada: Second Edition*. Barrie, ON: Aviation Education Services.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO C360.06 – EXPLAIN ASPECTS OF AIR TRAFFIC SERVICES (ATS)

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts located at Annexes J and K for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 3 to clarify, emphasize and summarize aspects of ATS.

An in-class activity was chosen for TP 2 as this is an interactive way to reinforce the difference between ATC clearances and ATC instructions.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have explained aspects of ATS.

IMPORTANCE

It is important for cadets to know that ATS is the provision of control and information services and that it is required to maintain a safe and efficient air transport system. Personnel working at an aerodrome need to be aware of the types of services provided at the aerodrome and to be prepared to communicate with the appropriate ATS unit to ensure smooth and safe operations.

Teaching Point 1 **Explain Types of ATS**

Time: 10 min Method: Interactive Lecture

AIR TRAFFIC SERVICES (ATS)

A wide variety of services are provided to pilots and aircraft. Control and information services are both included in this category.

Air Traffic Control (ATC)

ATC service has been established primarily for the prevention of collisions and the efficient flow of traffic. The provision of ATC service will take precedence over the provision of flight information services. ATC service ensures separation between aircraft, especially those that are operating under instrument meteorological conditions (IMC). ATC service is provided to aircraft during all phases of flight and on the ground at busy aerodromes.

Information Services

Information that could be relevant to the safety of a flight is provided to pilots as it becomes available. Sometimes, ATC service suggestions are included. It is up to the pilot to make decisions based on a suggestion. Information provided includes:

- severe weather conditions along the proposed route of flight,
- changes in the serviceability of navigation aids,
- weather conditions reported or forecasted at destination or alternate aerodromes,
- changes in the serviceability of navigation aids,
- condition of airports and associated facilities, and
- other items considered pertinent to the safety of the flight.

Advisory Services

At uncontrolled aerodromes, the information listed below is provided by advisory services (if appropriate) during initial aerodrome advisory communications:

- active or preferred runway,
- wind direction and speed,
- air traffic that warrants attention,
- vehicle traffic,
- wake turbulence cautionary,
- aerodrome conditions,
- weather conditions, and
- additional information of interest for the safety of flight.

Alerting Services

When an aircraft declares an emergency, alerting services notifies the appropriate agency to provide emergency standby services. If an aircraft becomes overdue, search and rescue (SAR) agencies can be notified. Alerting a responsible authority of any unlawful interference (hijack), bomb threat or inability to communicate is also included in this service.

Briefing Services

Briefing services, provided by flight service specialists, consult on meteorological and aeronautical information to assist pilots in pre-flight planning. The flight service specialist adapts meteorological information, including satellite and radar imagery, to fit the needs of flight crew members and operations personnel and provides consultation and advice on special weather problems.

Notice to Airmen (NOTAM) Services

NOTAM services collect information from pilots, aerodrome operators and aeronautical facilities operators and distribute as required and requested. This includes Runway Surface Condition (RSC) reports and Canadian Runway Friction Index (CRFI) information.

Distribute photocopies of Annex J to the cadets.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What type of ATS has priority over provision of flight information services?

Q2. What type of service provides such information as active or preferred runway, wind direction and speed, air traffic and vehicle traffic?

Q3. What type of service assists pilots with flight planning?

ANTICIPATED ANSWERS

A1. ATC service.

A2. Advisory service.

A3. Briefing service.

Teaching Point 2	Explain the Difference Between an ATC Clearance and an ATC Instruction
Time: 10 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to allow the cadets to explain the difference between an ATC clearance and an ATC instruction.

RESOURCES

- One sheet of paper for each cadet, and

- Pens/pencils.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute one handout of Annex K to each cadet.
2. Organize the cadets into groups of four.
3. Explain to the cadets the following definitions:

   (a) **ATC Clearance.** An authorization from ATC for a pilot to proceed with a specific action (eg, takeoff or landing) or along a specific route.

Whenever an ATC clearance is received and accepted by the pilot, compliance shall be made with the clearance. If a clearance is not acceptable, the pilot should immediately inform ATC of this fact as acknowledgement of the clearance alone will be taken by a controller as indicating acceptance. A clearance will be identified by the use of the word “clear” in its contents. Example of clearances are:

“You are cleared to the circuit”.

“You are cleared for take off on runway two niner”.

   (b) **ATC Instruction.** A directive from ATC to do something specific (eg, maintain 5 000 feet).

A pilot shall comply with an ATC instruction that is directed to and received by the pilot, provided the safety of the aircraft is not jeopardized. An instruction will always be worded in such a manner as to be readily identified, although the word “instruct” will seldom be included. Pilots shall comply with and acknowledge receipt of all ATC instructions directed to and received by them. An example of an instruction would be:

“Hold on taxiway”.

“Climb to and maintain one three thousand”.

4. Have each group write down examples of ATC clearances or an ATC instructions that might be given to a person operating an aircraft at an aerodrome.
5. Read out each group’s ATC clearance/instruction and have the class identify it as a clearance or instruction.
6. Continue until all of the ATC clearances/instructions have been read or time runs out.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets’ participation in the ATC clearance and ATC instruction activity will serve as the confirmation of this TP.

Teaching Point 3	**Explain the Functions of ATC**
Time: 5 min	Method: Interactive Lecture

AREA CONTROL CENTRES (ACCS)

Area control service is provided by ACCs to flights operating within specified control areas. These areas typically consist of high level airspace and serve aircraft operating in the en route phase of flight. Information and advisory services are provided when workloads permit.

TERMINAL CONTROL UNITS (TCUS)

Terminal control service is provided by TCUs to flights operating within specified control areas surrounding major aerodromes. The primary purpose is to provide arrival and departure control to aircraft as they transition from the takeoff or landing phase to the en route phase. This type of ATC unit is responsible for sequencing aircraft to ensure an efficient flow of traffic to and from an aerodrome.

CONTROL TOWERS

Control towers are located at busy aerodromes to provide ATC services to aircraft during takeoff and landing. Control of aircraft on the ground is also provided. Workloads in most control towers do not usually permit the provision of information and advisory services so aircraft will obtain the required information from another ATS unit on a different frequency or by telephone before making contact with the control tower.

FLIGHT SERVICE STATIONS (FSSS)

FSSs provide information, advisory, alerting, briefing and NOTAM services. FSSs are responsible for large areas and provide service for all of the aerodromes in their area. Remote communications systems allow flight service specialists to communicate via radio to aircraft and vehicles hundreds of kilometres away.

FSSs are the initial point of contact for pilots during the pre-flight planning stage. They play a key role in the collection and distribution of NOTAMs. FSSs can be contacted by pilots via radio when in the air (and on the ground where remote communications facilities exist) or by telephone.

Vehicle control service at uncontrolled aerodromes with a mandatory frequency is provided by a FSS. The FSS may be hundreds of kilometres away and providing this service to multiple aerodromes. Personnel operating vehicles at aerodromes in this situation must pay close attention to this fact and be very clear and concise about their intentions and location.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Which unit provides control to aircraft and vehicles on the ground at busy aerodromes?

Q2. Which unit provides control services to aircraft arriving and departing a controlled aerodrome?

Q3. Which unit plays a key role in the provision of NOTAM services?

ANTICIPATED ANSWERS

A1. Control tower.

A2. TCU.

A3. FSS.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What type of ATS has priority over the provision of flight information services?

Q2. Which ATC communication must a pilot obey provided the safety of the aircraft is not jeopardized?

Q3. What type of service assists pilots with flight planning?

ANTICIPATED ANSWERS

A1. ATC.

A2. An ATC instruction.

A3. Briefing service.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

ATS provides the control and information services that support safe operation at busy aerodromes. Personnel working at an aerodrome need to be aware of the types of services provided at the aerodrome and be prepared to communicate with the appropriate ATS unit.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

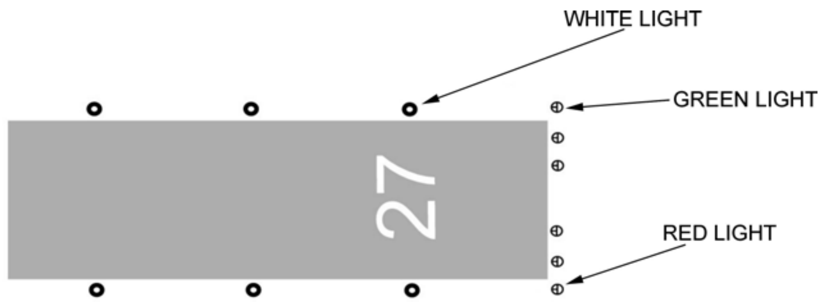
C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://www.tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

MANOEUVRING LIGHTING

RUNWAY LIGHTING

Edge lights are located along the runway. These lights are white in colour (white light bulb with a clear lens) and provide assistance in identifying the edge of the runway. The lights are spaced evenly along each edge with no more than 60 m (200 feet) between the lights. Each row of lights is the same distance from the runway centreline and may be located along the edge of the runway or no more than 1.5 m away from the edge, except in areas that experience significant accumulations of snow. In areas that experience significant accumulations of snow, edge lights may be placed up to 3 m from the runway edge.

The edge lights that cross the beginning of a runway are green while the lights at the end of a runway are red. This is accomplished by using a two-colour filter under the lens. The red side is located on the runway side so that when an aircraft is on the runway looking at the light, a red light is visible. The green filter is on the other side so that when the aircraft is approaching the runway, a green light is visible.



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16A-1 Runway Lighting

TAXIWAY LIGHTING

Edge lights are placed along taxiways in the same way edge lights are placed along runways. The maximum spacing remains at 60 m (200 feet) and will be closer together along a curved section than along a straight section. Taxiway edge lights are blue in colour. The blue colour is created by using a blue lens instead of a clear lens.

Where a taxiway intersects a runway, two blue lights are placed on each side of the taxiway, adjacent to the runway, to indicate the intersection.

APRON LIGHTING

Apron edge lights are yellow in colour (created by using a yellow lens). Where a taxiway intersects an apron, two yellow lights are placed on each side of the taxiway, adjacent to the apron, to indicate the intersection.

Light Location	Colour
Runway Edge Lights	White
Taxiway Edge Lights	Blue
Apron Edge Lights	Yellow
Runway/Taxiway Intersection	Two blue
Taxiway/Apron Intersection	Two yellow
Runway Threshold (end of runway side)	Red
Runway Threshold (start of runway side)	Green

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 16A-2 Runway Lighting Colours

UNSERVICEABLE AREA MARKINGS

Certain ground markings indicate the status of aerodromes and pilots are required to comply with these markings.

A large cross, either white or yellow and at least 6.1 m in length, displayed at each end of a runway or taxiway indicates that that runway or taxiway is unserviceable. For night operations, any unserviceable portion of a runway is closed off by placing red lights at right angles to the centerline across both ends. In addition, the runway lights for the unserviceable area are turned off.

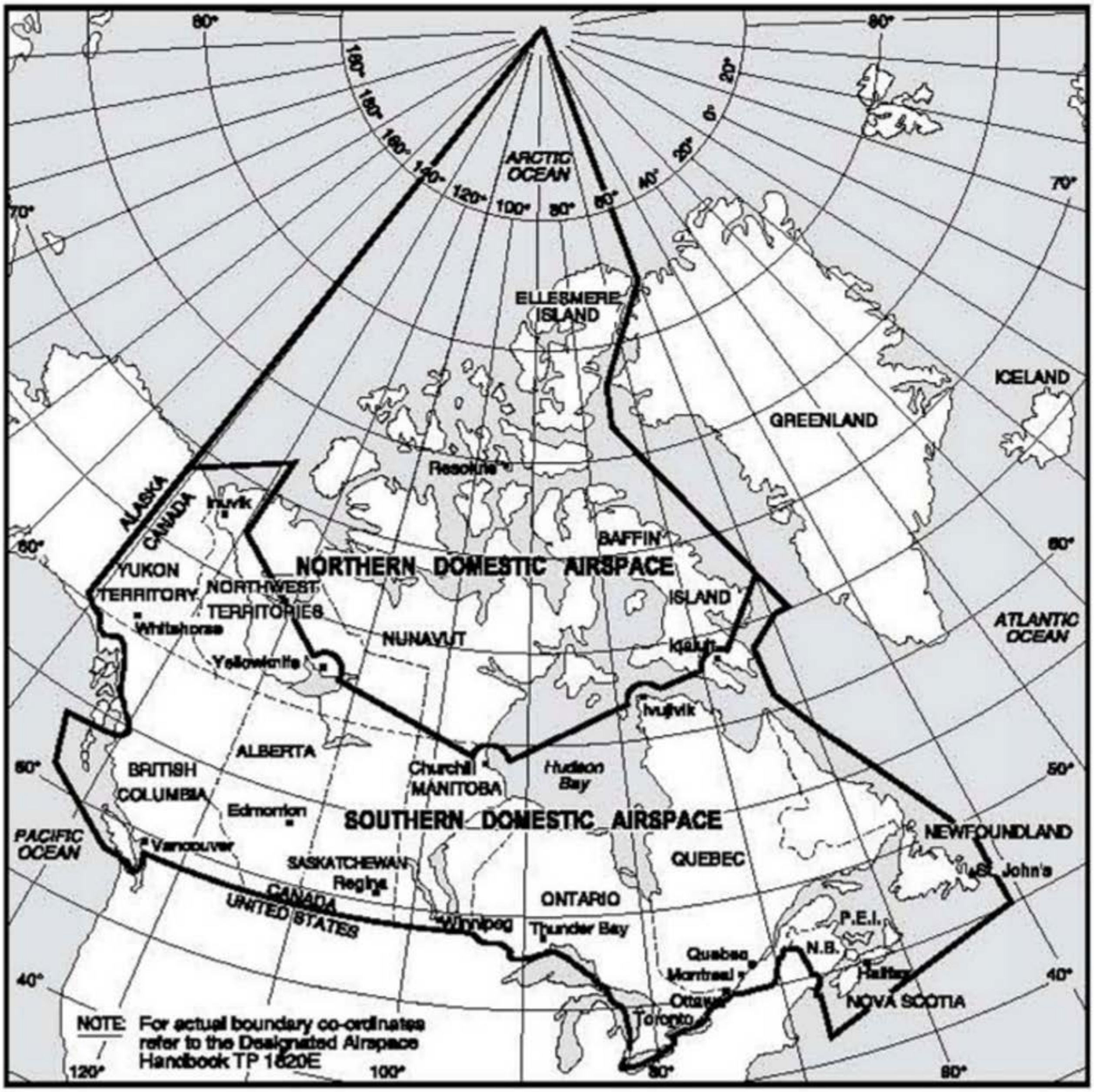
If an unserviceable portion of any manoeuvring area or taxiway is small enough that it can be bypassed by an aircraft with safety, red flags are used to outline the area. At night, the area is marked with red lights – sometimes flashing.

APPROACH LIGHTING SYSTEM (ALS)

An ALS provides additional guidance to aid a pilot in finding the beginning of the runway during periods of low visibility. These lights are used as part of an instrument landing system (ILS) and aid the pilot in transitioning from the instrument portion of the approach to the visual portion.

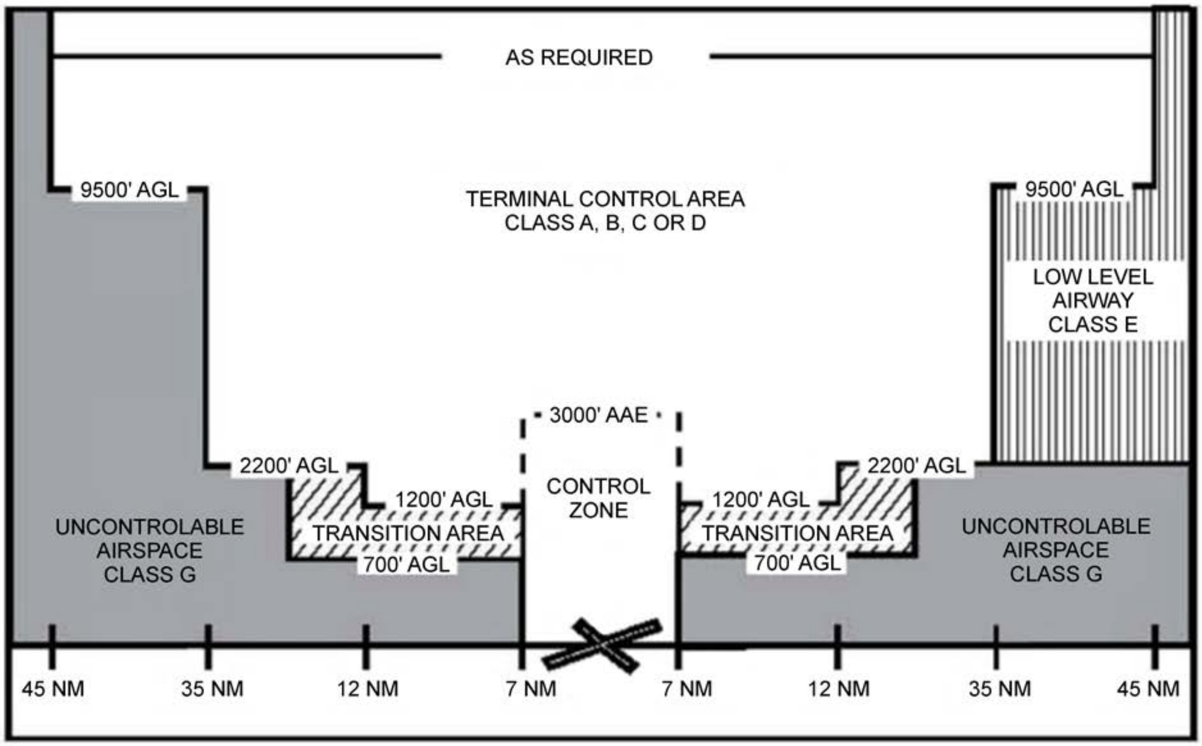
The aerodrome operator must ensure that the systems are working properly by inspecting them on a regular basis. During the winter, the snow around the systems must be cleared to keep them visible.

CANADIAN DOMESTIC AIRSPACE



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 182)

Figure 16B-1 Boundaries of CDA, NDA, and SDA



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 186)

Figure 16B-2 Typical Airspace Surrounding an Aerodrome

AIRSPACE CLASSIFICATIONS

CDA is divided into seven classes, each identified by a single letter: A, B, C, D, E, F, or G. Flight within each class is governed by specific rules applicable to that class.

CLASS A

Class A airspace is designated where an operational need exists to exclude VFR aircraft. All operations must be conducted under IFR and are subject to Air Traffic Control (ATC) clearances and instructions. An ATC clearance gives authorization to proceed within controlled airspace and an ATC instruction is a directive issued by an ATC unit for air traffic control purposes.

All high level controlled airspace is designated as Class A.

CLASS B

Class B airspace is designated where an operational need exists to provide air traffic control service to IFR and to control VFR aircraft.

All low level controlled airspace above 12 500 feet ASL or at and above the minimum en route altitude (MEA), whichever is higher, up to but not including 18 000 feet ASL will be Class B airspace. Control zones and associated terminal control areas may also be classified as Class B airspace.

CLASS C

Class C airspace is controlled airspace in which both IFR and VFR flights are permitted.

Airspace classified as Class C becomes Class E airspace when the appropriate ATC unit is not in operation. Terminal control areas and associated control zones may be classified as Class C airspace.

CLASS D

Class D airspace is controlled airspace in which both IFR and VFR flights are permitted, but VFR flights must establish two-way communication with the appropriate ATC agency prior to entering the airspace.

Airspace classified as Class D becomes Class E airspace when the appropriate ATC unit is not in operation. A terminal control area and associated control zone could be classified as Class D airspace.

CLASS E

Class E airspace is designated where an operational need exists for controlled airspace but does not meet the requirements for Class A, B, C, or D.

Low level airways, control area extensions, transition areas, or control zones established without an operating control tower may be classified as Class E airspace.

CLASS F

Class F airspace is an area in which activities must be restricted, or limitations imposed upon aircraft operations that are not a part of those activities. Typical uses for Class F airspace include:

- military practice areas,
- fire-bombing,
- parachute jumping,
- flight training,
- soaring,
- hang gliders, and

- air shows.

Class F airspace is sometimes known as special use airspace. It may be classified as Class F advisory, or as Class F restricted, and can be controlled airspace, uncontrolled airspace, or a combination of both.

CLASS G

Class G airspace is airspace that has not been designated Class A, B, C, D, E or F and in which ATC has neither the authority or responsibility for exercising control over air traffic.

To help remember:

- Classes A to E are controlled airspace,
- Class F may be controlled or uncontrolled, and
- Class G airspace is uncontrolled.

The difference between Class C and Class D is that an ATC clearance is needed to enter Class C, but two-way communication is all you need to enter Class D.

AIRSPACE MODEL CONSTRUCTION CHECKLIST

Use this as a guide to ensure that your model has all the required components. As you add each component to the model, you can check it off the list. If you add something to the model that is not on the list below, write it in the extra spaces provided.

Primary runway

Secondary runway

Control zone

Terminal control area

Transition area

____

____

____

____

____

____

____

____

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VEHICLES USED AT AN AERODROME

Enfield Auto Body, Major Clients and Services. Retrieved November 15, 2007, from http://www.enfieldautobody.com/majorclients.htm

Figure 16E-1 Pickup Truck Used at an Aerodrome

NRRA, Airport Vehicles. Retrieved November 15, 2007, from http://www.nrairport.com/equipment/airport_vehicles.htm

Figure 16E-2 Dump Truck Used at an Aerodrome

Bosserman Aviation Equipment, New Refuelers. Retrieved November 19, 2007, from http://www.bossermanaviationequip.com/refuelers.htm

Figure 16E-3 Mobile Tanker Used at an Aerodrome

Sioux Gateway Airport, Photo Gallery. Retrieved November 15, 2007, from http://www.flysiouxgateway.com/index.php/gallery/image_full/107/

Figure 16E-4 A Snowplow Used at an Aerodrome

Chisholm/Hibbing, 2007, Airport Deicing Service, Copyright 2007 by Chisholm/Hibbing Airport. Retrieved November 15, 2007, from http://www.hibbingairport.com/services/deicer.php

Figure 16E-5 A De-Icing Truck Used at an Aerodrome

Stinar Corporation, Stinar Lavatory and Water Trucks. Retrieved November 19, 2007, from http://www.stinar.com/lav_water_trucks.shtml

Figure 16E-6 A Ground Servicing Truck (Potable Water) Used at an Aerodrome

NRRA, Airport Vehicles. Retrieved November 15, 2007, from http://www.nrairport.com/equipment/airport_vehicles.htm

Figure 16E-7 Front Mounted Sweeper

Viking Cives, Photo Gallery. Retrieved November 16, 2007, from http://vcl.vikingcives.com/ViewPage.aspx?pg=35

Figure 16E-8 One-Way Snowplow Blade Mounted on a Truck

Patria, Airport Equipment. Retrieved November 16, 2007, from http://patria.fi/products/PatriaProductsPublic/search.aspx?selectedcategory=CD498

Figure 16E-9 Two-Way Snowplow Blade Mounted on a Special Chassis

NRRA, Airport Vehicles. Retrieved November 15, 2007, from http://www.nrairport.com/equipment/airport_vehicles.htm

Figure 16E-10 Front Mounted Snow Blower (Mounted on a Tractor)

Eagle Airfield, Used Equipment Inventory. Retrieved November 16, 2007, from http://www.eagleairfield.com/Used.html

Figure 16E-11 Self-Propelled Snow Blower

Velcon Canada, 2003, Engineered Products and Systems, Copyright 2003 by Velcon Canada.
Retrieved November 19, 2007, from http://www.velconcanada.ca/specialprojects.html

Figure 16E-12 Above Ground Tank and Refuelling Cabinet

Velcon Canada, 2003, Engineered Products and Systems, Copyright 2003 by Velcon Canada. Retrieved November 19, 2007, from http://www.velconcanada.ca/specialprojects.html

Figure 16E-13 Refuelling Cabinet

Bosserman Aviation Equipment, New Refuelers. Retrieved November 19, 2007, from http://www.bossermanaviationequip.com/refuelers.htm

Figure 16E-14 Mobile Tanker

VEHICLE IDENTIFICATION

Match the pictures with the most correct name or purpose. Each picture has a matching name and a matching purpose. Not all names or purposes have a matching picture.

A

B

C

D

E

F

Name

_________ Pickup truck

_________ Snowplow

_________ Fire truck

_________ De-icing truck

_________ Ground servicing truck

_________ Mobile tanker

_________ Dump truck

_________ Aircraft tow tractor

_________ Snow blower

Purpose

_________ Push snow.

_________ Respond to aircraft emergencies.

_________ Spray aircraft to remove/prevent ice.

_________ Move aircraft around on apron.

_________ Blow snow.

_________ Deliver supplies to aircraft on the apron.

_________ General aerodrome use.

_________ Carry loads of snow and grit.

_________ Deliver fuel to aircraft.

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ANSWER KEY

A

B

C

D

E

F

Name

____F____ Pickup truck

____B____ Snowplow

_________ Fire truck

____D____ De-icing truck

____C____ Ground servicing truck

____A____ Mobile tanker

____E____ Dump truck

_________ Aircraft tow tractor

_________ Snow blower

Purpose

____B____ Push snow.

_________ Respond to aircraft emergencies.

____D____ Spray aircraft to remove/prevent ice.

_________ Move aircraft around on apron.

_________ Blow snow.

____C____ Deliver supplies to aircraft on the apron.

____F____ General aerodrome use.

____E____ Carry loads of snow and grit.

____A____ Deliver fuel to aircraft.

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ARFF TRUCK

Oshkosh Truck Corporation, 2007, Striker 4500, Copyright 2007 by Oshkosh Truck Corporation. Retrieved November 28, 2007, from http://www.oshkoshtruck.com/pdf/Oshkosh_Striker4500.pdf

Figure 16H-1 ARFF Truck

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AERODROME SECURITY DEFINITIONS

Restricted Area. A portion of an aerodrome where access is only granted to authorized persons.

Restricted Area Access Point. A location in a security barrier at which a control system is in place that controls access to a restricted area from a non-restricted area.

Screening. The checking, identification, observation, inspection or authorized search of persons, goods and other things in the possession or control of persons.

Security Barrier. A physical structure or natural feature used to prevent or deter access by unauthorized persons to a restricted area.

Sterile Area. A restricted area, including any passenger loading bridges attached to it. It is used to separate passengers who have been screened, or are exempt from screening, and other authorized persons from unauthorized persons at the aerodrome.

RESTRICTED AREAS

All aircraft movement areas (runways, taxiways and aprons) are restricted areas and only those who are authorized have access to these areas. Restricted areas also exist inside the terminal building. The area used by passengers between the time they are screened and the time they board the aircraft is a restricted area (specifically a sterile area). Other areas inside the terminal building that will be a restricted area include:

- aerodrome and airline operations,
- baggage-handling areas,
- ATC, and
- emergency response.

FENCES

The fences most commonly used as security measures at an aerodrome are chain-link fences erected around the perimeter of the aircraft movement areas. Access through the fence is provided by gates for vehicles and people or through buildings adjacent to the movement areas.

GATES

The gates found in aerodrome fencing can be categorized in several ways: routine, emergency, or occasional access points and vehicle or personnel access points. Additionally, they can be operated manually or mechanically. Gates designed to be operated mechanically should also be able to be opened manually in case of electrical failure. In all cases, a gate that remains open can become a major security problem.

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EXAMPLE OF A NOTAM FILE

Aerodrome NOTAM file CYYZ

070620 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ RWY 15L/33R CLSD DUE CONST DLY 1230/2230 0711291230 TIL 0711302230

061070 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ THR 23 DISPLACED 685 FT (200 FT BEYOND PUB DISPLACEMENT OF 485 FT) DUE OBST 615 FT NE OF THR 23, 38 FT AGL, 592 MSL. MARKED BY ORANGE MARKERS AND WING BAR LGT EITHER SIDE OF RWY. FOR RWY 23 DEP, ACFT REQUIRING FULL LEN MUST NOTIFY GROUND CTL UPON INITIAL CTC.
DECLARED DIST:
RWY 05: TORA 11120 TODA 11435 ASDA 11120 LDA 10985
RWY 23: TORA 11120 TODA 12120 ASDA 11120 LDA 10435
CAP 4 ILS OR NDB RWY 23 TCH TO READ 45 FT VICE 55 FT
TIL APRX 0712312000

070270 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ CRANE 7353 FT BFR THR 15L AND 131 FT LEFT EXTENDED RWY CL, 115 FT AGL 686 MSL LGTD, 1100/2100 DLY 0706091100/0711032100 AND 1200/2200 DLY 0711041200 TIL 0712072200

070449 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ AMEND PUB:
6 SMOKE STACKS WITHIN AN AREA BOUNDED BY 434449N 794048W 434448N 794046W 434446N 794049W 434447N 794050W TO POINT OF ORIGIN (CENTRED APRX 5 NM NNW AD) 215 FT AGL 811 MSL.
LGTD, NOT PAINTED

070584 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ PARKING AREAS: TML 1:
TAXILANE 9E AND 9W CLSD.
NEW TAXILANE 10 OPN 246 FT/75 M EAST OF TAXILANE 9, EQUIPPED WITH CL LGT.
UNLGTD OUTER LOOP JOINING TAXILANE 9 TO 10 PAINTED WITH DASHED CL AND RESTRICTED TO ACFT WINGSPAN 118 FT /35.9 M OR LESS.
TIL APRX 0711292000

070592 CYYZ TORONTO/LESTER B.PEARSON INTL
CYYZ CAT III APCH 06L NOT AUTH PENDING INITIAL CERTIFICATION TIL 0802191700

Nav Canada, AWWS - NOTAM Page. Retrieved November 29, 2007, from http://www.flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais&NoSession=NS_Inconnu&Page=Fore-obs%2Fnotam&TypeDoc=htmls

Figure 16J-1 A NOTAM File

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AIR TRAFFIC CONTROL CLEARANCES AND INSTRUCTIONS

Whenever an ATC clearance is received and accepted by the pilot, compliance shall be made with the clearance. If a clearance is not acceptable, the pilot should immediately inform ATC of this fact as acknowledgement of the clearance alone will be taken by a controller as indicating acceptance. A clearance will be identified by the use of the word "clear" in its contents. Example of clearances are:

"You are cleared to the circuit".

"You are cleared for take off on runway two niner".

EXAMPLE OF AN ATC CLEARANCE

"Cleared for takeoff on runway zero four."

Write down an example of an ATC Clearance:

A pilot shall comply with an ATC instruction that is directed to and received by the pilot, provided the safety of the aircraft is not jeopardized. An instruction will always be worded in such a manner as to be readily identified, although the word "instruct" will seldom be included. Pilots shall comply with and acknowledge receipt of all ATC instructions directed to and received by them. An example of an instruction would be:

"Hold on taxiway".

"Climb to and maintain one three thousand".

EXAMPLE OF AN ATC INSTRUCTION

"Hold short of taxiway."

Write down an example of an ATC Instruction:

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CHAPTER 17

PO 370 – RECOGNIZE ASPECTS OF AIRCRAFT MANUFACTURING AND MAINTENANCE

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M370.01 – IDENTIFY COMPONENTS OF THE PITOT STATIC SYSTEM

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of Annexes A and B.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to review, clarify, emphasize, and summarize the pitot static system.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified components of the pitot static system used in aircraft.

IMPORTANCE

It is important for cadets to identify components of the pitot static system because it is an important part of most aircraft. Familiarity with this system will allow cadets to gain an understanding of this common aircraft feature as it applies to both manufacturing and maintenance of aircraft.

Teaching Point 1	**Explain the Pitot Static System**
Time: 10 min	Method: Interactive Lecture

Flight instruments enable an aircraft to be operated with maximum performance and safety. One set of flight instruments, those of the pitot static system, measure and utilize air pressure.

Show the cadets Figure 17A-1.

There are two major parts of the pitot static system:

- the static pressure vent and lines, and
- the pitot pressure, also called impact pressure, chamber and lines.

The static pressure line provides the source of ambient (normal outside) air pressure for the operation of the altimeter, vertical speed indicator, and airspeed indicator, while the pitot pressure, or impact pressure line provides impact pressure to the airspeed indicator. The airspeed indicator is the only instrument that requires both air pressures.

STATIC VENT

The static vent is located where the air flowing past the aircraft will not disturb air pressure. This will vary with each model of aircraft. The static vent provides undisturbed air pressure for the static line.

The openings of the static vent must be checked during the pre-flight inspection to ensure that they are free from obstructions. Blocked or partially blocked openings should be cleaned by a certified mechanic. Blowing into these openings is not recommended because this could damage the instruments.

STATIC LINE

The static line is a hollow tube. Since the static line is vented to the free undisturbed air by the static vent, air pressure in the static line will change as the air pressure around the aircraft changes. As the aircraft gains altitude, air pressure in the static line will drop. This pressure change is transmitted through the static line to the instruments which utilize static air pressure. These instruments include the:

- altimeter,
- vertical speed indicator, and
- airspeed indicator.

PITOT PRESSURE CHAMBER

In the pitot static system, the impact air pressure (air striking the airplane because of its forward motion) is taken from a pitot tube. It is mounted in a location that provides minimum disturbance or turbulence caused by the motion of the aircraft through the air. Often, a pitot tube cover is placed over the pitot tube when the aircraft is parked to prevent foreign objects, such as insects, from entering the pitot static system. It is important that the pitot tube cover, if used, is removed prior to takeoff.

As the aircraft moves through the air, the impact pressure on the open pitot tube affects the pressure in the pitot pressure chamber. Any change of pitot (impact) pressure in the pitot pressure chamber is transmitted through a line connected to the airspeed indicator, which uses impact pressure for its operation.

In some aircraft, the static pressure is obtained at the same location as the pitot pressure. This is done by using a hybrid pitot-static tube. In a pitot-static tube, the static vent is combined with the impact tube. The effects are the same.

Show the cadets Figure 17A-2.

The opening of the pitot tube must be checked during the pre-flight inspection to assure that it is free from obstructions. Blocked or partially blocked openings should be cleaned by a certified mechanic. Blowing into these openings is not recommended because this could damage the instruments.

PITOT LINE

Any change of pressure in the pitot chamber is transmitted through a pitot line (a hollow tube) to the airspeed indicator, which uses impact pressure as well as static pressure for its operation.

OPERATION OF THE PITOT STATIC SYSTEM

As described above, the pitot static system of chambers and lines delivers two types of air pressure to flight instruments:

- static pressure, and
- pitot pressure.

When flight instruments are calibrated correctly, they will measure the air pressure that is delivered to them, relative to air pressure at sea level as well as impact pressure relative to static pressure. By measuring the air pressures in the static pressure and impact pressure lines, the calibrated instruments will present useful information about the aircraft's position to the pilot.

Pitot static instrument error will almost always indicate blockage of the pitot tube, the static port, or both.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the pitot static system used for?

Q2. How is static pressure change delivered to the instruments?

Q3. Which instrument measures pitot (impact) pressure?

ANTICIPATED ANSWERS

A1. For operating instruments that measure and use air pressure.

A2. It is delivered through lines.

A3. The airspeed indicator.

Teaching Point 2	**Explain Instruments of the Pitot Static System**
Time: 15 min	Method: Interactive Lecture

AIRSPEED INDICATOR

> Show the cadets Figures 17B-1 and 17B-2.

The airspeed indicator is a sensitive, differential pressure gauge, which measures and shows the difference between pitot, or impact, pressure and static pressure. These two pressures will be equal when the airplane is parked on the ground in calm air. When the aircraft moves through the air, the pressure in the pitot line becomes greater than the pressure in the static line. This difference in pressure is registered by the airspeed pointer on the face of the instrument, which is calibrated in miles per hour, knots, or both.

As the pressure in the pitot tube and pitot line increases, the diaphragm in the airspeed indicator expands. The diaphragm will then maintain its size while the impact pressure is stable. As the impact pressure decreases, the diaphragm contracts accordingly. This expansion and contraction of the diaphragm is reflected in the readout of the airspeed indicator via a system of gears and shafts.

Prior to takeoff, the airspeed indicator should read zero unless there is a strong wind blowing directly into the pitot tube.

VERTICAL SPEED INDICATOR

> Show the cadets Figures 17B-3 and 17B-4.

The vertical speed indicator (VSI), sometimes called a vertical velocity indicator (VVI), indicates whether the airplane is climbing, descending, or in level flight. The rate of climb or descent is indicated in thousands of feet per minute. If properly calibrated, the VSI indicates zero in level flight.

Although the VSI operates solely from static pressure, it measures pressure difference; the pressure now relative to the pressure a moment ago. It contains a diaphragm with connecting linkage and gearing to the indicator pointer inside an airtight case. The inside of the diaphragm is connected directly to the static line of the pitot static system. The area outside the diaphragm, which is inside the instrument case, is also connected to the static line, but through a restricted orifice (calibrated leak).

Both the diaphragm and the case receive air from the static line at existing atmospheric pressure. When the airplane is on the ground or in level flight, the pressures inside the diaphragm and the instrument case remain the same and the pointer indicates zero.

However, when the aircraft climbs or descends, the pressure inside the diaphragm changes immediately, but due to the metering action of the restricted passage, the case pressure remains higher or lower for a short time, causing the diaphragm to contract or expand. This causes a pressure difference that is relative to climb rate and is indicated on the instrument needle as a climb or descent.

ALTIMETER

Show the cadets Figures 17B-5 and 17B-6.

The altimeter measures the height of the aircraft above sea level. Since it is the only instrument that gives altitude information, the altimeter is one of the most vital instruments in the aircraft. However, the altimeter is calibrated with respect to standard atmospheric conditions, while air will actually seldom meet those standard conditions. Variations in atmospheric pressure and temperature will introduce errors into the altimeter's measurements. To use the altimeter effectively, its operation and how atmospheric pressure and temperature affect it must be thoroughly understood.

A stack of sealed aneroid wafers comprises the main component of the altimeter. Aneroid wafers expand and contract with changes in atmospheric pressure, in this case, pressure from the static source. The mechanical linkage translates these changes into pointer movements on the indicator.

The pressure altimeter is an adaptation of an aneroid barometer that measures the pressure of the atmosphere at the level where the altimeter is located and presents it as an altitude indication in feet instead of simple air pressure, as a barometer would. The altimeter uses static pressure as its source of operation. Air is denser at sea level than aloft, so as altitude increases, atmospheric pressure decreases. This difference in pressure at various levels causes the altimeter to indicate changes in altitude.

Since altimeters are calibrated with respect to standard atmospheric conditions as described above, it is necessary to adjust altimeters to non-standard static pressures that result from weather fronts. For example, if flying from a high-pressure area to a low-pressure area without adjusting the altimeter, the actual altitude of the aircraft would be LOWER than the indicated altitude because the altimeter was originally set to compensate for a non-standard high air pressure. Arriving in the low-pressure area, it must be reset to compensate for a non-standard low air pressure.

An old saying, "High to low, look out below" is a way of remembering which condition is most dangerous. When flying from a low-pressure area to a high-pressure area without adjusting the altimeter, the actual altitude of the airplane is HIGHER than the indicated altitude because the altimeter was originally set to compensate for a non-standard low air pressure. Arriving in the high-pressure area, it must be reset to compensate for a non-standard high air pressure.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What does an airspeed indicator measure?

Q2. What does a vertical speed indicator measure?

Q3. What does an altimeter measure?

ANTICIPATED ANSWERS

A1. The difference between static pressure and pitot, or impact, pressure.

A2. The difference between static air pressure now and static air pressure a moment ago.

A3. The difference between static air pressure and a standard air pressure, usually at sea level.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Which flight instrument measures pitot, or impact pressure?

Q2. Why are pitot tube covers used?

Q3. What is the difference between a pitot tube and a pitot-static tube?

ANTICIPATED ANSWERS

A1. The airspeed indicator.

A2. To prevent blockage of the pitot tube when the aircraft is parked.

A3. A pitot-static tube is a combination of a pitot tube with a static vent.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

The pitot static system, which is based on different air pressures, is found on most aircraft. Understanding how the system works allows a pilot or mechanic to use instruments correctly and to diagnose problems that are encountered with pitot static systems.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium Edition*. Ottawa, ON: Aviation Publishers Co. Limited.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M370.02 – IDENTIFY AIRCRAFT MANUFACTURERS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Update the information located at Annexes C to I using the reference.

Create slides of Annexes C to I.

Prepare the video *Viking Video Profile*. This will be shown in TP 1.

Create slides of aircraft located at Annexes C to H with titles blocked out for use in TP 3.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to orient the cadets to aircraft manufacturing companies, give an overview of them and to generate interest.

An in-class activity was chosen for TP 3 as it is an interactive way to allow cadets to test their ability to identify aircraft manufacturers.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified manufacturers of light and heavy aircraft that are commonly found at Canadian aerodromes.

IMPORTANCE

It is important for cadets to identify manufacturers of aircraft as this will enhance their enjoyment of aviation and will help them identify aircraft they observe at Canadian aerodromes.

Teaching Point 1	**Discuss Manufacturers of Light Aircraft**
Time: 15 min	Method: Interactive Lecture

CESSNA AIRCRAFT COMPANY

The Cessna Aircraft Company traces its history to June 1911, when Clyde Cessna, a farmer in Rago, Kansas, built a wood-and-fabric plane and became the first person to build and fly an aircraft between the Mississippi River and the Rocky Mountains.

Over the years since 1911, Cessna has produced many different types of aircraft and many of the models had variations.

Show the cadets the list of Cessna aircraft located at Annex C.

A rented Cessna 172 Skyhawk is often used for air cadet familiarization flying exercises.

Show the cadets Figures 17C-2 to 17C-5, identifying each type of aircraft. Mention that the Cessna 305 is used as a glider tow plane in the Air Cadet Gliding Program.

DIAMOND AIRCRAFT INDUSTRIES

The Diamond story began in 1981 when Hoffmann Flugzeugbau was founded in Friesach, Austria, to produce the newly certified H36 Dimona motorglider. In 1992, the company, then known as Dimona Aircraft, established a full production facility in London, Ont., with a view to supplying the US market with its new aircraft. Later, after modifying its name to Diamond, the company grew into an international manufacturer with over 46 000 sq m of modern production facilities, over 800 employees, five distinct product lines, and facilities on three continents. The company's operation at the London, Ont. airport has over 23 000 sq m of state-of-the-art production facilities to design, build and test aircraft.

Diamond produces a variety of aircraft types, including:

- DA20, a single-engine propeller-driven aircraft,
- DA42, a twin-engine propeller-driven aircraft, and
- D-JET, a single-engine gas turbine fanjet.

Show the cadets the figures located at Annex D, identifying each type of aircraft.

PIPER AIRCRAFT, INC

Originally founded as the Taylor Brothers Aircraft Manufacturing Company in September 1927, the company was renamed Taylor Brothers Aircraft Corporation in April of 1928 and then Piper Aircraft Corporation in November 1937.

Now located at Vero Beach, Florida, Piper's manufacturing capabilities cover a wide variety of fabrication, assembly, paint and inspection processes. The company also designs and builds its own tooling. Piper's engineering design work is also comprehensive, with separate engineering groups responsible for aircraft certification, production support, customer service engineering, product development, engineering administration and test operations.

Show the cadets the figures located at Annex E, identifying each type of aircraft.

VIKING AIR

Viking Air is a manufacturing, maintenance and leasing company located at the Victoria International Airport in Sidney, B.C.

Viking Air, although a very small company by Canadian aviation standards, purchased the type certificates for seven de Havilland heritage aircraft, giving Viking the exclusive right to re-start production for any of these seven de Havilland Canada aircraft types.

Viking Air holds the Type Certificates for the following de Havilland aircraft:

- DHC-1 Chipmunk,
- DHC-2 Beaver,
- DHC-3 Otter,
- DHC-4 Caribou,
- DHC-5 Buffalo,
- DHC-6 Twin Otter, and
- DHC-7 Dash 7.

The DHC-6 Twin Otter and DHC-2 Beaver remain popular in commercial aviation, while the DHC-5 Buffalo continues to serve the CF in a Search and Rescue capacity.

Show the cadets the figures located at Annex F, identifying each type of aircraft.

Show the cadets the six-minute video *Viking Video Profile* (Reference C3-203).

CONFIRMATION OF TEACHING POINT 1

Participation in the aircraft identification activity at the end of this lesson will serve as the confirmation of TP 1.

Teaching Point 2	**Discuss Manufacturers of Heavy Aircraft**
Time: 5 min	Method: Interactive Lecture

AIRBUS

Airbus is one of the world’s two leading aircraft manufacturers. The company employs 57 000 people and produces a comprehensive range of heavy commercial aircraft.

Manufacturing, production and sub-assembly of parts for Airbus aircraft are distributed around 16 sites in Europe, with final assembly in Toulouse, France and Hamburg, Germany. Airbus draws on a global network of more than 1 500 suppliers in over 30 countries.

There are also centres for engineering design, sales and customer support in North America; and sales and customer support centres in Japan and China. Airbus has a joint engineering centre in Russia with Kaskol, a Russian aircraft manufacturer.

Around the world, Airbus has 5 spare parts centres, 160 field sites, 3 training centres in Toulouse, Miami and Beijing and one A320 maintenance training centre in Hamburg. Airbus has an agreement with CAE (formerly Canadian Aviation Electronics Ltd.) to provide Airbus-approved training courses in many other sites around the world.

Show the cadets the figures located at Annex G, identifying each type of aircraft.

THE BOEING COMPANY

Headquartered in Chicago, Illinois, Boeing employs more than 150 000 people across the United States and in 70 other countries, with major operations in the Puget Sound area of Washington State, southern California and St. Louis, Missouri.

For more than a century, Boeing has produced a vast number of aircraft types. Some Boeing aircraft had historical significance that extended well beyond aviation; they actually changed the world. For example, America entered the age of jet transport on July 15, 1954, when the Boeing 707 prototype, the model

367-80, made its maiden flight from Renton Field, south of Seattle, Washington. Forerunner of the more than 14 000 Boeing jetliners built afterwards, the prototype, nicknamed the "Dash 80," served 18 years as a flying test laboratory before it was turned over to the Smithsonian Air and Space Museum in May 1972. The Boeing 707 was a very successful aircraft type.

> Show the cadets the Figure 17H-1.

Other popular Boeing aircraft, that are commonly seen, include the:

- Boeing 737,
- Boeing 747,
- Boeing 767, and
- Boeing 777.

> Show the cadets the remaining figures located at Annex H, identifying each type of aircraft.

Different aircraft are suitable for different routes, depending on such things as traffic volume. A large carrier such as Air Canada requires a variety of aircraft to suit a variety of applications.

> Show the cadets Figure 17I-1.

CONFIRMATION OF TEACHING POINT 2

Participation in the aircraft identification activity at the end of this lesson will serve as the confirmation of TP 2.

Teaching Point 3	**Conduct an Activity to Allow the Cadets to Test Their Ability to Identify Aircraft Manufacturers**
Time: 5 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to give the cadets an opportunity to test their ability to identify aircraft manufacturers.

RESOURCES

Pictures of aircraft located at Annexes C to H, with titles blocked out (with sticky notes).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two teams on opposite sides of the room.
2. Display a picture of an aircraft discussed during this lesson.
3. Have one team attempt to identify the aircraft and its manufacturer in 10 seconds.
4. Award one point for the aircraft's name and another for the manufacturer.
5. If the first team is unable to name the aircraft or its manufacturer, the second team may try.
6. Award two points for successful aircraft or manufacturer naming by the second team.
7. Alternate the successive pictures and opportunities between the two teams.
8. The team with the most points after five minutes is the winner.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

Participation in the activity will serve as the confirmation of TP 3.

END OF LESSON CONFIRMATION

Participation in the aircraft identification activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Aircraft manufacturers, like their product lines, are constantly changing. To make aircraft that can compete in sophisticated markets, the organizations themselves must improve to meet the ever-evolving competition.

INSTRUCTOR NOTES/REMARKS

The manufacturers and the aircraft included in this lesson were chosen because cadets frequently encounter these aircraft. Time limitations prevented more manufacturers and aircraft from being included.

REFERENCES

C3-232 Cessna Aircraft Company. (2008). *Welcome to Cessna.com*. Retrieved February 8, 2008, from http://cessna.com/.

C3-233 Diamond Aircraft Industries. (2008). *Diamond Aircraft*. Retrieved February 8, 2008, from http://www.diamondair.com/mainpage.php.

C3-234 Piper Aircraft, Inc. (2008) *Piper: Freedom of Flight*. Retrieved February 8, 2008, from http://www.newpiper.com/.

C3-235 Viking Air. (2008). *Viking*. Retrieved February 8, 2008, from http://www.vikingair.com/.

C3-236 Airbus. (2008). *Airbus*. Retrieved February 8, 2008, from http://www.airbus.com/en/.

C3-237 Boeing. (2008). *Boeing*. Retrieved February 8, 2008, from http://www.boeing.com/.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M370.03 – DESCRIBE ROUTINE AIRCRAFT INSPECTION PROCEDURES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create a slide of Annex J.

Photocopy handout of Annex J for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to orient the cadets to routine aircraft inspections, give an overview of them, and to generate interest.

INTRODUCTION

REVIEW

IAW EO M370.01 (Identify Components of the Pitot Static System, Section 1), the cadet will review the purpose and importance of pitot tubes and static pressure vents.

OBJECTIVES

By the end of this lesson the cadet shall be expected to describe routine aircraft inspection procedures.

IMPORTANCE

It is important for cadets to be able to describe routine aircraft inspection procedures so they may appreciate the attention that must be given to safety in aviation.

Teaching Point 1 | **Describe the Pilot's Inspection Prior to Flight**

Time: 10 min | Method: Interactive Lecture

An aircraft operating in Canada is subject to inspections that allow the aircraft to operate safely. There are two main types of inspections:

1. inspections performed by the pilot prior to flight, and
2. inspections performed by a certified Aircraft Maintenance Engineer (AME) at designated intervals appropriate to the aircraft.

This inspection overview and all others described in this instructional guide are examples only. Always refer to and follow the recommendations of the manufacturer when carrying out any inspections and procedures. Individual models of aircraft may have special procedures and inspection guidelines that will vary from those described here.

PILOT'S INSPECTION PRIOR TO FLIGHT

Prior to every flight, a pilot completes a thorough inspection of the aircraft.

Overall Appearance of the Aircraft

The pilot stands a short distance away from the aircraft and observes the general overall appearance of the aircraft, looking for obvious defects. This is important because it may indicate large defects that could affect aerodynamics.

Before beginning the walk-around inspection, enter the cockpit and ensure that the aircraft is prepared for inspection, ensuring:

- battery and ignition switches are OFF,
- control locks are REMOVED, and
- landing gear switch is in the gear DOWN position.

Fuselage/Empennage

Inspection of the fuselage/empennage will include:

- baggage compartment: contents properly arranged and secured,
- static air pressure vents: free from obstructions,
- pitot tube: free from obstructions – cover REMOVED,
- conditions of the aircraft covering: missing or loose rivets, cracks, tears, etc.,
- anti-collision and navigation lights: condition,
- avionics antennas: cracks, oil or dirt, proper mounting and damage,
- wheel and tires: cuts, bruises, excessive wear, and proper inflation,
- oleo shock absorber and shock strut: proper inflation and cleanliness,
- wheel well and fairing: general condition and secure,
- limit and position switches: cleanliness and secure, and

- ground safety lock: REMOVED.

Wings

Inspection of the wings will include:

- control surface locks: REMOVED,
- control surfaces: dents, cracks, excess play, condition of hinge pins and bolts,
- covering: missing or loose rivets, cracks, tears, etc,
- wing tip and navigation light: wing tip and light secure and undamaged,
- landing light: condition, cleanliness, secure, and
- stall warning vane: freedom of movement.

Prior to inspection, turn the master switch ON so that the stall warning signal can be checked when the vane is deflected.

Fuel

Inspection of the aircraft fuel systems will include:

- fuel quantity in tank: type and amount of fuel visually checked,
- fuel tank filler cap and fairing covers secure,
- fuel tank vents: clear of obstructions,
- drain valve: free of contaminants (drain fuel into a container to check), and
- drain cocks: operating properly without drips.

Engine/Propeller

Inspection of the engine/propeller will include:

- engine oil quantity: oil sump filled and filler cap and dipstick secured,
- general condition and evidence of fuel and oil leaks,
- cowling, access doors, and cowl flaps: condition checked and all secure,
- carburetor air filter: clean and secure,
- exhaust stacks: no cracks and studs tight,
- spark plugs: terminals secure and clean,
- engine mount: cracks and mounts secure,
- main fuel strainer: free of water or sediment (drain fuel into a container to check),
- cowling and baffle: seals snug and in place for proper engine cooling,
- propeller and spinner: security, oil leakage and condition. No deep nicks or scratches, and
- ground area under the propeller: free of loose stones, cinders, etc.

Instruments Check

Check all instruments for proper reading and, where applicable, fluid levels.

Emergency Locator Transmitter (ELT)

Inspection of the ELT to ensure:

- it is mounted securely,
- tight connections,
- general condition (no corrosion),
- antenna secure,
- annual recertification completed and current,
- battery not time-expired, and
- ELT switch in ARMED position.

Seat Belts

Check that seat belts are secure and in good condition. Secure seat belts in unoccupied seats.

Doors and Windows

Close and secure doors, windows and canopy top.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. When does a pilot perform an inspection of the aircraft?

Q2. When does an AME perform an inspection of the aircraft?

Q3. What is an ELT?

ANTICIPATED ANSWERS

A1. Prior to flight.

A2. At designated intervals appropriate to the aircraft.

A3. Emergency Locator Transmitter.

Teaching Point 2	Describe the Pilot's Cockpit Check Prior to Flight
Time: 10 min	Method: Interactive Lecture

PILOT'S COCKPIT CHECK PRIOR TO FLIGHT

A systematic and careful cockpit check will be carried out prior to flight. It is extremely important to carry out a thorough pre-flight inspection. Small clues indicating a malfunctioning or damaged component may easily be missed in a hurried pre-flight check. Be vigilant after maintenance, painting or a modification job has been performed on the airplane. It is possible for components to be reinstalled incorrectly.

Written Checklist for the Specific Aircraft Type

The cockpit check will be made deliberately without haste using a written checklist. A definite sequence will be followed, moving clockwise around the cockpit. Each control will be touched and named aloud. Always work from a written checklist, not a memorized list, no matter how small the aircraft.

Show the cadets the slide of Figure 17J-1.

There are many checklists relating to the various phases in the operation of an aircraft: pre-flight, before starting engines, before taxiing, engine run-up, before takeoff, takeoff and climb, cruise, descent, before landing, aborted landing, after landing and after shutdown, as well as checklists relating to emergency situations. Larger aircraft use them all. Whenever checklists are required for an aircraft, they must be used during all phases of the aircraft's operation to which they apply.

Run-Up of the Engine(s)

Position the aircraft into the wind when running up the engine(s) for engine cooling. Open and close the throttle slowly while checking operation, to include:

- oil pressure and temperature,
- RPM at full throttle,
- magneto operation,
- instruments, to include:
  - voltmeter,
  - ammeter,
  - manifold pressure gauge,
  - fuel pressure gauge,
  - tachometer,
  - vacuum, and
  - other instruments as shown on the written checklist;
- carburetor heat,
- fuel mixture control,
- idling speed,
- working engine temperature, and
- other parameters as shown on the written checklist.

Switches

Check switch positions for takeoff as per written checklist (eg, magneto ON, generator ON, anti-collision beacon ON, navigation lights ON, etc).

Flaps Set for Takeoff

Adjust the flaps to the takeoff position when ready for takeoff.

Control Surface Operation

Check freedom of all controls, to include:

- ailerons,

- elevators, and
- rudders.

While moving the control column and rudder pedals, check that the control surfaces are responding in the proper direction of travel. This check is particularly important if the aircraft has undergone maintenance.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to allow the cadets to experience completing a pilot checklist.

RESOURCES

Photocopies of Annex J for each cadet.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Give each cadet a photocopy of Figure 17J-1.
2. Divide the cadets into pairs.
3. Have one cadet, acting as pilot in command (PIC), call out the checklist steps for Pre-flight Inspection Cockpit.
4. Have the second cadet, acting as co-pilot, repeat commands and act out the procedure in any manner that the PIC deems appropriate.
5. Have the cadets trade roles and have the new PIC call out the checklist steps for Before Takeoff.
6. Have the new co-pilot repeat commands and act out the procedure.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is used to guide a cockpit check?

Q2. Why is it important to be vigilant after maintenance, painting or a modification job has been performed on the airplane?

Q3. Why position the aircraft into the wind when running up the engine(s)?

ANTICIPATED ANSWERS

A1. A written checklist.

A2. It is possible for components to be reinstalled incorrectly.

A3. For engine cooling.

Teaching Point 3 — **Discuss an Aircraft's Required Inspections**

Time: 5 min — Method: Interactive Lecture

AN AIRCRAFT'S REQUIRED INSPECTIONS

Certificate of Airworthiness (C of A)

A Transport Canada (TC) C of A can be issued for an aircraft, which fully complies with all standards of airworthiness certification (for its applicable type).

TC regulations require that an aircraft carry its C of A on every flight.

Annual Airworthiness Information Report (AAIR)

The owner of a Canadian aircraft, other than an ultralight aeroplane, must submit an AAIR using the prescribed report form. The aircraft owner will complete the annual report by entering all data required and signing the certification to vouch that the information supplied is correct.

Approved Maintenance Schedules

All Canadian aircraft, other than ultralight or hang gliders, shall be maintained in accordance with an approved maintenance schedule, approved by the Minister of Transport, which meets the Aircraft Equipment and Maintenance Standard.

Approved maintenance schedules shall:

- be based upon data obtained from an approved maintenance review board (MRB) report; or
- where no current MRB report exists, be based upon data obtained from:
  - the current recommendations of the aircraft manufacturer,
  - a maintenance schedule approved by the Minister for use by another operator, or
  - any other data acceptable to the Minister.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. When can a C of A be issued?

Q2. How often must an AAIR be submitted?

Q3. Who approves a maintenance schedule?

ANTICIPATED ANSWERS

A1. When an aircraft fully complies with all standards of airworthiness certification (for its applicable type).

A2. Annually.

A3. The Minister of Transport.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. When does a pilot perform an inspection of the aircraft?

Q2. What is used to guide a cockpit check?

Q3. What requires an aircraft to carry its C of A on every flight?

ANTICIPATED ANSWERS

A1. Prior to flight.

A2. A written checklist.

A3. TC regulations.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Safety in aviation requires attention to detail and it can only be successful through careful planning and preparation.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-116 (ISBN 0-9680390-5-7) MacDonald, A. F., & Peppler, I. L. (2000). *From the Ground Up: Millennium edition*. Ottawa, ON: Aviation Publishers Co. Limited.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO C370.01 – IDENTIFY TASKS REQUIRED TO MAINTAIN AIRCRAFT

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy handouts located at Annexes K to M for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to review, clarify, emphasize and summarize the tasks required to maintain aircraft.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified tasks required to maintain aircraft.

IMPORTANCE

It is important for cadets to identify tasks required to maintain aircraft so that they will have an appreciation for the aircraft maintenance industry, including an understanding of safety requirements.

Teaching Point 1	**Discuss Aircraft Maintenance Work**
Time: 10 min	Method: Interactive Lecture

During the early days of aviation it was discovered that flying posed safety hazards. As aviation matured, organizations were formed to develop and enforce safety procedures. Faster aircraft and increasing air traffic became essential parts of Canadian commerce and industry. Air regulations have developed to keep pace with technological and social changes. Each regulation has a purpose and was put in place with the intention of supporting safe aviation.

MAINTENANCE CERTIFICATION

Aircraft maintenance in Canada is regulated by the Canadian Aviation Regulations (CARs). CARs are a compilation of regulatory requirements designed to enhance both safety and the competitiveness of the Canadian aviation industry. Parts I–VIII of the CARs correspond to eight broad areas of aviation:

- Part I – General Provisions,
- Part II – Aircraft Identification and Registration,
- Part III – Aerodromes, Airports and Heliports,
- Part IV – Personnel Licensing and Training,
- Part V – Airworthiness,
- Part VI – General Operating and Flight Rules,
- Part VII – Commercial Air Services, and
- Part VIII – Air Navigation Services.

EXAMPLES OF MAINTENANCE REQUIRING CERTIFICATION

CARs Part V – Airworthiness and Part VI – General Operating and Flight Rules, include the regulations for aircraft maintenance and elementary work. Generally, maintenance done on an aircraft in Canada must be followed by a maintenance release signed by a licensed aircraft maintenance engineer (AME) before the aircraft can be flown. Certain routine tasks have been designated as elementary work and do not require an AME's signature. Instead, the aircraft owner or appointee must record the work done in the aircraft's technical record, such as the journey logbook and technical logbooks.

A maintenance release signed by an AME is required for activities such as:

- modifying, repairing or replacing structural airframe parts;
- overhauling the engine;
- re-contouring or straightening a propeller blade;
- repairing avionics; and
- welding fuel tanks.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What does the acronym CARs mean in Canadian aviation?

Q2. What does the acronym AME mean in Canadian aviation?

Q3. Who must sign a maintenance release?

ANTICIPATED ANSWERS

A1. Canadian Aviation Regulations.

A2. Aircraft Maintenance Engineer.

A3. An AME.

Teaching Point 2	**Discuss Elementary Work**
Time: 15 min	Method: Individual Activity

Although performing and recording elementary work is less restrictive by aviation standards, it is still very rigorous by typical standards in such fields as private automobile maintenance. To understand aviation maintenance, cadets must recognize the difference between flying at hundreds of km/h at thousands of feet above the ground and parking a stalled car on the shoulder of the road when a fan belt breaks.

SPECIFIC TASKS DESIGNATED AS ELEMENTARY WORK

The difference between maintenance requiring a maintenance release and elementary work has been made easy to recognize in CAR Part VI, Standard 625, Appendix A–Elementary Work.

Elementary work task listings include 29 specific items that cover many routine activities including, under specified circumstances, changing engine oil, changing spark plugs, removing and replacing glider wings and tail surfaces, checking and replacing batteries, changing light bulbs, repairing upholstery, etc.

Distribute a copy of Annex K to each cadet.

The CARs carefully limit the activities in elementary work. For example, checking tire pressures over 100 psi is not elementary work and will require a maintenance release.

RECORDING ELEMENTARY WORK

Elementary work performed on light aircraft is recorded in the aircraft's technical record. The entry in the technical record of the work performed must be signed by the person who performed the work. Since aviation maintenance is a safety consideration, the accurate recording of all maintenance is important. Aircraft logbooks are often the first documents to be collected by investigators in the event of an accident.

Transport Canada (TC) regulations stipulate that all maintenance must be logged before the aircraft is flown.

Distribute Annexes L and M to each cadet.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to familiarize the cadets with recording elementary work.

RESOURCES

Handouts of Annexes L and M.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Demonstrate how to fill out the logbook pages as per the examples located at Annex M.
2. Have each cadet fill in the top line of their blank journey logbook flight record at Annex L to show a fictitious flight from CNT7 (Picton, Ont.) to CYSN (Welland, Ont.), establishing a history for an imaginary aircraft. Except for the date, the details of that data line should look similar to the 26 Aug 07 data line entered by M. Calvert and shown at Annex M.
3. Upon arrival at Welland, have each cadet record the addition of a litre of engine oil and adjustment of tire pressure in their logbook pages, as well as two other items of elementary work selected from the list located at Annex K.
4. If cadets do not complete all this work in the time, have them complete it after class. Ensure that the flight details and the engine oil addition are recorded correctly.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Who must sign a maintenance release?

Q2. What tasks may be performed on an aircraft without a maintenance release?

Q3. How many specific tasks has TC designated as elementary work?

ANTICIPATED ANSWERS

A1. An AME.

A2. Tasks designated as elementary work by the TC CARs.

A3. 29.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Aircraft maintenance is a critical part of aviation and of Canadian transportation, commerce and industry. Professionally performed, aircraft maintenance serves the requirements of both safety and efficiency.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-096 (ISBN 1715-7382) Transport Canada. (2006). *Aeronautical Information Manual*. Ottawa, ON: Her Majesty the Queen in Right of Canada.

C3-210 (ISBN 0-660-62327-7) Transport Canada. (2003). *Aircraft Journey Log*. Ottawa, ON: Her Majesty the Queen in Right of Canada.

C3-211 (ISBN 0-660-19017-6) Transport Canada. (2005). *Airframe Log*. Ottawa, ON.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO C370.02 – DESCRIBE MATERIALS USED IN AIRCRAFT CONSTRUCTION

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of figures located at Annexes N to P.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to review, clarify, emphasize and summarize materials used in aircraft construction.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to describe materials used in aircraft construction.

IMPORTANCE

It is important for cadets to learn about materials used in aircraft construction as it will enhance their understanding of the materials used to build aircraft and why they are chosen.

Teaching Point 1 — **Describe Wood and Fabrics Used in Aircraft Construction**

Time: 5 min — Method: Interactive Lecture

WOOD

Although wood was used for the first airplanes because of its high strength and low weight, the cost of manpower needed for wood construction and maintenance has caused wood to be almost entirely replaced by other materials, particularly metal.

Species of Wood

If wood is used, it must be carefully selected to meet aviation requirements. Aircraft grade Sitka spruce, sometimes referred to as Airplane spruce, is the preferred reference wood for aviation because of its uniformity, strength and shock-resistance.

Assessment of Wood

If other wood is substituted for aircraft grade Sitka spruce, the replacement wood must meet the same requirements.

Laminated wood is constructed of two or more layers of wood that are bonded together with a glue or resin.

Assessing wood requires the examination of many characteristics such as grain, knots and pitch pockets. A defect might make a piece of wood unusable.

FABRIC

Organic Fabric

Early aircraft were constructed using organic fabrics, such as linen, for the skin of the fuselage and wings. The earliest builders did not use any process to increase the strength of the material. The material was not airtight and it loosened and wrinkled with changes in humidity. Soon, rubberized and varnished coatings came into use to improve the fabric. Later, cotton fibres dissolved in nitric acid were used to make a dope that was worked into the fabric to produce a more durable finish.

Show the cadets the Black Maria, an example of fabric construction, at Annex N.

The Black Maria can be seen today in the National Aviation Museum in Ottawa, ON.

The next step in fabric improvement was to paint enamel over the doped fabric. It cracked and peeled with time, so aluminum powder was blended into the paint. The aluminum powder pigmentation proved very effective in blocking harmful sunlight and reflecting heat away from the fabric.

Other improvements in doping followed, but eventually advances in chemical technology led to new finishes on durable synthetic materials. Although various high grades of cotton are still sometimes used, man-made inorganic fabrics have become the most popular fabric for covering an aircraft.

Inorganic Fabric

Polyester fibres, woven into cloth with different weights are sold under various trade names. Other inorganic fibres include fibreglass and composites.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why has wood been used less for modern aircraft?

Q2. What species is the preferred reference wood for aircraft construction?

Q3. What is laminated wood?

ANTICIPATED ANSWERS

A1. Wood construction has high costs for manpower.

A2. The reference species is Sitka spruce.

A3. Laminated wood is constructed of two or more layers of wood that are bonded together with a glue or resin.

Teaching Point 2	**Describe Composites Used in Aircraft Construction**
Time: 15 min	Method: Interactive Lecture

COMPOSITE CONSTRUCTION

> The term composite in this lesson refers to a combination of two or more materials that differ in composition or form. Composite is sometimes used to mean any synthetic building material.

Composite structures differ from metallic structures in important ways: excellent elastic properties, high strength combined with light weight and the ability to be customized in strength and stiffness. The fundamental nature of many composites comes from the characteristics of a strong fibre cloth imbedded in a resin.

Fibreglass

Fibreglass is made from strands of silica glass that are spun together and woven into cloth. Fibreglass weighs more and has less strength than most other composite fibres. However, improved matrix materials now allow fibreglass to be used in advanced composite aviation applications.

> A matrix is any material that sticks other materials together.

There are different types of glass used in fibreglass: E-glass, which has a high resistance to electric current, and S-glass, which has a higher tensile strength, meaning that the fabric made from it resists tearing.

Aramid

Aramid is a polymer. A polymer is composed of one or more large molecules that are formed from repeated units of smaller molecules.

Ask the cadets to name all the applications they are aware of for Kevlar® .

The best-known aramid material is Kevlar®, which has a tensile strength approximately four times greater then the best aluminum alloy. This cloth material is used in many applications where great strength is needed: canoes, body armour and helicopter rotors. Aramid is ideal for aircraft parts that are subject to high stress and vibration. The aramid’s flexibility allows it to twist and bend in flight, absorbing much of the stress. In contrast, a metal aircraft part would develop fatigue and stress cracks sooner under the same conditions.

Carbon/Graphite

The term carbon is often used interchangeably with the term graphite; however, they are not quite the same material. Carbon fibres are formed at 1315 degrees Celsius (2400 degrees Fahrenheit), but graphite fibres are produced only above 1900 degrees Celsius (3450 degrees Fahrenheit). As well, their actual carbon content differs – but both carbon and graphite materials have high compressive strength and stiffness.

Carbon molecules will form long strings that are extremely tough (this is what makes diamonds so strong). These minute hair-like strands of carbon (a very common and inexpensive element) are, per unit of weight, many times stronger than steel. Individual carbon fibres are flexible, rather than stiff, and bend easily despite having high tensile strength. To stiffen the fibres, cross-directional layers are immersed in a matrix material such as epoxy plastic.

The term epoxy refers to a substance derived from an epoxide. An epoxide is a carbon compound containing an oxygen atom bonded in a triangular arrangement to two carbon atoms. So, an epoxy matrix is itself carbon-based, as are the fibres that it binds.

Show the cadets Figure 17O-1.

The passenger cabin of airliners must be pressurized so that passengers will not have to wear oxygen masks during flight. The large two-level cabin of the A380 Airbus requires a bulkhead (wall) to keep this pressurized air from leaking into the unpressurized tail section. Airbus’ facility in Stade, Germany specializes in the design and production of carbon fibre reinforced plastic (CFRP) components and the A380 rear pressure bulkhead was produced there.

Ceramic

Ceramic fibre is a form of glass fibre designed for use in high temperature applications. It can withstand temperatures approaching 1650 degrees Celsius (3000 degrees Fahrenheit), making it effective for use around engines and exhaust systems.

Show the cadets Figure 17O-2.

Ceramic's disadvantages include both weight and expense, but sometimes no other known material will do the job. One of the most famous applications of ceramic is the Thermal Protection System used on the space shuttle. The properties of aluminum demand that the maximum temperature of the shuttle's structure be kept below 175 degrees Celsius (350 degrees Fahrenheit) during operations. Heating during re-entry (in other words, heating caused by friction with the air) creates surface temperatures high above this level and in many places will push the temperature well above the melting point of aluminum (660 degrees Celsius or 1220 degrees Fahrenheit).

Underneath its protective layer of tiles and other materials, the space shuttle has an ordinary aluminum construction, similar to many large aircraft.

Show the cadets Figure 17O-3.

A space shuttle's Thermal Protection System is very complex and it contains highly sophisticated materials. Thousands of tiles of various sizes and shapes cover a large percentage of the space shuttle's exterior surface. There are two main types of silica ceramic tiles used on the space shuttle:

- **Low-Temperature Reusable Surface Insulation (LRSI).** LRSI tiles cover relatively low-temperature areas of one of the shuttles, the Columbia, where the maximum surface temperature runs between 370 and 650 degrees Celsius (700 and 1200 degrees Fahrenheit), primarily on the upper surface of fuselage around the cockpit. These tiles have a white ceramic coating that reflects solar radiation while in space, keeping the Columbia cool.

Show the cadets Figure 17O-4.

- **High-Temperature Reusable Surface Insulation (HRSI).** HRSI tiles cover areas where the maximum surface temperature runs between 650 and 1260 degrees Celsius (1200 and 2300 degrees Fahrenheit). They have a black ceramic coating, which helps them radiate heat during re-entry.

Both LRSI and HRSI tiles are manufactured from the same material and their primary difference is the coating.

A different and even more sophisticated material, Reinforced Carbon-Carbon (RCC), is used for the nose cone and leading edges of the space shuttle. It is a composite material consisting of carbon fibre reinforcement in a matrix of graphite, often with a silicon carbide coating to prevent oxidation.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What type of glass is used in fibreglass strands?

Q2. What is best known aramid material?

Q3. What method is used to stiffen carbon fibre materials?

ANTICIPATED ANSWERS

A1. Silica glass.

A2. Kevlar®.

A3. Immersing cross-directional layers of carbon fibres in a matrix compound such as epoxy plastic.

Teaching Point 3	**Describe Metals Used in Aircraft Construction**
Time: 5 min	Method: Interactive Lecture

METALS USED IN AIRCRAFT CONSTRUCTION

Aluminum

Pure aluminum lacks sufficient strength to be used for aircraft construction. However, its strength increases considerably when it is alloyed or mixed with other compatible metals. For example, when aluminum is mixed with copper or zinc, the resultant aluminum alloy is as strong as steel, with only one-third the weight. As well, the corrosion resistance possessed by the aluminum carries over to the newly formed alloy.

Alclad®

Most external aircraft surfaces are made of clad aluminum. Alclad® consists of a pure aluminum coating rolled onto the surface of heat-treated aluminum alloy. The thickness of the aluminum coating is approximately five percent of the alloy thickness, on each side of the alloy sheet. This clad surface greatly increases the corrosion resistance of the aluminum alloy. However, if the aluminum coating is penetrated, corrosion can attack the alloy within.

Magnesium

Magnesium is one of the lightest metals with sufficient strength and suitable working characteristics for use in aircraft structures. In its pure form it lacks sufficient strength, but like aluminum, mixing it with other metals to create an alloy produces strength characteristics that make magnesium useful.

Titanium

Titanium and its alloys are lightweight metals with very high strength. Pure titanium weighs only half as much as stainless steel and is soft and ductile. Titanium's alloys have excellent corrosion resistance, particularly to salt water.

Show the cadets Figure 17P-1 and Figure 17P-2.

Stainless Steel

Stainless steel is a classification of corrosion-resistant steel that contain large amounts of chromium and nickel. It is well suited to high-temperature applications such as firewalls and exhaust system components.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Why is pure aluminum unsuitable for use in aircraft components?

Q2. What three characteristics make titanium useful for aircraft components?

Q3. What two metals are mixed with steel to make stainless steel?

ANTICIPATED ANSWERS

A1. Pure aluminum lacks sufficient strength.

A2. Titanium alloys have high strength, are lightweight and are resistant to corrosion.

A3. Steel is mixed with chromium and nickel.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What species is the reference wood for aircraft construction?

Q2. What is the name used to commonly identify aramid material?

Q3. What two metals are mixed with steel to make stainless steel?

ANTICIPATED ANSWERS

A1. The reference wood is Sitka spruce.

A2. Aramid is commonly called Kevlar®.

A3. Steel is mixed with chromium and nickel.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Materials used in aircraft construction have evolved and improved since the earliest construction and the rate of change is accelerating. Advances in associated technologies are continually integrated with aircraft construction as aircraft become larger, more powerful and more complex.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-136 (ISBN 0-88487-207-6) Sanderson Training Systems. (2001). *A&P Technician Airframe Textbook*. Englewood, CO: Jeppesen Sanderson Inc.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO C370.03 – IDENTIFY BASIC POWER TOOLS USED IN AIRCRAFT MANUFACTURING AND MAINTENANCE

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create slides of figures located at Annexes Q to S.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1–3 to identify basic power tools used in aircraft manufacturing and maintenance and to give an overview of them.

An in-class activity was chosen for TP 4 as it is an interactive way to confirm the cadets' comprehension of the material.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet will have identified basic power tools used in aircraft manufacturing and maintenance.

IMPORTANCE

It is important for the cadets to know about basic power tools used in aircraft manufacturing and maintenance because this will enhance their knowledge of aircraft construction and the aviation maintenance field.

Teaching Point 1 **Describe the Characteristics and Methods of Application for Power Hand Tools Used With Aircraft**

Time: 5 min Method: Interactive Lecture

POWER HAND TOOLS

Power hand tools were originally developed to speed up work. However, some hand tools have improved to the point that they allow a novice to produce a degree of precision and excellence that was previously only attainable by expert master craftsmen.

Power hand tools also create safety concerns. Their power allows them to do a lot of damage in a very short time and their power also makes them hard to control. A twisting or reciprocating power tool can easily cause the user to lose their balance when it is first applied to the work piece. This loss of balance can result in damage to the work piece and injuries to the worker.

Show the cadets the slide of each tool at Annex Q, as they are discussed.

Drill. If there were no restrictions on technician's space or movement, there would only need to be one type of drill. However, when working in and around aircraft, drill requirements become more complex, which has given rise to various types and shapes of drills, to include:

- electric,
- pneumatic,
- right angle,
- flexible drive right angle,
- flexible drive straight, and
- long drill bit.

The drills in Figure 17Q-1 look like dentists' tools because the functions are similar. Aircraft construction and maintenance has very confined, hard-to-reach spaces that need to be worked on and worked in.

Electric hand drills can perform a number of tasks. They can drill small round holes using drill bits and they can drill large round holes using hole saw bits. There are many specialty attachments, such as screwdriver bits and sanding disks.

Reciprocating Saw. A reciprocating saw is used to make rough cuts. Reciprocating saw blades are easily replaced. They come in a variety of grades for different materials and cutting speeds. When blades are worn, they are recycled appropriately and replaced.

Sander. A disk sander is used to trim curved cuts in sheet metal, wood or plastic after they have been rough cut. Disks for sanders are easily replaced and they come in a variety of grades and materials for different applications. When worn they are discarded.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why are there many different styles of drills?

Q2. What is a reciprocating saw used for?

Q3. What materials can a disk sander be used for?

ANTICIPATED ANSWERS

A1. Drills have to be used in confined, hard-to-reach spaces.

A2. It is used to make rough cuts.

A3. A disk sander can be used on metal, wood or plastic.

Teaching Point 2	**Describe the Characteristics and Methods of Application for Shop Equipment Used With Aircraft**
Time: 5 min	Method: Interactive Lecture

Aircraft are characterized by smooth curved and rounded streamlined shapes intended to reduce turbulence and drag. To form the skin of the aircraft into these shapes, sheet metals must be formed very carefully. A number of tools have developed, which allow fast, accurate metal cutting and forming.

Sheet metal gauges are numbered so that the thicker materials have lower designation numbers. Therefore, 12 gauge metals are thicker than 24 gauge metals.

Show the cadets the slide of each tool at Annex R, as they are discussed.

FORMING TOOLS

Bar Folding Machine. A bar folding machine is used to bend the edges of relatively light sheet metal stock, up to 22 gauge thickness.

Cornice Brake. Cornice brakes, or leaf brakes as they are sometimes called, are used for bending sheet metal of a wide range of thicknesses, including heavier materials up to 12 gauge.

Slip Roll Former. A slip roll former is used to make gentle bends and to fabricate parts such as contoured fuselage skin.

COMPOUND CURVE TOOLS

Mechanical Compound Curve Tools. Large volumes of smaller compound curve components can be fabricated in a hydropress, which uses a rubber blanket and water pressure to form the component from a carefully shaped die.

Manual Compound Curve Tools. Sandbags and hammers are often used when only one compound curve component is to be formed.

CUTTING TOOLS

Squaring Shear. A squaring shear is used to make straight cuts across sheet metal.

Scroll Shear. Scroll shears are used to make irregular cuts on the inside of a sheet of metal without cutting through to the edge.

Band Saw. A band saw is used for cutting curved lines in metal, wood or plastic. The blade speed can be varied for each material.

Drill Press. A drill press is used to increase accuracy and straightness beyond what a hand-held drill can accomplish.

Lathe. A lathe is used for spinning objects so that they can be cut into a circular shape. A lathe makes circular objects in the way that a drill press makes circular holes.

Rotary Punch Press. A rotary punch press is used to punch holes or make circular cuts in metal parts.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What are scroll shears used for?

Q2. What is another name for a cornice break?

Q3. What are two tools used to make components with compound curves?

ANTICIPATED ANSWERS

A1. Scroll shears are used to make irregular cuts on the inside of a sheet of metal without cutting through to the edge.

A2. A cornice break is also called a leaf break.

A3. A hydropress or a sandbag and hammer can be used for compound curves.

Teaching Point 3	**Describe the Characteristics and Methods of Application for Fastening Tools and Associated Fasteners Used With Aircraft**
Time: 5 min	Method: Interactive Lecture

Show the cadets the slide of each tool at Annex S, as they are discussed.

FASTENING TOOLS

Rivet Gun. Most rivets in aircraft construction are driven by a rivet gun. This is because a rivet gun is fast and can get into tight spaces. However, a rivet gun does less perfect riveting than a compression riveting tool.

Lighter rivet guns are used for placing rivets with small diameter shanks and heavier rivet guns are used for rivets with large shanks.

Rivet Cutter. Rivet cutters have holes for common-size rivet shank diameters. If a rivet is too long for the intended application, the rivet cutter is used to shorten the shank length. To reduce stocking requirements, some shops only stock rivets with long shanks and then cut them to the desired length. A rivet cutter has holes for common shank diameters and leaves that can be selected for the desired shank length.

Bucking Bar. Bucking bars are placed against the opposite end of the rivet from the rivet gun or hammer during the riveting operation. The rivet is flattened between the bucking bar and the hammer or rivet gun. The bucking bar gets its name from the way it bucks, or jumps, on the end of the rivet. There are many shapes and sizes of bucking bars and one of the important challenges of this work begins with the careful selection of the correct bucking bar. It must clear the structure and yet fit perfectly squarely on the end of the rivet.

Squeezer. A squeezer, or compression riveter, is used in place of a rivet gun or hammer. The squeezer is fast and produces a more uniform riveting shape than either hammers or rivet guns, but a squeezer can only operate on easily accessible locations near the edge of the material.

ASSOCIATED FASTENERS

Rivet. Rivets have been used since sheet metal was first used in aircraft construction and they remain the single most common aircraft fastener. Rivets change in dimension to fill their hole during riveting. This makes for a very solid attachment. The rivet part number designation conveys much information, including the style of rivet head, the material it is made from, the shank diameter and the shank length.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What tool places most aircraft rivets?

Q2. What tool is fastest and produces the best rivet shapes?

Q3. How did the bucking bar get its name?

ANTICIPATED ANSWERS

A1. The rivet gun.

A2. The compression riveting tool, sometimes referred to as a squeezer.

A3. Bucking bars are called that because of the way they buck, or jump, during riveting.

Teaching Point 4	**Conduct a Tool Identification Activity**
Time: 10 min	Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to give the cadets an opportunity to test their knowledge of basic power tools used in aircraft manufacturing and maintenance.

RESOURCES

Pictures of shop tools located at Annexes Q to S, with titles blocked out (with sticky notes).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into two teams on opposite sides of the room.
2. Display a picture of a shop tool.
3. Have one team attempt to identify the tool and its use in 10 seconds.
4. Award one point for the tool's name and another for the tool's use.
5. If the first team is unable to name the tool or its use, offer an opportunity to the second team.
6. Award two points for successful tool or application naming by the second team.
7. Alternate the successive pictures and opportunities between the two teams.
8. The team with the most points after 10 minutes is the winner.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the tool identification activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Tools and equipment used in aircraft manufacturing and maintenance have developed over the years to increase the speed of the work to be done and to allow a more consistent product. The variety of these tools presents both a challenge and an opportunity to aviation technicians.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-136 (ISBN 0-88487-207-6) Sanderson Training Systems. (2001). *A&P Technician Airframe Textbook*. Englewood, CO: Jeppesen Sanderson Inc.

C3-137 (ISBN 0-88487-203-3) Sanderson Training Systems. (2000). *A&P Technician General Textbook*. Englewood, CO: Jeppesen Sanderson Inc.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 7

EO C370.04 – CONSTRUCT AN ALUMINUM MODEL BIPLANE

Total Time:	360 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

View reference C3-160 *Building the B.C. Air Originals Biplane* DVD.

Photocopy all templates and construct one set of wood jigs and wood templates located at Annex T for the cadets. Make Mylar templates of Figures 17T-1 and 17T-2. Using these templates and wood jigs, create parts for two aluminum model biplanes.

Assemble one aluminum model biplane for demonstration purposes, as shown at Annex AG.

Assemble one part for each assembly line.

Photocopy assembly line instructions at Annexes U to AF for each assembly line.

Photocopy one set of final assembly plans at Annex AG for each cadet.

Set up the classroom for the first set of assembly lines outlined in TP 1.

The workstations using power tools for cutting and tapering wood require supervisors.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to introduce cadets to aluminum model biplane construction in a safe, controlled environment. This activity contributes to the development of these skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have constructed an aluminum model biplane.

IMPORTANCE

It is important for cadets to construct an aluminum model biplane because it will allow them to learn about mass production. The aircraft manufacturing industry employs precision mass production techniques to produce modern aircraft.

Teaching Point 1	**Explain and Prepare Mass Production of Aluminum Model Biplane Parts**
Time: 70 min	Method: Practical Activity

> Show the cadets a completed aluminum model biplane.

At the beginning of the 20th century, vehicles were produced one at a time in a manner that today would be called customized. An American named Ransome Eli Olds applied the idea of an assembly line to produce his 1901 Curved Dash Oldsmobile in greater numbers. Henry Ford then improved the assembly line so that his 1914 Model T Ford was assembled in 93 minutes, thus making it possible for the majority of people to afford an automobile.

The Wright brother's 1903 Flyer was produced in a customized manner as well, but Olds' methods were soon applied to aeronautical manufacture when the Wright Aircraft Company was formed in Dayton, Ohio in 1909. Although the mass market for aircraft was slower to grow than the market for automobiles, World War I prompted the United States government to order thousands of aircraft.

Mass production is not limited to large assemblies. It can also be applied to production of models.

> Production of parts for the aluminum model biplane will be carried out using a simple assembly line. However, final assembly will be by customization so that each cadet can make a unique model using mass-produced parts.

> Show the cadets the parts needed for one aluminum model biplane as well as the templates, tools and raw materials that will be used in mass production.

This EO is intended to introduce the cadets to the methods of mass production. All the parts for the aluminum model biplane will be fabricated by cadets working in assembly lines. However, this cannot be one big assembly line. There are more than 30 pieces, but because each part is very simple, the assembly lines are small and also simple. Some parts must be fabricated first, since other assemblies require them. To begin the process, start as many of the following 13 assembly lines as resources permit, providing work for each cadet:

- raw aluminum material assembly line (described at Annex U),
- wood assembly line (Annex V),
- aluminum billet assembly line (Annex W),
- aluminum panel shearing assembly line (Annex X) using billets from the previous line,
- cardboard insert assembly line (Annex Y),
- wire station assembly line (Annex Z), and
- drill station assembly line for bottle caps (Annex AA).

As soon as these assembly lines have produced materials for stock, the fuselage assembly line, the top wing assembly line, the empennage assembly line and the propeller assembly line can be formed to begin those processes.

Except for certain assembly lines, such as the Wood Assembly Line and the Drill Assembly Line, the cadets will be seated at their tables or desks within proximity of each other so that materials can be passed on for processing. For example, once a cadet with the template has marked an aluminum billet with the shape of the horizontal stabilizer, the billet must be passed on to the next cadet with scissors to be cut out. This is also the case with cardboard inserts. All such work takes place at a desk or table.

Beyond the initial start-up phase, timings for other assembly lines cannot be predicted since this depends on the speed at which individual lines work and the parts for aluminum model biplanes are made. As well, additional manpower may have to be provided for assembly lines that cannot keep up; any cadet can do this work but some cadets will be faster than others. The instructor is expected to balance manpower as work progresses.

To allow for spare parts, an additional 10 per cent of parts should be made above the amounts required. This is due to inevitable losses as a result of poor workmanship. Make enough parts so that each cadet can assemble at least one aluminum model biplane. If some cadets finish ahead of others, they can make additional models or be assigned to making additional parts for additional models.

ACTIVITY

Time: 65 min

OBJECTIVE

Two objectives of this activity are for the cadets in each work group to set up their work area and also for the cadets to learn to mass produce the parts for aluminum model biplanes.

RESOURCES

- Instructions for constructing an aluminum model biplane,
- Example parts for each assembly line,
- Templates for constructing aluminum model biplane parts,
- Mechanic's gloves,
- Aluminum cans (36 per cadet),
- Softwood, 20 mm thick (fence boards),
- Bottle caps (ten per cadet),
- Corrugated cardboard,
- Tape (masking),
- Glue (two-part epoxy),
- Poster board (thin cardboard not corrugated),
- Mylar,
- Copper-coated welding rod or music wire (two sizes 1/16 inch and 3/32 inch),
- Ball-peen hammer,
- Pliers,
- Flat screwdriver,
- Rasp,
- Hand stapler,
- Staple gun,
- Push-pin,
- Hot glue gun,
- Awl,
- Wire cutter,
- Box knife,
- Scissors,
- Ruler,
- Felt-tipped pen,
- Needle-nose pliers,
- Adjustable wrench,
- Electric hand drill, and
- Hole saw bits (2-3/4 inch and 1-7/8 inch).

ACTIVITY LAYOUT

- Arrange assembly lines as shown in the layout figures located at Annexes U to AA.

- Provide a shop environment for the wood assembly line.

ACTIVITY INSTRUCTIONS

1. Organize the cadets into the work groups described at Annexes U to AA, providing them with wood jigs and prefabricated wood templates constructed from the templates in reference C3-146, or those located at Annex T, as required.

2. Assembly line assignments include:
Raw Aluminum Material Assembly Line (Annex U)
Prepare aluminum billets from aluminum cans by:

 (a) washing the aluminum cans and removing the pull tabs;

 (b) removing the bottom from one can per biplane (parts B-1 to stock);

 (c) removing the bottom from one can per biplane leaving 2-inch tops (parts B-3 to stock); and

 (d) removing the top and bottom from fifteen cans per biplane (raw blanks to stock).
 Wood Assembly Line (Annex V)
 Produce wood rounds for aluminum model biplane fuselages by:

  (a) cutting 3/4 inch thick rounds (2-3/4 inch and 1-7/8 inch diameters); and

  (b) tapering wood rounds 10 degrees to create F-1 and F-2.
 Aluminum Billet Assembly Line (Annex W)
 Cut cans vertically on the nutrition label (blanks).
 Aluminum Panel Shearing Assembly Line (Annex X)
 Using raw aluminum billets from stock, fabricate the following parts:

  (a) aluminum panels (dimensions 2-5/8 inch by 8-1/8 inch) for under-wing panels, and

  (b) aluminum panels (dimensions 3-5/8 inch by 8-1/8 inch) for wing panels bent 90 degrees on the1/8 inch edge.
 Cardboard Insert Assembly Line (Annex Y)
 Fabricate the following parts from corrugated cardboard sheets:

  (a) cardboard inserts for Bottom Wing (BWC) 7-1/4 inch by 2-5/8 inch,

  (b) cardboard inserts for Bottom Wing (BWAS) 6-1/2 inch by 3/4 inch,

  (c) cardboard inserts for Top Wing (TWC) 18-1/4 inch by 2-3/4 inch,

  (d) cardboard inserts for Top Wing (TWAS) 18-1/4 inch by 3/4 inch,

  (e) cardboard inserts for Horizontal Stabilizer (HS) from Template No. 8, and

  (f) cardboard inserts for Vertical Stabilizers (VS) from Templates No. 9/10.
 Wire Station Assembly Line (Annex Z)
 Fabricate the following parts from wire stock:

  (a) 3/32-inch welding rods 7-3/4 inches long and bend landing gear wire,

  (b) 1/16-inch welding rods 6-3/4 inches and bend landing gear support wire,

  (c) 3/32-inch wire 15-3/4 inches long for wing spars, and

  (d) 3/32-inch wire 18 inches long for propeller shaft.
 Drill Station Assembly Line (Annex AA)
 Perform the following operations:

(a) Drill a 3/32-inch hole in the centre of bottle caps for wheels.

(b) Drill a 3/32-inch hole in the centre of can B-1 for front fuselage.

(c) Drill a 3/32-inch hole in the centre of can P-2 for propeller.

(d) Drill a 3/32-inch hole in the centre of can P-1 for propeller face.

(e) Enlarge holes A, B and C in fuselage assembly to 3/32 inch.

(f) Enlarge hole D in fuselage assembly to 1/16 inch.

(g) Enlarge holes E and F in fuselage assembly to 10-24 bolt size, as required.

(h) Enlarge eight bolt holes in top wing for 10-24 bolts as required.

(i) Enlarge four bolt holes for 10-24 bolts in bottom wing as required.

3. Inform the cadets that they will be rotated among the workstations.

4. Assign the cadets to workstations.

5. Have each work group produce units for prototype assembly as well as stock for assembly line start-up in subsequent mass production sessions.

6. When sufficient parts have been fabricated for building more than two aluminum model biplanes, halt production and, as a demonstration in front of the class, assemble a prototype aluminum model biplane by combining the fuselage, upper wing and empennage. Do not attach propeller or landing gear at this stage.

SAFETY

- Supervised assembly lines, including the hole-saw station and the rasp station, will be used by one cadet at a time. Each of the supervised stations, using electric power tools, must be constantly supervised.
- Before beginning, ensure each cadet can perform the activity safely.
- Cadets shall wear mechanic's gloves while working with sharp materials.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 2	**Demonstrate, Explain and Have the Cadets Manufacture the Parts for Aluminum Model Biplanes**
Time: 120 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets experience mass production of various aluminum model biplane parts at a variety of workstations.

RESOURCES

- Instructions for constructing an aluminum model biplane,

- Templates for constructing aluminum model biplane parts,
- Mechanic's gloves (one pair per cadet),
- Empty aluminum beverage cans (36 per cadet),
- Bottle caps (ten per cadet),
- Corrugated cardboard,
- Tape,
- Glue (two-part epoxy),
- Poster board (thin cardboard not corrugated),
- Mylar,
- Copper-coated welding rod or music wire (two sizes 1/16 inch and 3/32 inch),
- Ball-peen hammer,
- Pliers,
- Flat screwdriver,
- Hand stapler,
- Staple gun,
- Push-pin,
- Hot glue gun,
- Awl,
- Wire cutters,
- Box knife,
- Scissors,
- Ruler,
- Felt-tipped pen,
- Needle-nose pliers,
- Adjustable wrench,
- Electric hand drill, and
- Hole saw bits (2-3/4 inch and 1-7/8 inch).

ACTIVITY LAYOUT

A classroom with desks or tables for work groups with assignments.

Assembly lines can be combined to work together if space and manpower permit. Lines should be selected and set up based on resources such as cadet manpower, working area and also manufactured parts that are available from previous work sessions. For example, the Top Wing assembly line cannot begin without the aluminum panels and cardboard panels provided by previous assembly lines. However, the Top Wing Assembly Line (Annex AD) can operate concurrently with the Aluminum Panel Shearing Assembly Line (Annex X) and the Cardboard Insert Assembly Line (Annex Y) if space and manpower permit.

ACTIVITY INSTRUCTIONS

1. Assign cadets to workstations.

2. In addition to the work groups and assembly lines already used, if still required, the following work groups and assembly lines will be established as manpower becomes available:
Aluminum Rear Fuselage Assembly Line (Annex AB)
Fabricate the rear fuselage from the following parts:

    (a) raw billets from scissor station,

    (b) softwood parts F-1 from stock,

    (c) softwood parts F-2 from stock, and

    (d) fabricated rear fuselages from assembly stations 1–6.

    Fuselage and Bottom Wing Assembly Line (Annex AC)
    Combine parts B-1, B-2, wood rounds and staples to make fuselages and bottom wings.
    Top Wing Assembly Line (Annex AD)
    To fabricate top wings:

    (a) combine cardboard parts TWC, TWAS and three pre-bent aluminum panels dimensions of 3-5/8 inch by 8-1/8 inch to form top wing (all from stock);

    (b) insert panels (dimensions of 2-5/8 inch by 8-1/8 inch) under wing (from stock);

    (c) staple top wing (ten staples); and

    (d) apply Wing Bolt Hole Placement Template (WBHPT) to top of top wing and with a push-pin, make eight holes for bolts in the top wing (top wing to stock).

    Empennage Assembly Line (Annex AE)
    Fabricate the empennage by combining the following parts:

    (a) aluminum horizontal stabilizer – Bottom,

    (b) aluminum horizontal stabilizer – Top Right,

    (c) aluminum horizontal stabilizer – Top Left,

    (d) cardboard insert HS – Horizontal Stabilizer, and

    (e) cardboard insert VS – Vertical Stabilizer.

    Propeller Assembly Line (Annex AF)
    Fabricate the fan propeller by combining the following parts:

    (a) aluminum propeller, and

    (b) aluminum propeller cover.

3. Inform each work group of the number of parts they will make.

4. As each work group completes fabrication of a particular part, have the cadets produce other parts until all parts required are in stock.

5. Ensure that each cadet fabricates a variety of parts.

SAFETY

- Supervised assembly lines, including the hole-saw station and the rasp station, will be used by one cadet at a time. Each of the supervised stations, using electric power tools, must be constantly supervised.

- Before beginning, ensure each cadet can perform the activity safely.
- Cadets shall wear mechanic's gloves while working with sharp materials.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 3	**Demonstrate, Explain and Have the Cadet Construct an Aluminum Model Biplane**
Time: 150 min	Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadet assemble an aluminum model biplane.

RESOURCES

- One complete set of parts for one aluminum model biplane per cadet,
- Instructions for assembling an aluminum model biplane parts located at Annex AG,
- Tape (masking),
- Glue, and
- Tools, to include:
  - ball-peen hammer,
  - pliers,
  - flat screwdriver,
  - hand stapler,
  - staple gun,
  - glue gun,
  - awl,
  - wire cutters,
  - box knife,
  - scissors,
  - ruler,
  - felt-tipped pen,
  - needle-nose pliers, and
  - adjustable wrench.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four.
2. Demonstrate the assembly of the aluminum model biplane.
3. Ensure that every cadet is ready to proceed before moving to the next step in the assembly.
4. Assist each cadet with installation of landing gear to prevent tearing the aluminum fuselage.

SAFETY

Cadets shall wear mechanic's gloves while working with sharp material.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in aluminum model biplane parts fabrication and aluminum model biplane assembly will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Construction of an aluminum model biplane using mass production of parts demonstrates one of the ways that society produces large volumes of equipment, including increasingly complex aircraft.

INSTRUCTOR NOTES/REMARKS

Templates, models and spare parts should be preserved for future training years.

Scheduling this lesson as a weekend activity will reduce preparation and cleanup.

Before beginning the instruction of this EO the instructor shall be familiar with the aluminum model biplane assembly techniques shown at references C3-146 and C3-160.

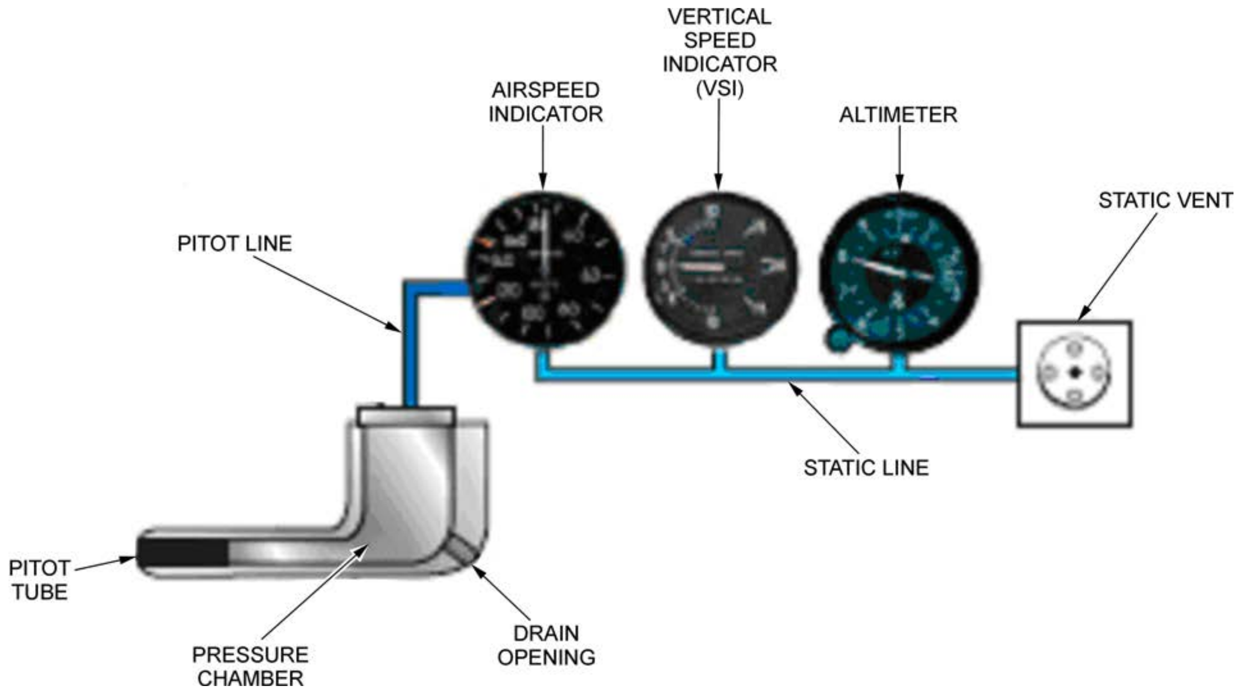
This lesson may be conducted over a number of separate sessions.

REFERENCES

C3-146 Mathis, D. P. (2005). *Step by Step Construction Plans: Classic Biplane*. Helena, MT: BC Air Originals.

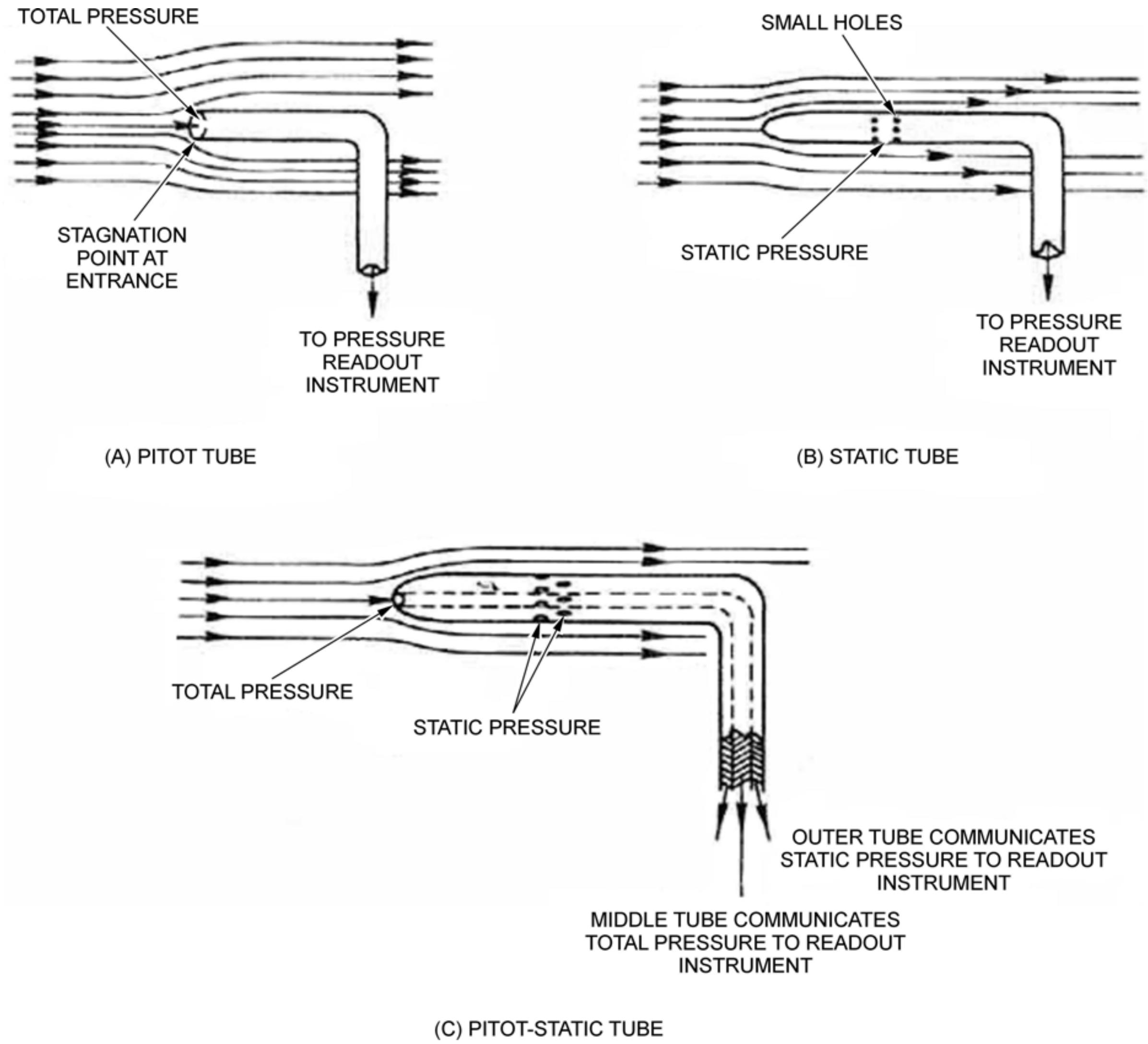
C3-160 Mathis, D. P. (2007). *Building the B.C. Air Originals Biplane*. Helena, MT: B.C. Air Originals.

PITOT STATIC SYSTEM AND TUBES



Pilot's Handbook of Aeronautical Knowledge, "Flight Instruments", 2003, United States Department of Transportation Federal Aviation Administration Flight Standards Service. Retrieved March 6, 2008, from http://www.faa.gov/library/manuals/aviation/pilot_handbook/

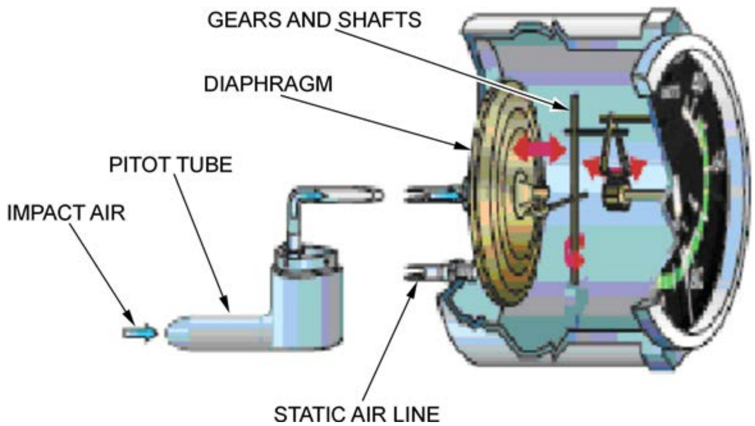
Figure 17A-1 The Pitot Static System



NASA SP-367 Introduction to the Aerodynamics of Flight by T. A. Talay (1975), "Ideal Fluid Flow". Retrieved March 6, 2008, from http://history.nasa.gov/SP-367/chapt3.htm#f27

Figure 17A-2 Pitot Tubes, Static Tubes and Pitot Static Tubes

INDICATORS

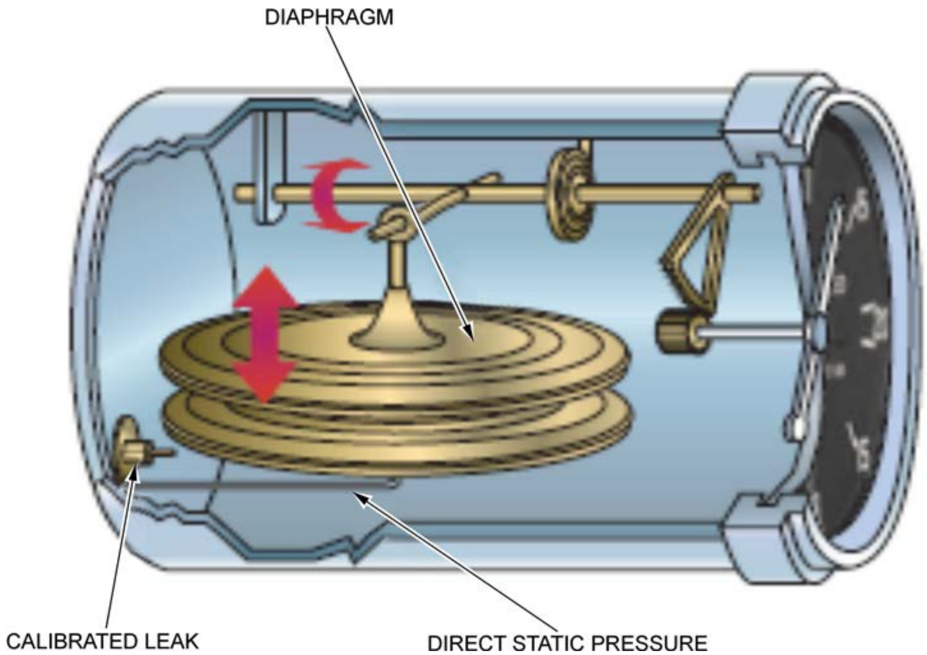


Pilot's Handbook of Aeronautical Knowledge, "Flight Instruments", 2003, United States Department of Transportation Federal Aviation Administration Flight Standards Service. Retrieved March 6, 2008, from http://www.faa.gov/library/manuals/aviation/pilot_handbook/

Figure 17B-1 Airspeed Indicator

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 17B-2 Airspeed Indicator Face

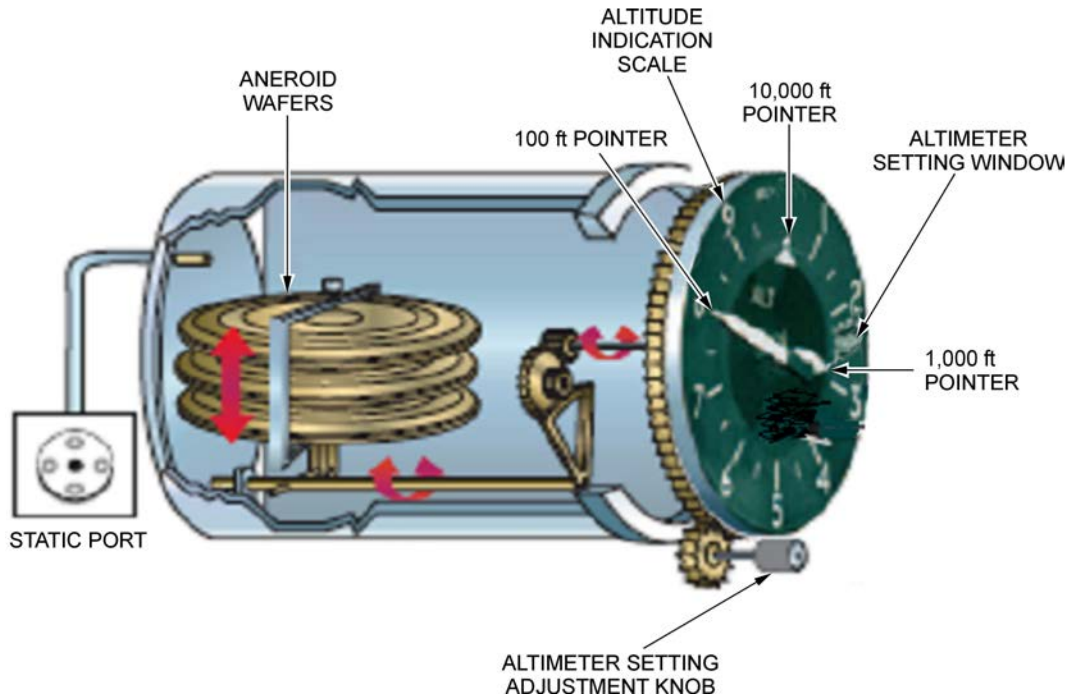


Pilot's Handbook of Aeronautical Knowledge, "Flight Instruments", 2003, United States Department of Transportation Federal Aviation Administration Flight Standards Service. Retrieved March 6, 2008, from http://www.faa.gov/library/manuals/aviation/pilot_handbook/

Figure 17B-3 Vertical Speed Indicator Parts

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 17B-4 Vertical Speed Indicator Face



Pilot's Handbook of Aeronautical Knowledge, "Flight Instruments", 2003, United States Department of Transportation Federal Aviation Administration Flight Standards Service. Retrieved March 6, 2008, from http://www.faa.gov/library/manuals/aviation/pilot_handbook/

Figure 17B-5 Altimeter Parts

North American Powered Parachute Federation, "Flight Instruments". Retrieved October 30, 2007, from http://www.nappf.com/nappf_flight_instruments.htm

Figure 17B-6 Altimeter Face

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TYPES OF CESSNA AIRCRAFT

Cessna NGP
Cessna CH-1 Helicopter
Cessna A
Cessna BA
Cessna AW
Cessna AT-17 Bobcat
Cessna C-34 Airmaster
Cessna T-37
Cessna 120
Cessna 140
Cessna 150 Commuter, Patroller & Aerobat
Cessna 152
Cessna 160
Cessna 162 Skycatcher
Cessna 165 Airmaster
Cessna 170
Cessna 172 Skyhawk, T-41 Mescalero
Cessna 175 Skylark
Cessna 177 Cardinal
Cessna 180 Skywagon
Cessna 182 Skylane
Cessna 185 Skywagon
Cessna 187
Cessna 188 AGwagon, AGpickup, AGtruck, and AGhusky
Cessna 190
Cessna 195
Cessna 205 Super Skywagon
Cessna 206 Stationair & Super Skylane
Cessna 207 Skywagon, Stationair 7 & 8
Cessna 208 Caravan
Cessna 210 Centurion
Cessna 303
Cessna 305 Bird Dog
Cessna 310
Cessna 320 Skynight
Cessna 335
Cessna 336 Skymaster, O-2 Skymaster
Cessna 337 Skymaster
Cessna 340
Cessna 350 formerly the Columbia 350
Cessna 400 formerly the Columbia 400
Cessna 401 Utiliner and Businessliner
Cessna 402 Utiliner and Businessliner
Cessna 404 Titan II
Cessna 406 Caravan II
Cessna 411
Cessna 414 Chancellor
Cessna 421 Golden Eagle
Cessna 425 Conquest I
Cessna 441 Conquest II
Cessna 500 Citation I
Cessna 501 Citation ISP
Cessna 510 Citation Mustang
Cessna 525 Citation Jet, CJ1, CJ1+
Cessna 525A CJ2, CJ2+
Cessna 525B CJ3
Cessna 550 Citation II, Cessna Citation Bravo
Cessna 551 Citation IISP
Cessna S550 Citation SII
Cessna 560 Citation V, Citation Ultra, Citation Encore, Citation Encore+
Cessna Citation 560XL Excel, XLS, XLS+
Cessna 620
Cessna 650 Citation III, Citation VI, Citation VII
Cessna 680 Citation Sovereign
Cessna 750 Citation X
Cessna 850 Citation Columbus

Wikimedia Commons by Adrian Pingstone, 2005, "Cessna 172G". Retrieved March 10, 2008, from http://en.wikipedia.org/wiki/Image:Cessna.f172g.g-bgmp.arp.jpg

Figure 17C-1 Cessna 172 Skyhawk

Cessna.com: Our Aircraft, 2008, "Amphibian Cessna Caravan". Retrieved March 16, 2008, from http://caravanamphib.cessna.com/#

Figure 17C-2 Cessna 208 Caravan Amphibian

Wikimedia Commons by Adrian Pingstone, 2005, "Cessna 404". Retrieved March 10, 2008, from http://en.wikipedia.org/wiki/Cessna_404

Figure 17C-3 Cessna 404 Titan II

Cessna emedia, 2008, "Citation image gallery". Retrieved March 16, 2008, from http://cessna.com/news/gallery/index.php?model=mustang

Figure 17C-4 Cessna 510 Citation Mustang

RCA OPS (PAC), 2005, "Aircraft operating instructions Cessna 305 aircraft". Retrieved March 16, 2008, from http://www.regions.cadets.forces.gc.ca/pac/rgs/doc/L19%20AOIs%201%20Jun%2006%20-%20Complete%20version.pdf

Figure 17C-5 Cessna 305 (L-19 Bird Dog)

DIAMOND

Diamond Aircraft: The Ultimate Fleet, 2008, "DA20 Eclipse". Retrieved March 16, 2008, from http://www.diamondair.com/aircraft.php

Figure 17D-1 Diamond DA20 Eclipse

Diamond Aircraft: The Ultimate Fleet, 2008, "DA42 Twin". Retrieved March 16, 2008, from http://www.diamondair.com/aircraft.php

Figure 17D-2 Diamond DA42 Twin Star

Diamond Aircraft D-Jet, 2006, "D-Jet: The features". Retrieved March 16, 2008 from http://www.diamond-air.at/fileadmin/uploads/files/productfacts/d-jet/D_JETbrochure.pdf

Figure 17D-3 Diamond D-Jet

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PIPER

Piper Aircraft Inc., 2008, "Piper freedom of flight: Heritage" at website
Retrieved March 16, 2008, from http://www.piper.com/company/heritage.asp

Figure 17E-1 Forerunner of the Piper Cub

Controller, "1979 Piper Aztec F", Copyright 2008 by Sandhills Publishing Company. Retrieved March 16, 2008, from http://www.controller.com/listings/aircraft-for-sale/PIPER-AZTEC-F/1979-PIPER-AZTEC-F/1126249.htm?guid=450D7ACC60104829A0081C4C7E88EFED

Figure 17E-2 Piper Aztek on Final

Piper Freedom of Flight "Piper unveils the revolutionary piperjet" Retrieved March 12, 2008, from http://www.prnewswire.com/mnr/carlisle/25816/

Figure 17E-3 Piper Jet

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VIKING AIR (DE HAVILLAND ORIGINAL PRODUCTS)

"Canada's Air Force", Image Gallery photo search (2007). Retrieved March 8, 2008, from http://www.airforce.forces.gc.ca/site/imagery/search_e.asp

Figure 17F-1 de Havilland DHC-6 Twin Otter (CC-138 Twin Otter)

Viking Air A New Beginning for a Canadian Legend, 2008, DHC-2T Turbo Beaver. Retrieved March 16, 2008, from http://www.vikingair.com/content.aspx?id=270#

Figure 17F-2 de Havilland DHC-2T Turbo Beaver

"Canada's Air Force", Image Gallery photo search (2007). Retrieved March 8, 2008, from http://www.airforce.forces.gc.ca/site/imagery/search_e.asp

Figure 17F-3 de Havilland DHC 5 Buffalo (CC-115 Buffalo)

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AIRBUS

Wikimedia Commons by Adrian Pingstone, 2005, "Airbus A300B4-603". Retrieved March 10, 2008, from http://en.wikipedia.org/wiki/Image:Luft.a300b4.d-aias.750pix..jpg

Figure 17G-1 Airbus A300

Wikimedia Commons by Adrian Pingstone, 2005, "Airbus A310-200". Retrieved March 10, 2008, from http://en.wikipedia.org/wiki/Image:Fedex.a310-200.n420fe.arp.jpg

Figure 17G-2 Airbus A310

Air Canada: Our Fleet, 2007, "Airbus A320-200 (320)". Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/a320-200xm.html

Figure 17G-3 Airbus A320

Air Canada: Our Fleet, 2007, “Airbus A330-300 (333)”. Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/a330-300.html

Figure 17G-4 Airbus A330

Air Canada: Our Fleet, 2007, "Airbus A340-300 (343)". Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/a340-300.html

Figure 17G-5 Airbus A340

Airbus Multimedia Library Images, 2007, "The A380". Retrieved March 16, 2008, from http://www.airbus.com/store/photolibrary/AIRCRAFT/AIRBUS/A380/att00009804/media_object_image_lowres_A380_touchdown

Figure 17G-6 Airbus A380

THE BOEING COMPANY

Boeing Commercial Airplanes: Out of Production, "707". Copyright 2008. Retrieved March 16, 2008, from http://www.boeing.com/commercial/gallery/707-04.html

Figure 17H-1 Dash-80 First Boeing 707

Air Canada: Historical Fleet, 2007, "737-200". Retrieved March 16, 2008, from http://www.aircanada.com/shared/images/common/fleet/pictures/737b.jpg

Figure 17H-2 Boeing 737

Air Canada: Historical Fleet, 2007, "747-400". Retrieved March 16, 2008, from http://www.aircanada.com/shared/images/common/fleet/pictures/747combi.jpg

Figure 17H-3 Boeing 747

Air Canada: Our Fleet, 2007, "767-300". Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/b767-300er.html

Figure 17H-4 Boeing 767

Air Canada: Our Fleet, 2007, "777-300ER". Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/77W.html

Figure 17H-5 Boeing 777

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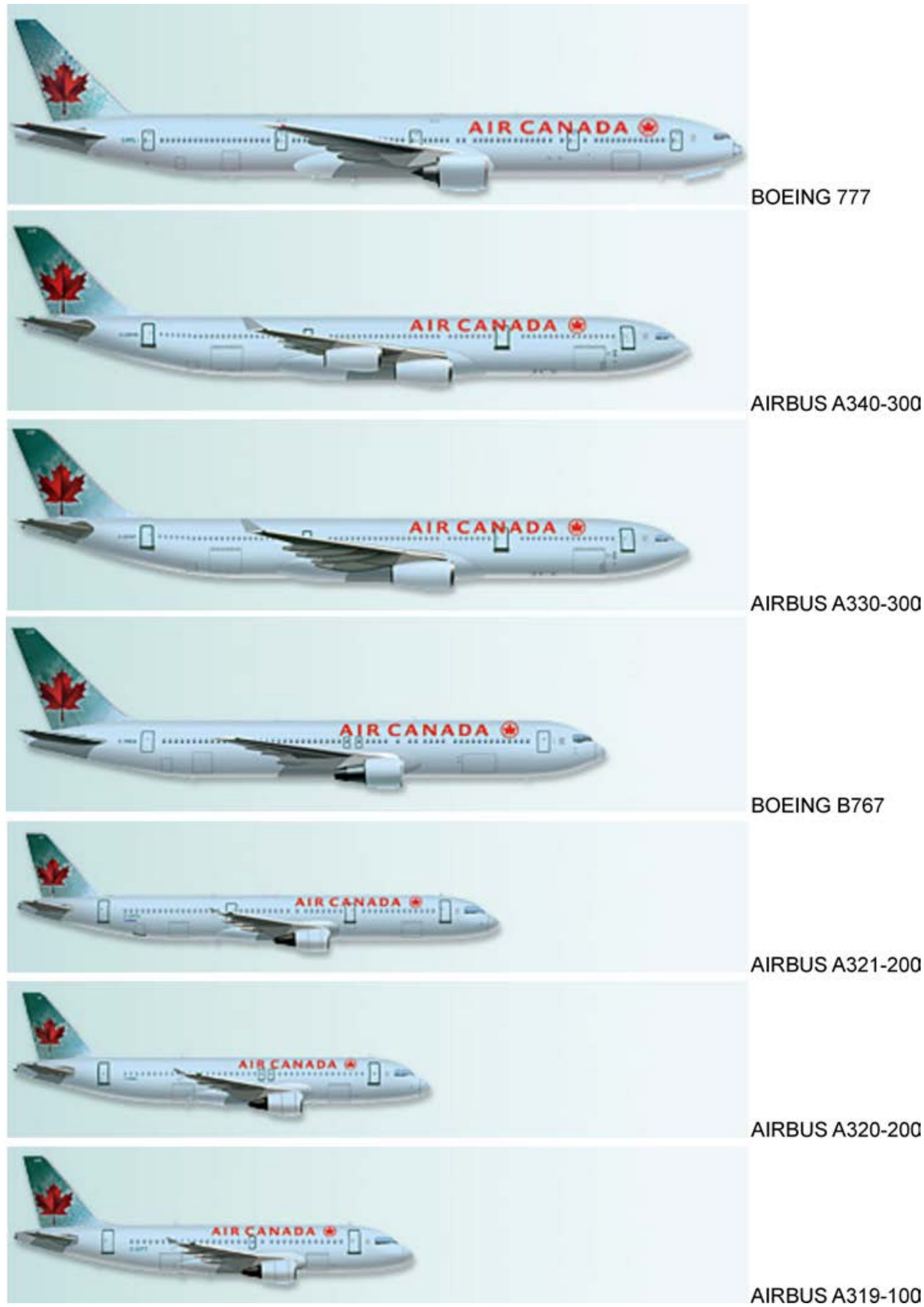
AIR CANADA'S FLEET



Air Canada, 2008, "Our Fleet". Retrieved March 16, 2008, from http://www.aircanada.com/en/about/fleet/

Figure 17I-1 Air Canada Fleet Comparison

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SKYHAWK CHECKLIST

Cessna 172 Preflight

Preflight Inspection Cockpit

Aircraft docs (ARROW)	Check
Weight & Balance	Check
Parking Brake	Set
Control wheel lock	Remove
Hobbs/Tach	Check/Remove
Ignition	Off
Avionics Power Switch	Off
Master Switch	On
Fuel quantity indicators	Check
Pitot Heat	On
Avionics Master Switch	On
Avionics Cooling Fan	Audible
Avionics Master Switch	Off
Static Pressure Alt Src Valve	Off
Annunciator Panel Switch	Test
Annunciator's Illuminate	Check
Annunciator Panel Switch	Off
Flaps	Extend
Pitot Heat	Off
Master Switch	Off
Pitot Tube	Test for Heat
Fuel shutoff valve	On (In)

Fuselage and Empenage

Baggage Door	Closed & Locked
Rivets	Check
Rudder Gust Lock	Remove
Tail Tie-Down	Disconnect
Control surfaces	Free & Secure
Trim Tab	Check Security
Antennas	Check Security

Right wing

Wing tie-down	Disconnect
Aileron	Free and Secure
Flaps	Secure
Main wheel tire	Inflated/Cond
Brakes	Not Leaking
Fuel tank sump	Sample
Fuel Quantity	Check
Fuel Filler cap	Secure

Nose

Engine oil level	Check
Fuel strainer	Sample
Propeller and spinner	Check
Alternator belt	Check
Air intake	Check
Carburetor air filter	Check
Landing lights	Check
Nose wheel strut & tire	Check
Nose-Tie down	Disconnect
Static source opening	Check

Left Wing

Wing tie-down	Disconnect
Aileron	Free and Secure
Flaps	Secure
Main wheel tire	Inflated/Cond
Brakes	Not Leaking
Fuel tank vent open	Check
Fuel tank sump	Sample
Fuel Quantity	Check
Fuel Filler cap	Secure
Pitot tube	Uncover and Check
Stall warning	Check
Landing/Taxi Light(s)	Clean/Cond

Before starting engine

Preflight inspection	Complete
Passenger Briefing	Complete
Seats, belts	Adjust & Lock
Doors	Closed & Locked
Brakes	Test & Set
Circuit breakers	Check In
Electrical Equip/Autopilot	Off
Avionics Power Switch	Off
Fuel Selector Valve	Both
Fuel shutoff valve	On (In)

Starting Engine

Throttle	Open 1/4 inch
Mixture	Rich (IN)
Carb heat	Cold (IN)
Prime	As required; locked
Aux Fuel Pump	On
Propeller area	Clear
Master Switch	On
Beacon	On
Ignition	Start
Throttle	Adjust 1000 rpm
Oil Pressure	Check normal
Aux Fuel Pump	Off
Avionics Master Switch	On
Radios	On

Cessna 172 In Flight

Transponder	Standby
Flaps	Up
Ammeter	Check
Heading Indicator	Set
ATIS/AWOS/ASOS	Obtain
Altimeter	Set
Autopilot	Engage
Flight Controls	Move Against AP
Autopilot	Disconnect (Sound)
Departure &Taxi Clmce	Contact

Before Takeoff

Parking brake	Set
Cabin doors	Closed & Locked
Seats, belts	Adjust & Lock
Flight controls	Free & Correct
Instruments (4)	Set
Fuel Quantity	Check
Fuel Shutoff Valve	On
Mixture	Rich (IN)
Fuel Selector Valve	Both
Elevator Trim	Set for TAKEOFF
Throttle	1800 rpm
Magnetos	Check
Suction gage	Check
Engine Instruments	Check
Ammeter	Check
Mixture	Set for Density Alt
Carb heat	On
Annunciator Panel	Clear
Throttle	1000 rpm
Throttle Friction Lock	Adjust
Strobe Lights	On
Radios/Avionics	Set
Autopilot	Off
Flaps	Set for Takeoff (0^{0}-10^{0})
Parking Brake	Release
Windows	Closed

Takeoff

Flaps	Up
Carb heat	Cold (In)
Transponder	Altitude
Trim	set for TAKEOFF
Throttle	Full
Tach, oil, airspeed	Check
Elevator	Lift at 55 KIAS
Climb	70-80 KIAS

Cruise

Pitch	Set
Throttle	As required
Trim	Set
Mixture	Adjust

Pre-landing checklist

Fuel selector	On
Mixture	Rich
Carb Heat	On
Seatbelts	Fastened

Approach

Flight instruments	Ckd & Set
Radios	Checked
ATIS	Checked
Carb Heat	On (Out)
Mixture	Rich
Landing light	On
Airspeed	65-75 KIAS (Flaps Up) 60-70 KIAS (Flaps Dn)

After landing

Flaps	Up
Carb Heat	Cold (In)
Transponder	Standby
Landing light	Off

Parking

Avionics	Off
Electrical	Off
Throttle	1000 RPM
Mixture	Cut-off
Ignition switch	Off
Master switch	Off

Securing the aircraft

Control Lock	Install
Hobbs/Tach	Record
Door/Window	Secure
Tie-downs	Secure

Comm Freq

ATIS	
Ground	
Tower	
Club	
Fuel	

International Flying Club, 2005, "Cessna 172 Preflight Cessna 172 In Flight". Retrieved March 17, 2008, from http://www.internationalflyingclub.org/docs/c172-chklist.pdf

Figure 17J-1 Skyhawk Checklist

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ELEMENTARY WORK TASK LISTINGS FROM STANDARD 625 APPENDIX A – ELEMENTARY WORK, CANADIAN AVIATION REGULATIONS PART VI – GENERAL OPERATING AND FLIGHT RULES

1. fabric patches measuring not more than 15 cm (6 in) in any direction and not requiring rib stitching or the removal of control surfaces or structural parts, on small privately operated aircraft;
2. removal and replacement of tires, wheels, landing skids or skid shoes, not requiring separation of any hydraulic lines, on small privately operated aircraft;
3. removal and replacement of skis on fixed landing gear, not requiring separation of any hydraulic lines, on small privately operated aircraft;
4. repair of non-structural fairings, cover plates and cowlings, on small privately operated aircraft;
5. cleaning and replacement of spark plugs, on small privately operated aircraft;
6. checking of cylinder compression, on small privately operated aircraft;
7. cleaning or changing of fuel, oil, and air filters, on small privately operated aircraft;
8. draining and replenishing engine oil, on small privately operated aircraft;
9. checking the electrolyte level and specific gravity of lead acid batteries, on small privately operated aircraft;
10. adjustment of generator or alternator drive belt tension, on small privately operated aircraft;
11. cleaning of balloon burner nozzles;
12. removal and replacement of balloon baskets, burners and gas tanks that are designed for rapid change in service;
13. removal and replacement of glider wings and tail surfaces that are designed for quick assembly;
14. repair of upholstery, trim and cabin furnishings;
15. removal and replacement of role equipment designed for rapid removal and replacement;
16. removal and replacement of passenger seat belts and harnesses;
17. removal and replacement of fuses, light bulbs and reflectors;
18. removal and replacement of avionics components that are rack mounted or otherwise designed for rapid removal and replacement, where the work does not require testing other than an operational check;
19. removal and replacement of aircraft batteries;
20. removal and replacement of co-pilot control levers, wheels, pedals and pedal guard plates that are designed for rapid removal and replacement, on other than transport category aircraft;
21. opening and closing of non-structural access panels;
22. removal and replacement of cabin doors on unpressurized aircraft, where the door is designed for rapid removal and replacement;
23. removal, replacement and repositioning of non structural partitions in the passenger cabin;
24. inspection and continuity checking of self-sealing chip detectors;
25. removal and replacement of induction system anti-icing baffles, scoops and deflectors that are designed for rapid removal and replacement;

26. removal, cleaning, replacement and adjustment of external components of chemical dispersal systems that are designed for rapid removal and replacement;

27. deactivating or securing inoperative systems in accordance with sections 605.09 or 605.10 of the CARs, including the installation of devices specifically intended for system deactivation, where the work does not involve disassembly, the installation of parts, or testing other than operational checks;

28. checking and adjusting air pressure in helicopter floats, and aircraft tires having an operating pressure below 100 psi, except on aircraft operated under CAR 704 and CAR 705; and

29. repetitive visual inspections or operational checks (including inspections and tests required by airworthiness directives) not involving disassembly or the use of visual aids, performed out of phase with the aircraft's scheduled check cycle at intervals of less than 100 hours air time, provided the tasks are also included in the most frequent scheduled maintenance check.

JOURNEY LOG FLIGHT RECORD

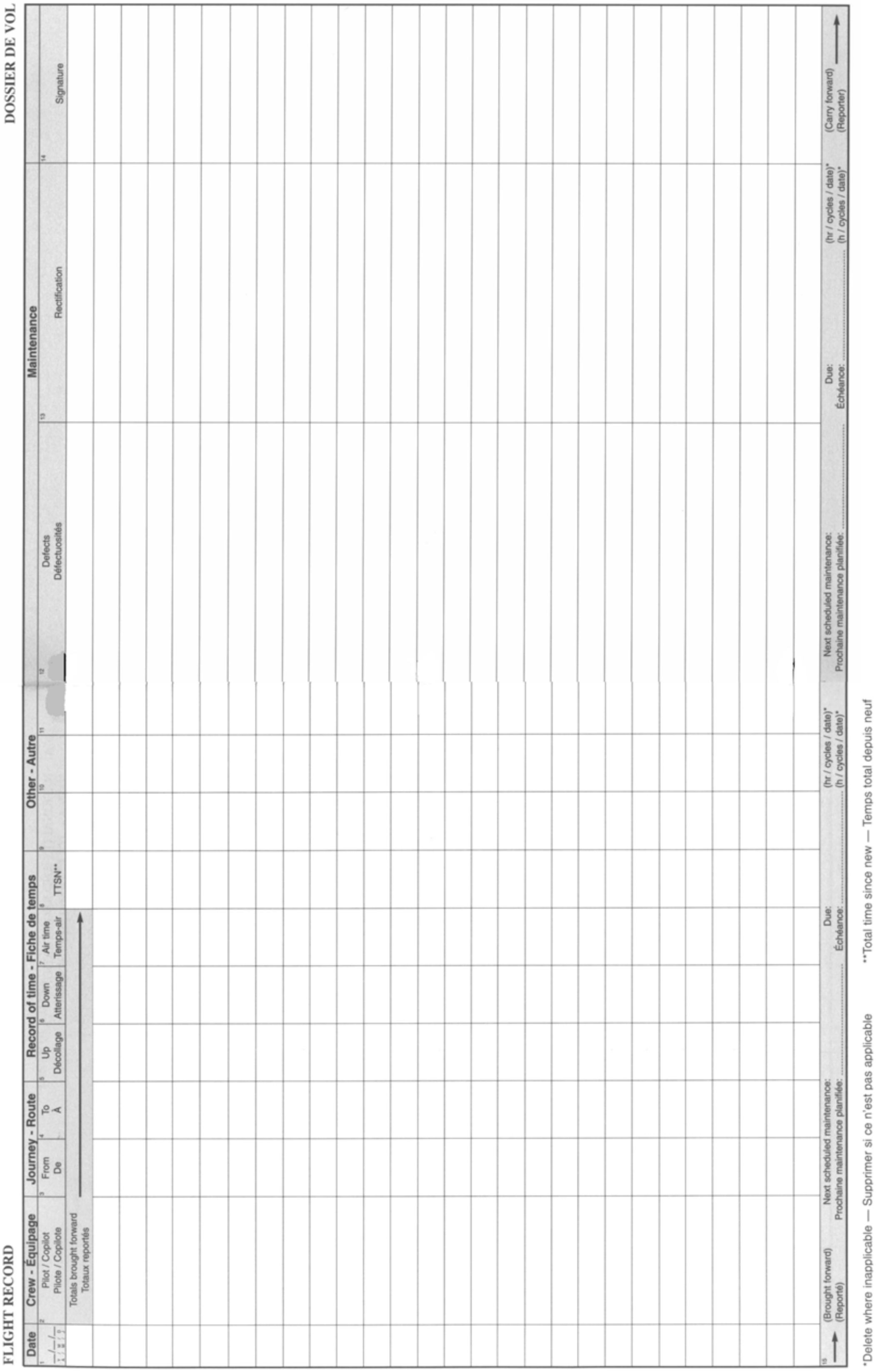
Section 1: Record of maintenance and elementary work

1

Date / /	Total air time	Total landings/cycle	Details of task	Signature	AME or AMO/ACA

Transport Canada, Airframe Log, Minister of Transport (p. 1)

Figure 17L-1 Airframe Logbook Page 1



FLIGHT RECORD — DOSSIER DE VOL

Date	Crew - Équipage	Journey - Route		Record of time - Fiche de temps				Other - Autre			Maintenance		
1 __/__/__	2 Pilot / Copilot Pilote / Copilote	3 From De	4 To À	5 Up Décollage	6 Down Atterrissage	7 Air time Temps-air	8 TTSN**	9	10	11	12 Defects Défectuosités	13 Rectification	14 Signature
	Totals brought forward Totaux reportés	→											
15 → (Brought forward) (Reporté)	Next scheduled maintenance: Prochaine maintenance planifiée:				Due: Échéance:			(hr / cycles / date)* (h / cycles / date)*			Next scheduled maintenance: Prochaine maintenance planifiée:	Due: Échéance: (hr / cycles / date)* (h / cycles / date)*	(Carry forward) (Reporter) →

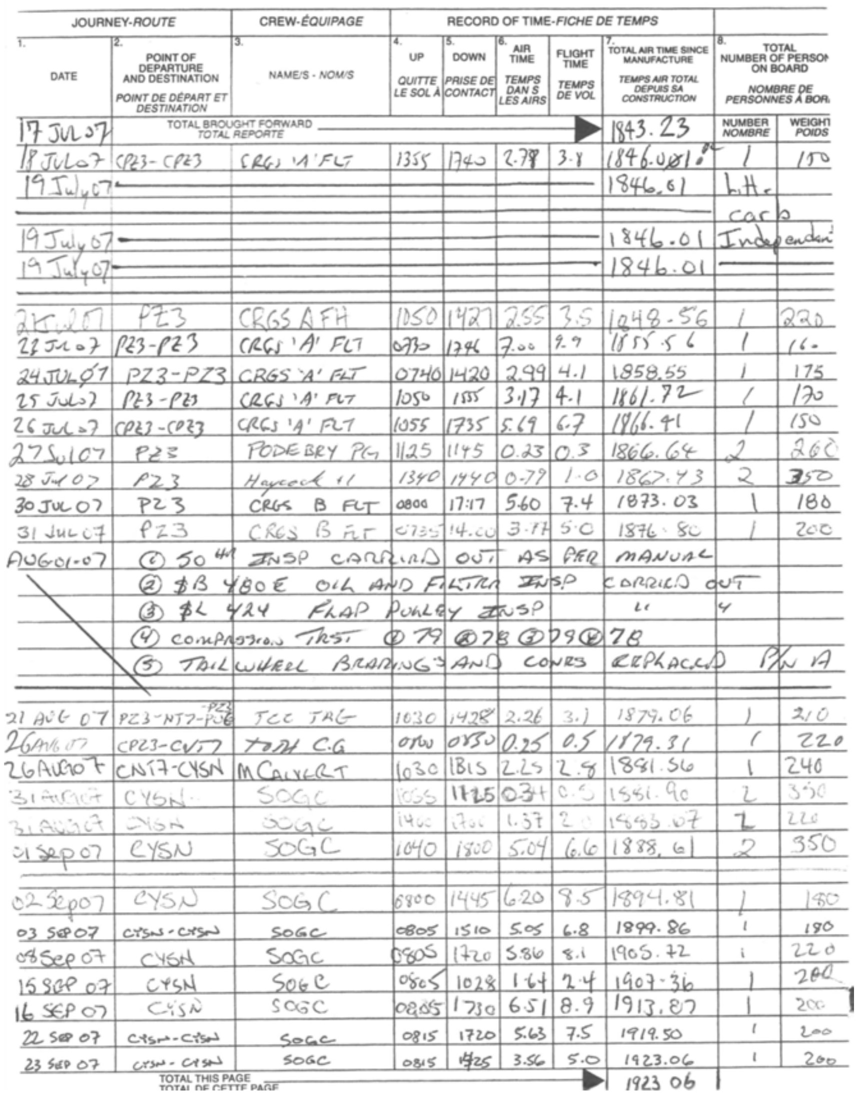
*Delete where inapplicable — Supprimer si ce n'est pas applicable

**Total time since new — Temps total depuis neuf

Transport Canada, Aircraft Journey Log, Minister of Transport (p. 1)

Figure 17L-2 Journey Logbook Flight Record Page 2

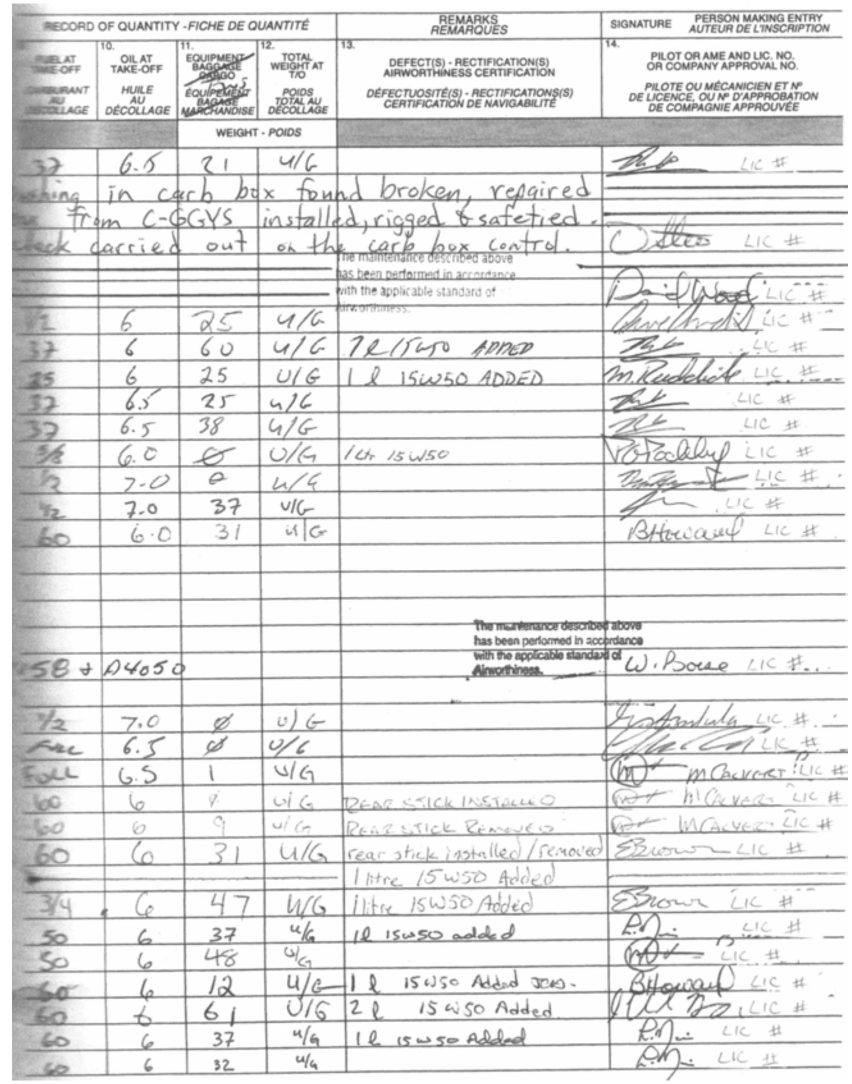
JOURNEY LOGBOOK



DATE	POINT OF DEPARTURE AND DESTINATION / POINT DE DÉPART ET DESTINATION	NAME/S - NOM/S	UP / QUITTE LE SOL À	DOWN / PRISE DE CONTACT	AIR TIME / TEMPS DANS LES AIRS	FLIGHT TIME / TEMPS DE VOL	TOTAL AIR TIME SINCE MANUFACTURE / TEMPS AIR TOTAL DEPUIS SA CONSTRUCTION	NUMBER / NOMBRE	WEIGHT / POIDS
17 JUL 07	TOTAL BROUGHT FORWARD / TOTAL REPORTÉ						1843.23		
18 JUL 07	CPZ3-CPZ3	CRGS 'A' FLT	1355	1740	2.78	3.8	1846.01	1	150
19 July 07							1846.01	Lt. carb	
19 July 07							1846.01	Independent	
19 July 07							1846.01		
21 Jul 07	PZ3	CRGS AFH	1050	1427	2.55	3.5	1848.56	1	220
22 Jul 07	PZ3-PZ3	CRGS 'A' FLT	0730	1746	7.00	9.9	1855.56	1	160
24 JUL 07	PZ3-PZ3	CRGS 'A' FLT	0740	1420	2.99	4.1	1858.55	1	175
25 Jul 07	PZ3-PZ3	CRGS 'A' FLT	1050	1555	3.17	4.1	1861.72	1	170
26 Jul 07	CPZ3-CPZ3	CRGS 'A' FLT	1055	1735	5.69	6.7	1866.41	1	150
27 Jul 07	PZ3	PODEBRY PG	1125	1145	0.23	0.3	1866.64	2	260
28 Jul 07	PZ3	Haycock "	1340	1440	0.79	1.0	1867.43	2	350
30 JUL 07	PZ3	CRGS B FLT	0800	17:17	5.60	7.4	1873.03	1	180
31 JUL 07	PZ3	CRGS B FLT	0735	14.00	3.77	5.0	1876.80	1	200
AUG 01-07	(1) 50 HR INSP CARRIED OUT AS PER MANUAL								
	(2) ΦB 480E OIL AND FILTER INSP CARRIED OUT								
	(3) ΦL 424 FLAP PULLEY INSP " "								
	(4) COMPRESSION TEST (1) 79 (2) 78 (3) 79 (4) 78								
	(5) TAILWHEEL BEARINGS AND CONES REPLACED P/N A								
21 AUG 07	PZ3-NT7-PZ3	TCC TAG	1030	1428	2.26	3.1	1879.06	1	210
26 AUG 07	CPZ3-CNT7	TOOH C.G	0710	0830	0.25	0.5	1879.31	1	220
26 AUG 07	CNT7-CYSN	M CALVERT	1030	1815	2.25	2.8	1881.56	1	240
31 AUG 07	CYSN	SOGC	1055	1125	0.34	0.5	1881.90	2	350
31 AUG 07	CYSN	SOGC	1400	1700	1.37	2.0	1883.07	2	220
01 Sep 07	CYSN	SOGC	1040	1800	5.04	6.6	1888.61	2	350
02 Sep 07	CYSN	SOGC	0800	1445	6.20	8.5	1894.81	1	180
03 SEP 07	CYSN-CYSN	SOGC	0805	1510	5.05	6.8	1899.86	1	190
08 Sep 07	CYSN	SOGC	0805	1720	5.86	8.1	1905.72	1	220
15 SEP 07	CYSN	SOGC	0805	1028	1.64	2.4	1907.36	1	200
16 SEP 07	CYSN	SOGC	0805	1730	6.51	8.9	1913.87	1	200
22 SEP 07	CYSN-CYSN	SOGC	0815	1720	5.63	7.5	1919.50	1	200
23 SEP 07	CYSN-CYSN	SOGC	0815	1425	3.56	5.0	1923.06	1	200
	TOTAL THIS PAGE / TOTAL DE CETTE PAGE						1923.06		

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 17M-3 Example of Journey Logbook First Page



FUEL AT TAKE-OFF / CARBURANT AU DÉCOLLAGE	OIL AT TAKE-OFF / HUILE AU DÉCOLLAGE	EQUIPMENT BAGGAGE CARGO / ÉQUIPEMENT BAGAGE MARCHANDISE (WEIGHT - POIDS)	TOTAL WEIGHT AT T/O / POIDS TOTAL AU DÉCOLLAGE	DEFECT(S) - RECTIFICATION(S) AIRWORTHINESS CERTIFICATION / DÉFECTUOSITÉ(S) - RECTIFICATION(S) CERTIFICATION DE NAVIGABILITÉ	PILOT OR AME AND LIC. NO. OR COMPANY APPROVAL NO. / PILOTE OU MÉCANICIEN ET Nº DE LICENCE, OU Nº D'APPROBATION DE COMPAGNIE APPROUVÉE
3/4	6.5	21	U/G		LIC #
...ing in carb box found broken, repaired					
from C-GGYS installed, rigged & safetied.					
check carried out on the carb box control.				The maintenance described above has been performed in accordance with the applicable standard of airworthiness.	LIC #
					LIC #
1/2	6	25	U/G		LIC #
3/4	6	60	U/G	1 l 15W50 ADDED	LIC #
25	6	25	U/G	1 l 15W50 ADDED	M Ruddick LIC #
3/4	6.5	25	U/G		LIC #
3/4	6.5	38	U/G		LIC #
5/8	6.0	Ø	U/G	1 Lt 15W50	LIC #
1/2	7.0	Ø	U/G		LIC #
1/2	7.0	37	U/G		LIC #
60	6.0	31	U/G		B Howard LIC #
58 + A4050				The maintenance described above has been performed in accordance with the applicable standard of Airworthiness.	W. Bowe LIC #
1/2	7.0	Ø	U/G		LIC #
Full	6.5	Ø	U/G		LIC #
Full	6.5	1	U/G		M Calvert LIC #
60	6	9	U/G	Rear stick installed	M Calvert LIC #
60	6	9	U/G	Rear stick removed	M Calvert LIC #
60	6	31	U/G	rear stick installed/removed	E Brown LIC #
				1 litre 15W50 Added	
3/4	6	47	U/G	1 litre 15W50 Added	E Brown LIC #
50	6	37	U/G	1 l 15W50 added	LIC #
50	6	48	U/G		LIC #
60	6	12	U/G	1 l 15W50 Added	B Howard LIC #
60	6	61	U/G	2 l 15W50 Added	LIC #
60	6	37	U/G	1 l 15W50 Added	LIC #
60	6	32	U/G		LIC #

Director Cadets 3, 2007 Ottawa, ON: Department of National Defence

Figure 17M-4 Example of Journey Logbook Second Page

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WOODEN AIRCRAFT

"The Aviation History Online Museum", 2007, Aircraft: Sopwith Triplane. Retrieved November 25, 2007, from http://www.aviation-history.com/sopwith/triplane.htm

Figure 17N-1 The Black Maria Sopwith Triplane

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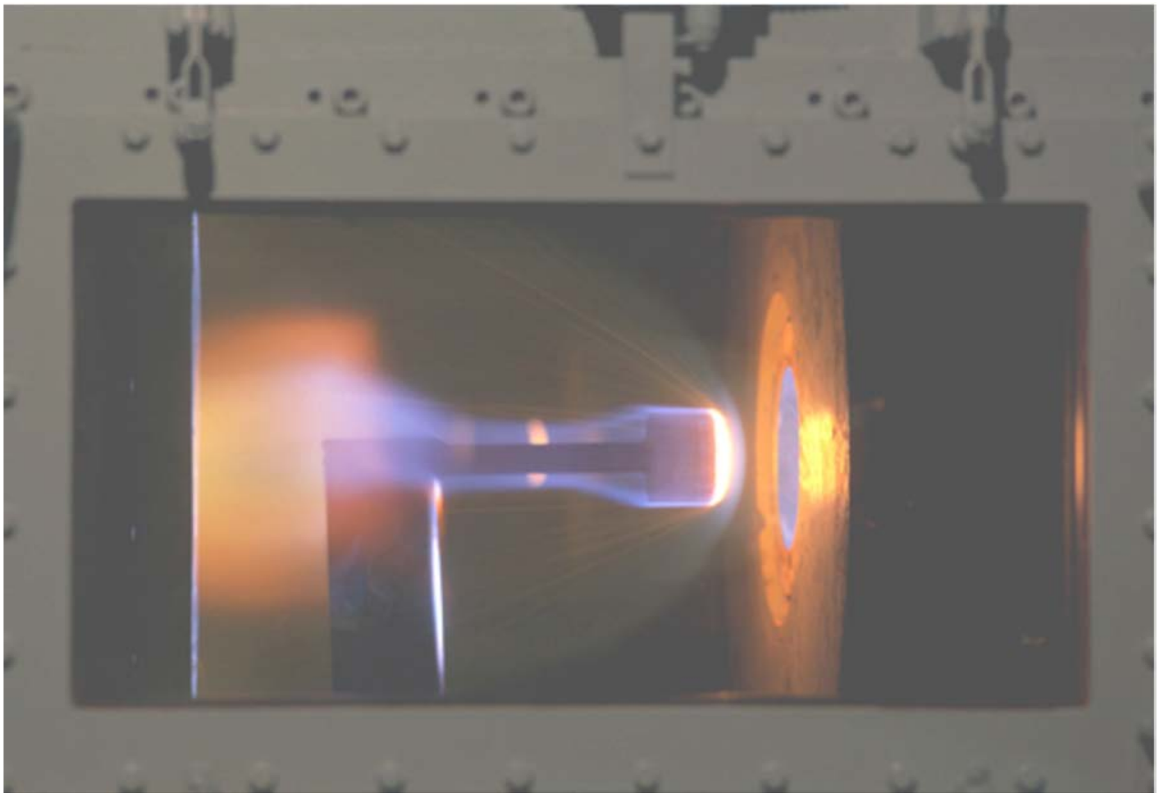
COMPOSITE MATERIALS USED IN AIRCRAFT CONSTRUCTION

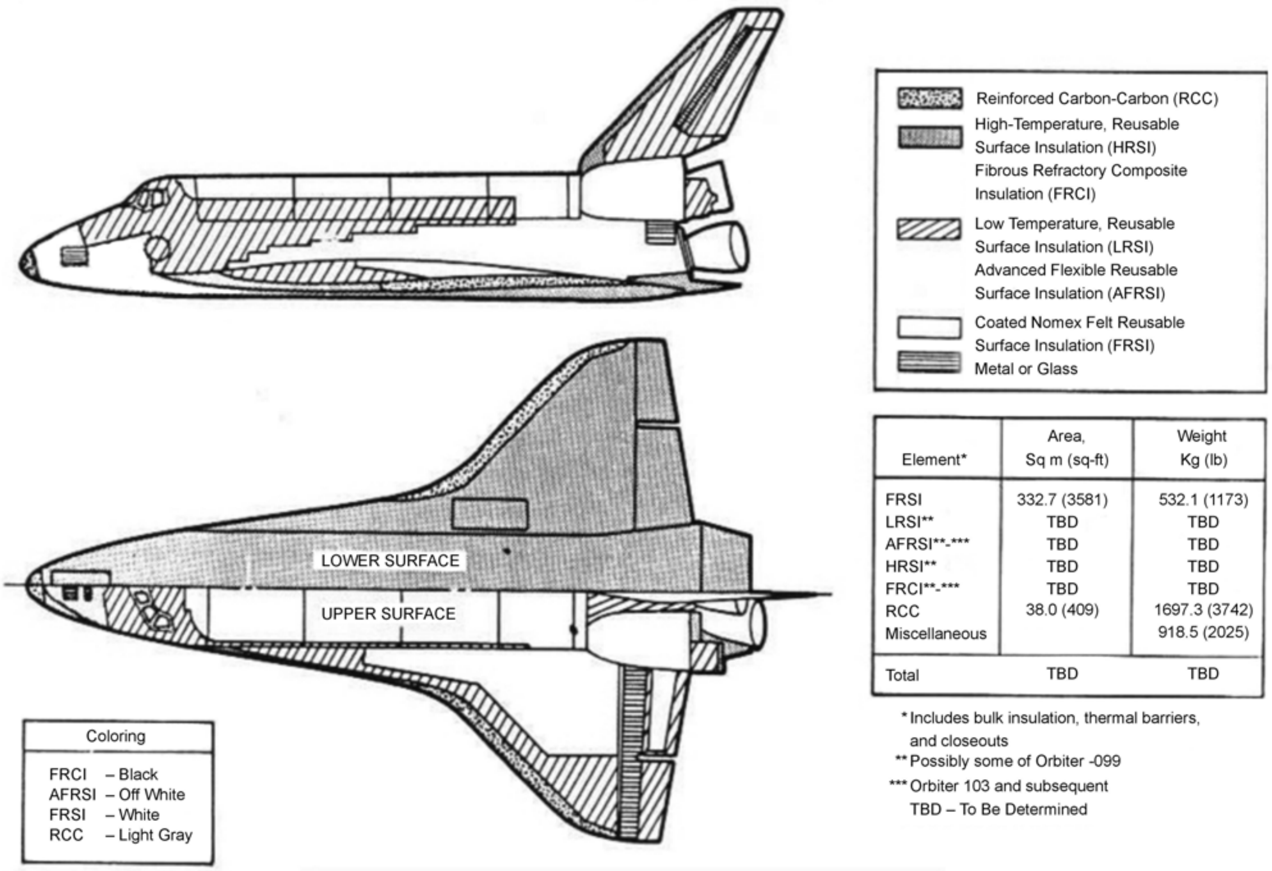
"A380 Navigator", 2007, Manufacturing Process. Retrieved November 24, 2007, from http://events.airbus.com/A380/Default2.aspx?ArtId=644

Figure 17O-1 A380 Rear Pressure Bulkhead



"US Centennial of Flight Commission", 2004, Shuttle Thermal Protection System. Retrieved November 25, 2007, from http://www.centennialofflight.gov/essay/Evolution_of_Technology/TPS/Tech41.htm

Figure 17O-2 Testing Thermal Insulation in a Wind Tunnel



Element*	Area, Sq m (sq-ft)	Weight Kg (lb)
FRSI	332.7 (3581)	532.1 (1173)
LRSI**	TBD	TBD
AFRSI**-***	TBD	TBD
HRSI**	TBD	TBD
FRCI**-***	TBD	TBD
RCC	38.0 (409)	1697.3 (3742)
Miscellaneous		918.5 (2025)
Total	TBD	TBD

* Includes bulk insulation, thermal barriers, and closeouts
** Possibly some of Orbiter -099
*** Orbiter 103 and subsequent
TBD – To Be Determined

"US Centennial of Flight Commission", 2004, Shuttle Thermal Protection System. Retrieved November 25, 2007, from http://www.centennialofflight.gov/essay/Evolution_of_Technology/TPS/Tech41.htm

Figure 17O-3 Orbiter Thermal Protection System

"US Centennial of Flight Commission", 2004, Shuttle Thermal Protection System. Retrieved November 25, 2007, from http://www.centennialofflight.gov/essay/Evolution_of_Technology/TPS/Tech41.htm

Figure 17O-4 Repairing TPS on Columbia

METAL USED IN AIRCRAFT CONSTRUCTION

"A380 Navigator", 2007, Manufacturing Process. Retrieved November 24, 2007, from http://events.airbus.com/A380/Default2.aspx?ArtId=644

Figure 17P-1 Titanium Pylon for an A380 Airbus Engine

"A380 Navigator", 2007, Manufacturing Process. Retrieved November 24, 2007, from http://events.airbus.com/A3

Figure 17P-2 Empty Pylons on an A380 Airbus

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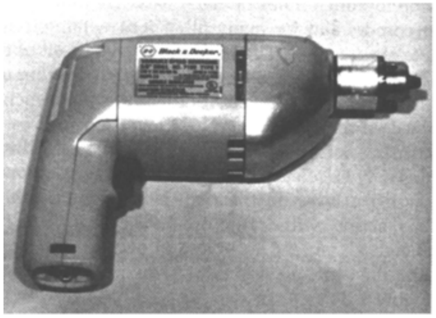
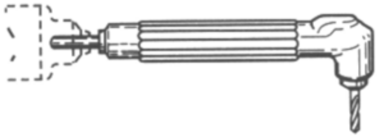
POWER TOOLS



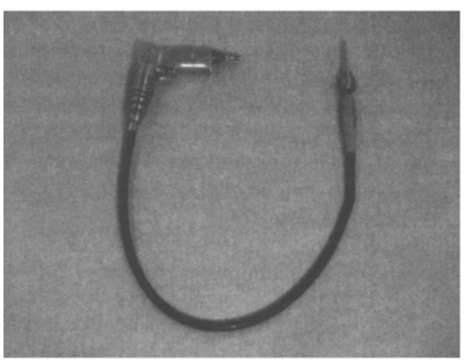
ELECTRIC

PNEUMATIC

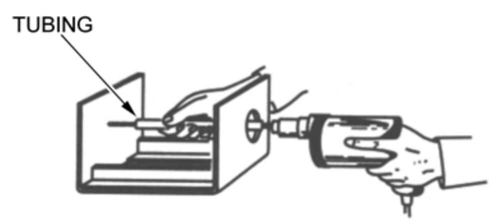


RIGHT ANGLE

FLEXIBLE DRIVE RIGHT ANGLE



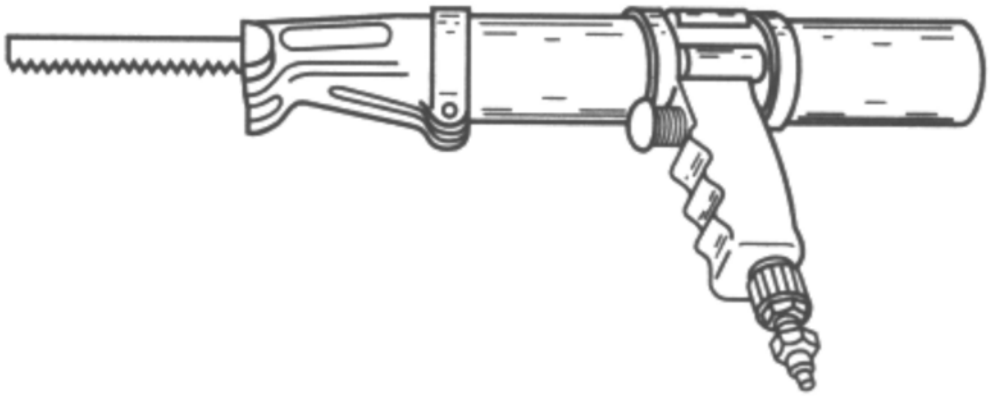
FLEXIBLE DRIVE STRAIGHT



LONG DRILL BIT APPLICATION

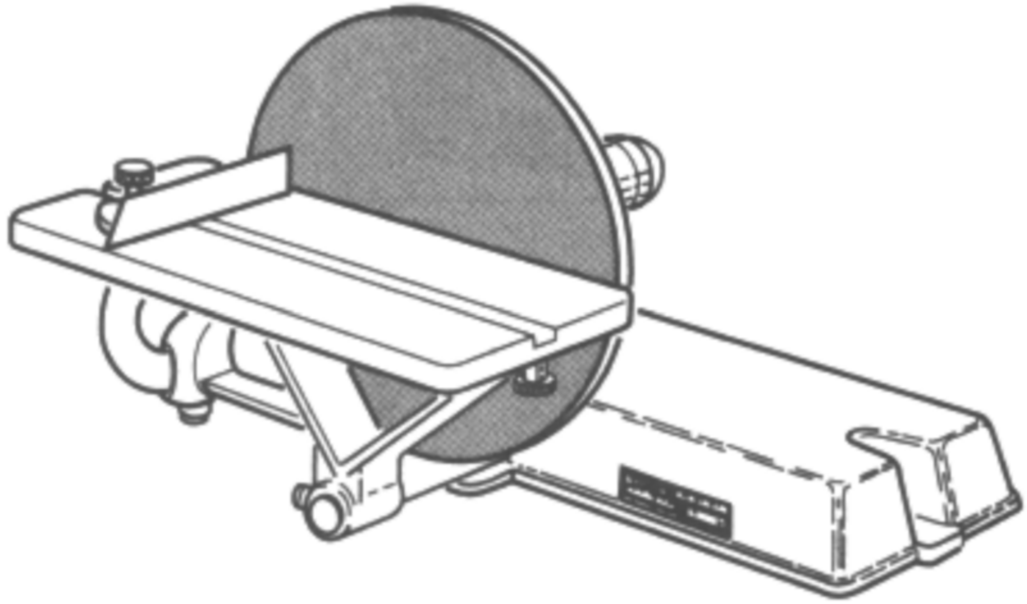
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-24 to 2-26)

Figure 17Q-1 Various Drill Types



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-19)

Figure 17Q-2 Reciprocating Saw



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-24)

Figure 17Q-3 Disk Sander

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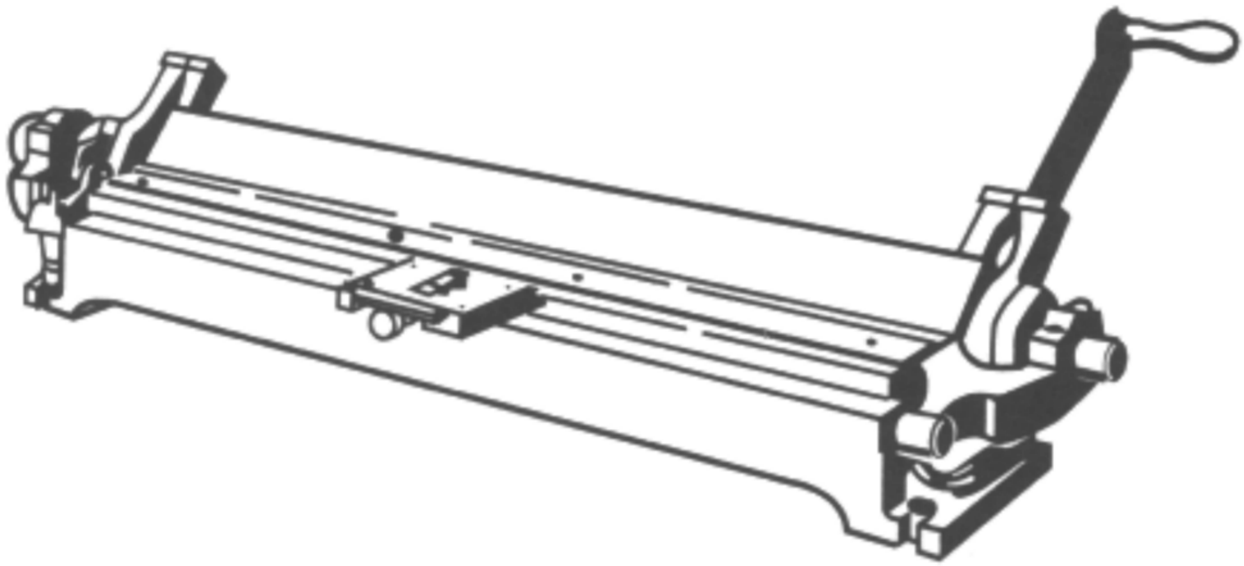
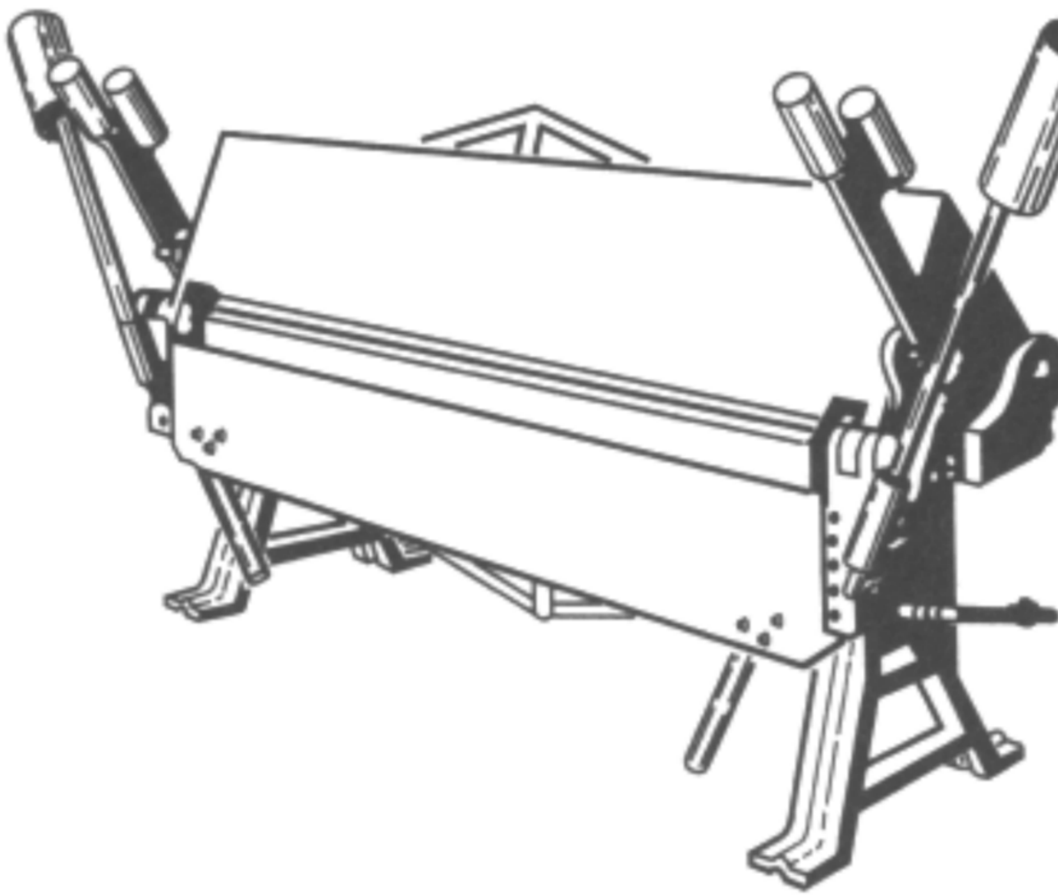
FORMING AND CUTTING TOOLS



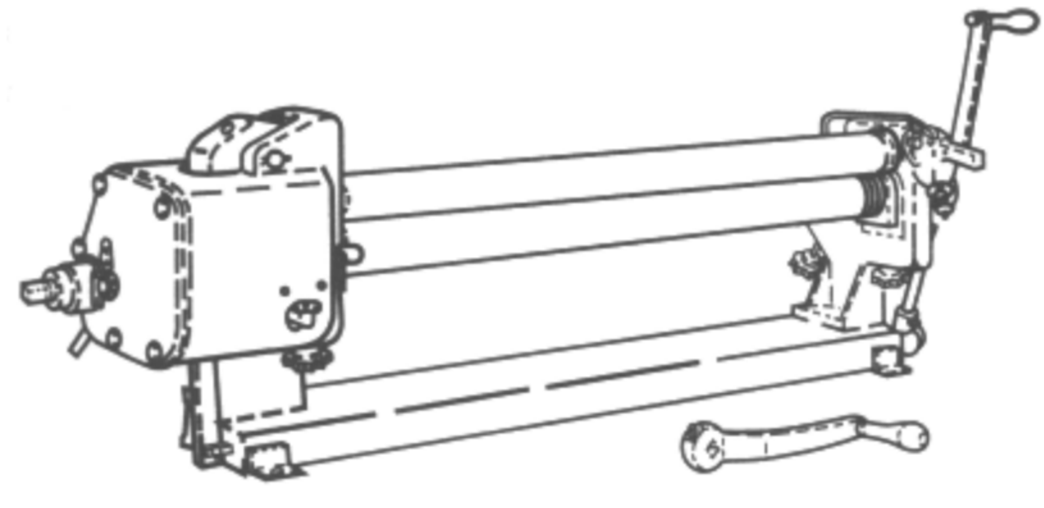
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-30)

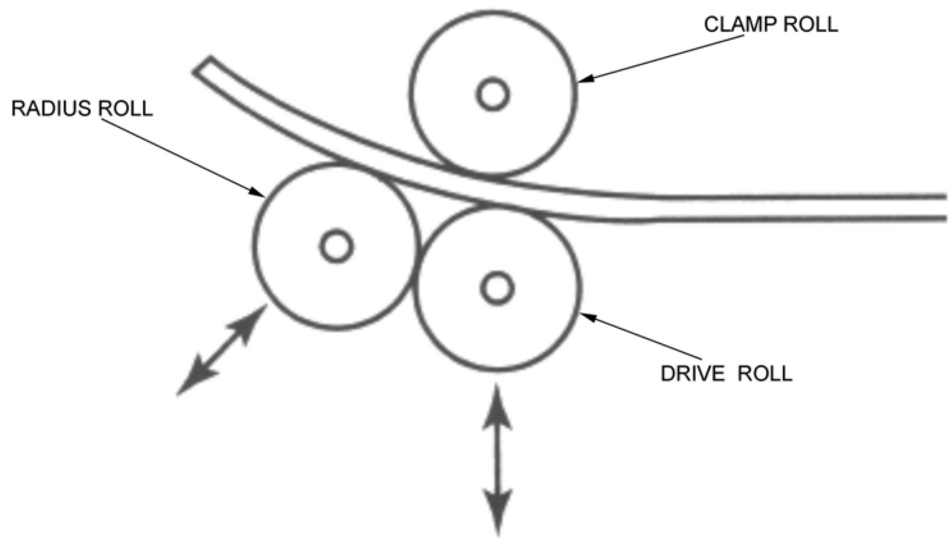
Figure 17R-1 Bar Folding Machine



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-29)

Figure 17R-2 Cornice Break



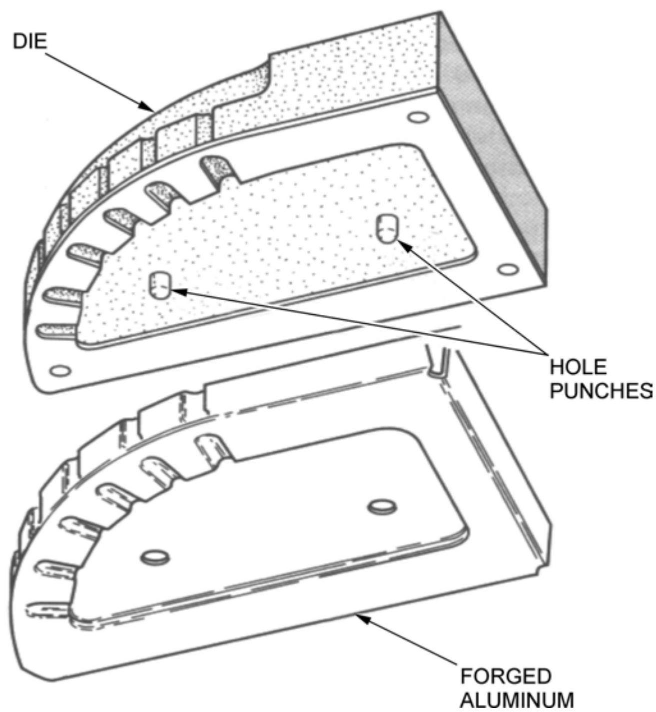


A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-31)

Figure 17R-3 Slip Roll Former

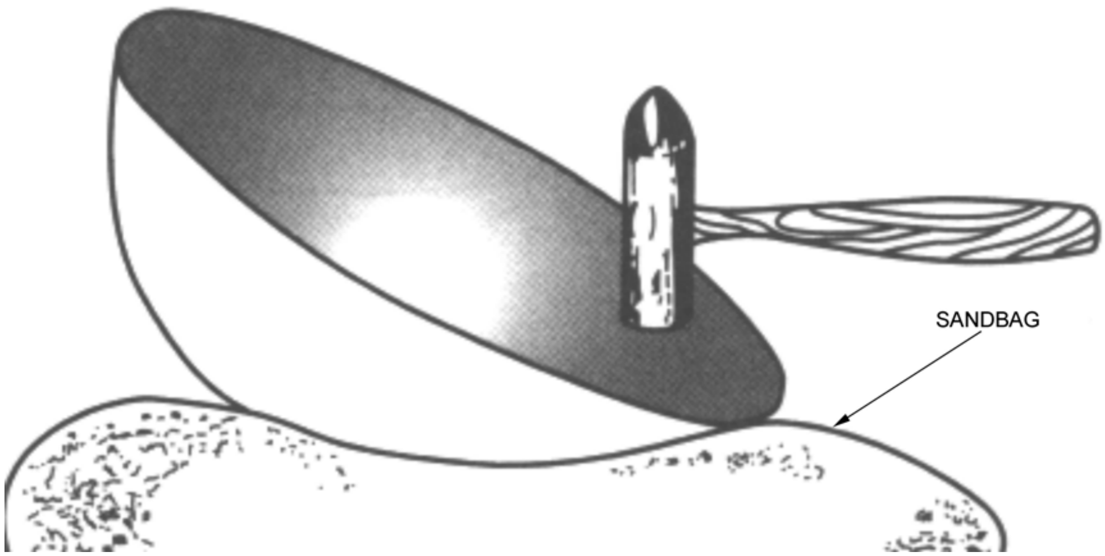
Triway YangZhong International Trade Company, Hydropress. Retrieved November 17, 2007, from http://www.nantex-triway.com/equipment.htm

Figure 17R-4 Hydropress



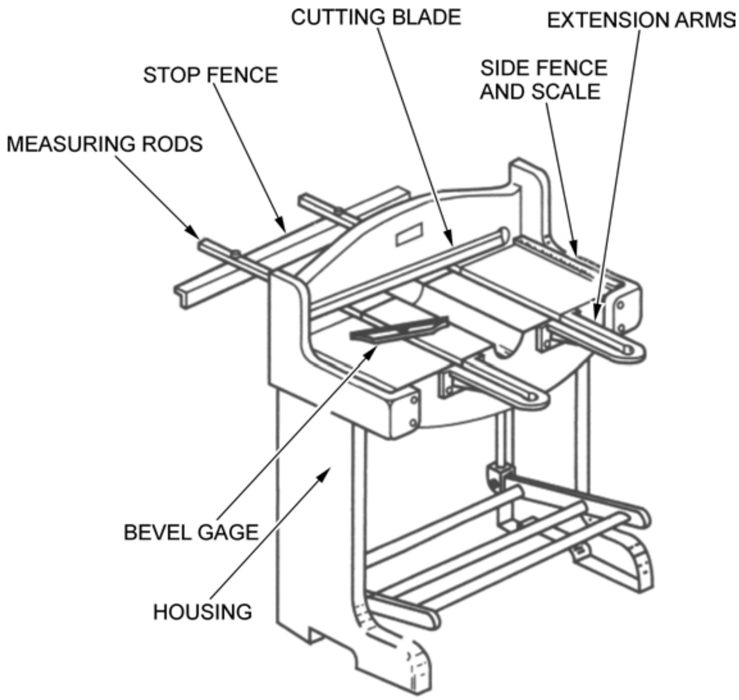
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-32)

Figure 17R-5 Hydropress Die With Forged Aluminum Product



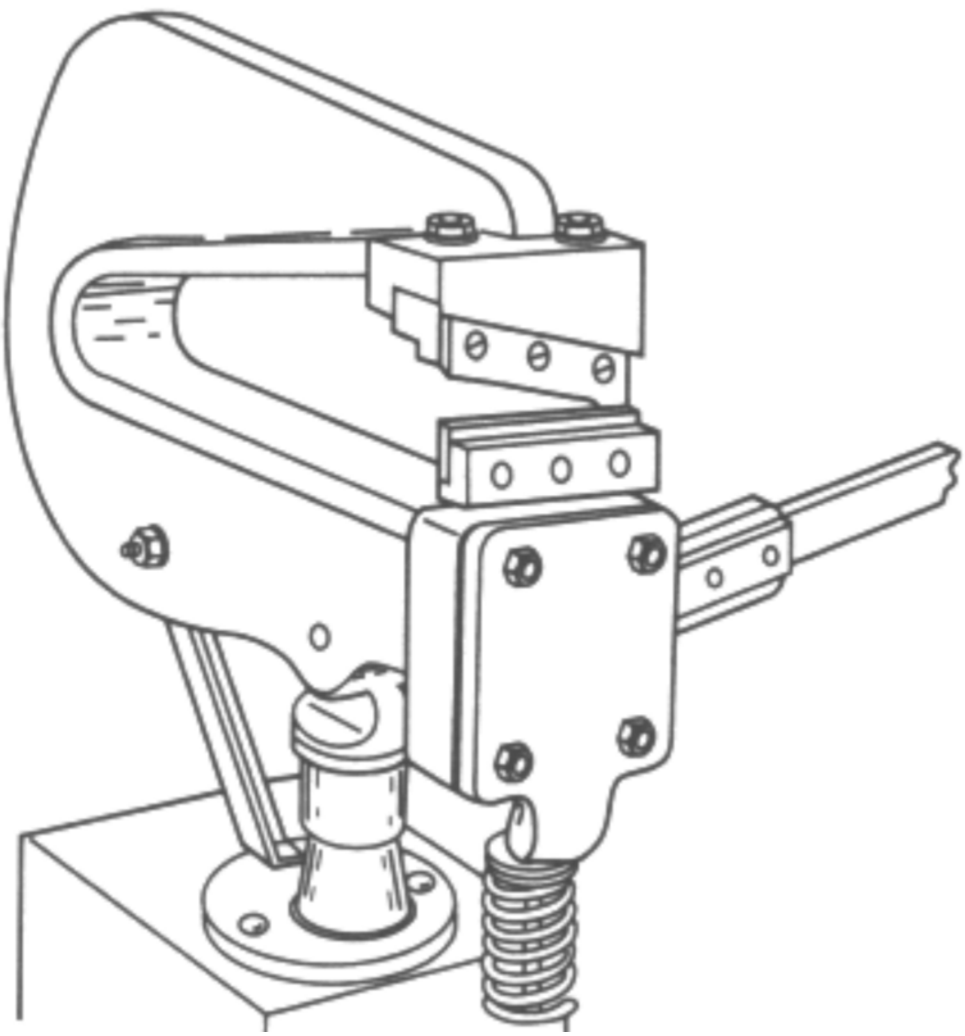
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-32)

Figure 17R-6 Sandbag Forming



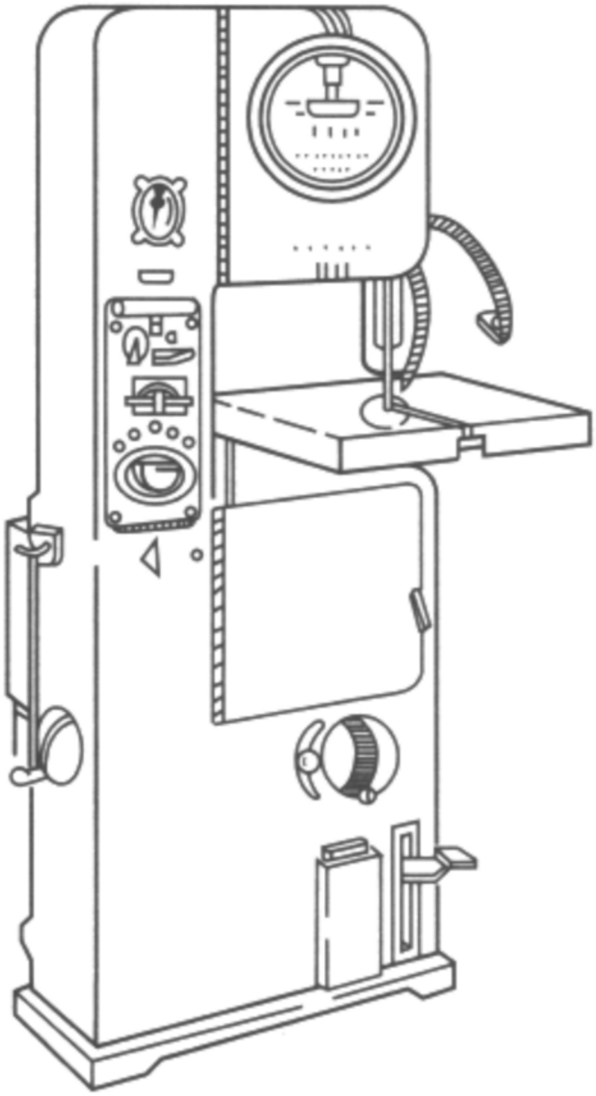
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-22)

Figure 17R-7 Squaring Shear



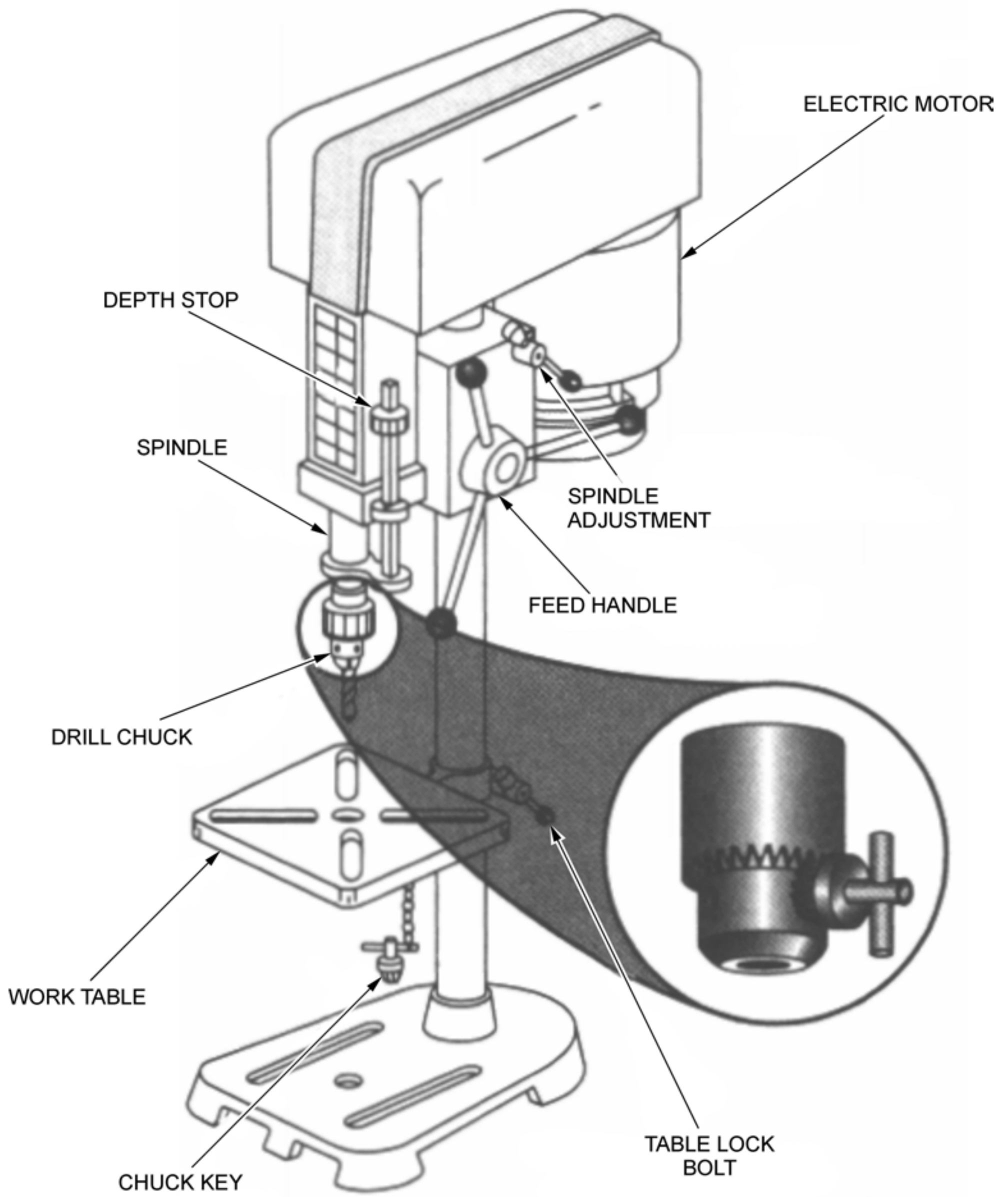
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-24)

Figure 17R-8 Scroll Shears



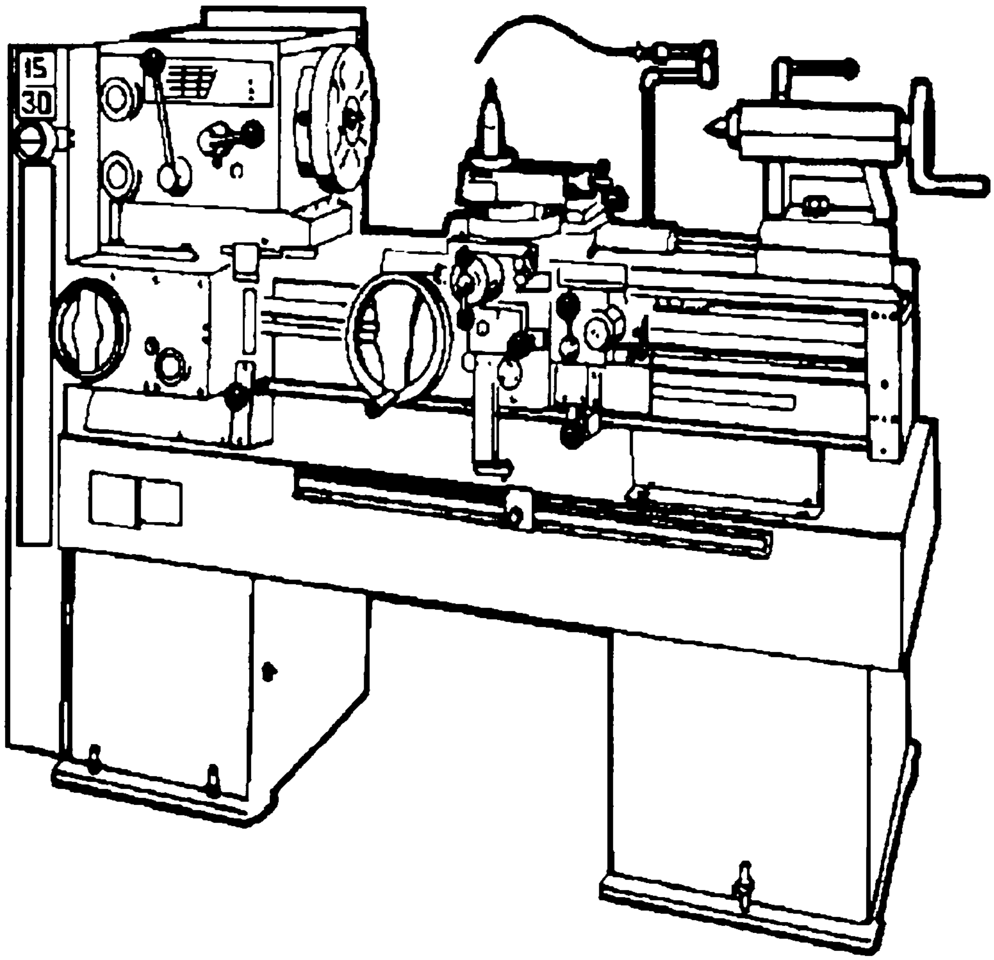
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-23)

Figure 17R-9 Band Saw



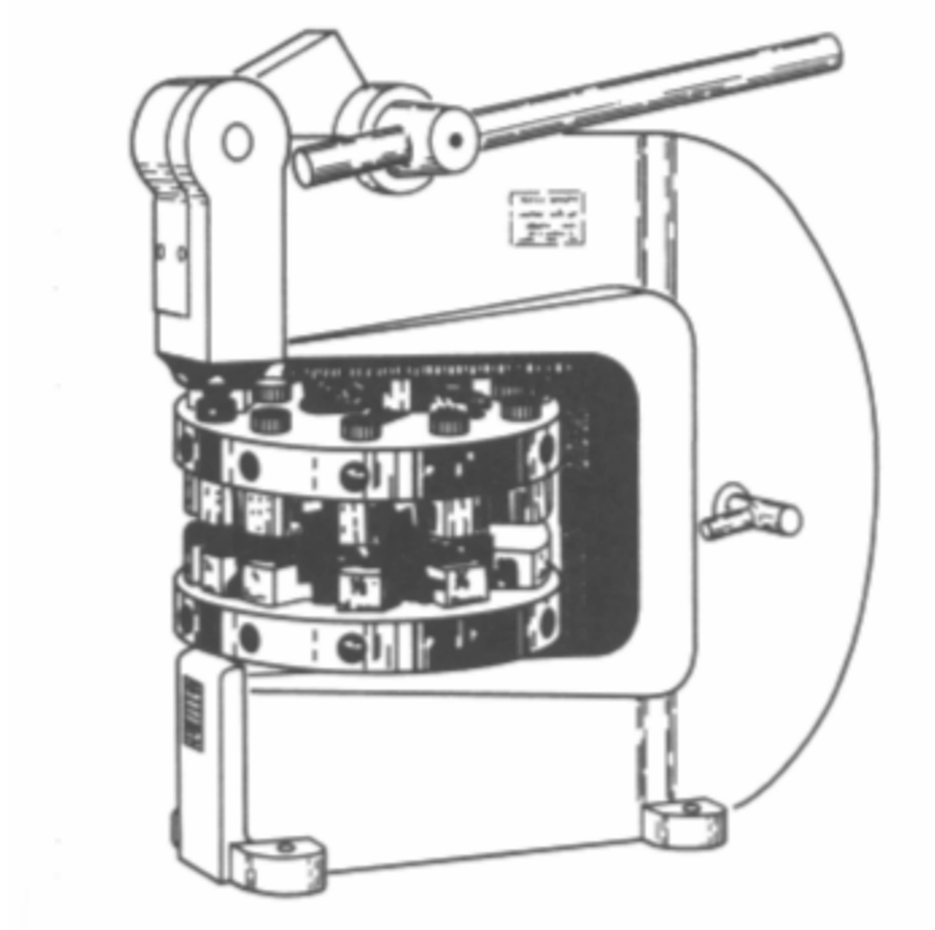
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-26)

Figure 17R-10 Drill Press



Fundamentals of Machine Tools, Headquarters Department of the Army Washington DC ,1996, Training Circular No. 9-524. Retrieved November 23, 2007, from http://metalworking.com/tutorials/army-TC-9-524/TOC.pdf

Figure 17R-11 Metal Lathe



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-23)

Figure 17R-12 Rotary Punch

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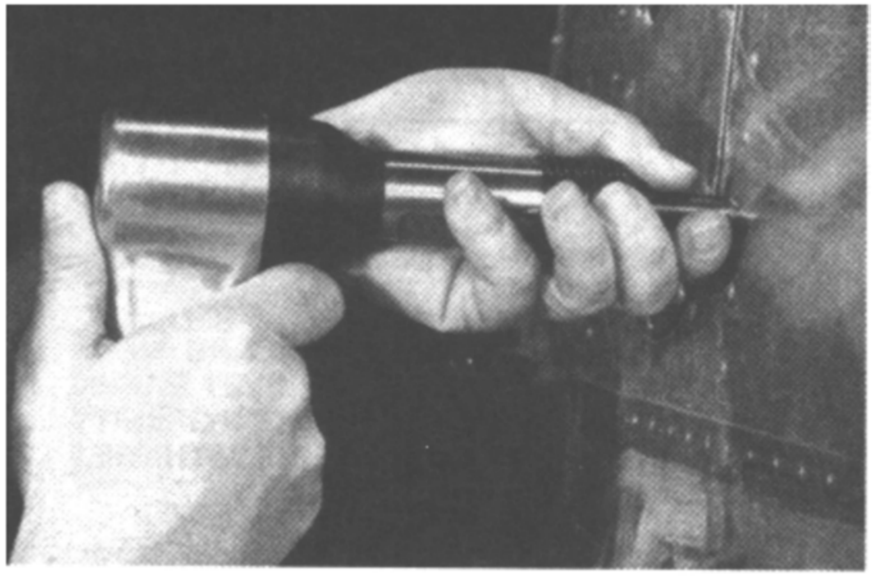
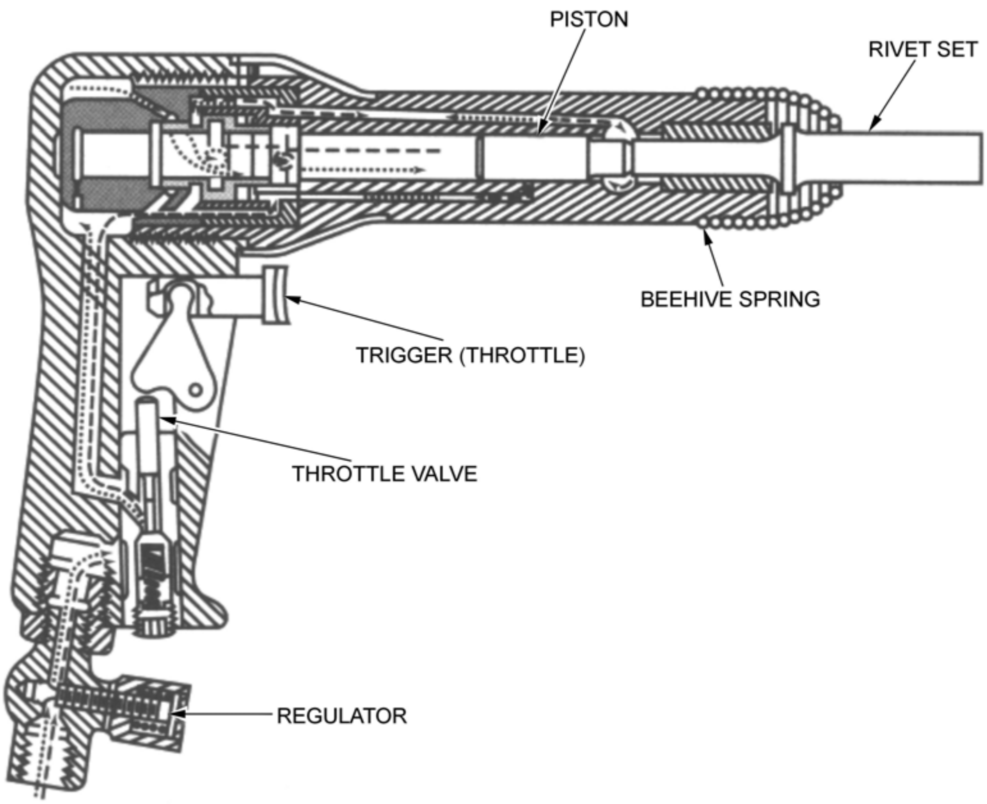
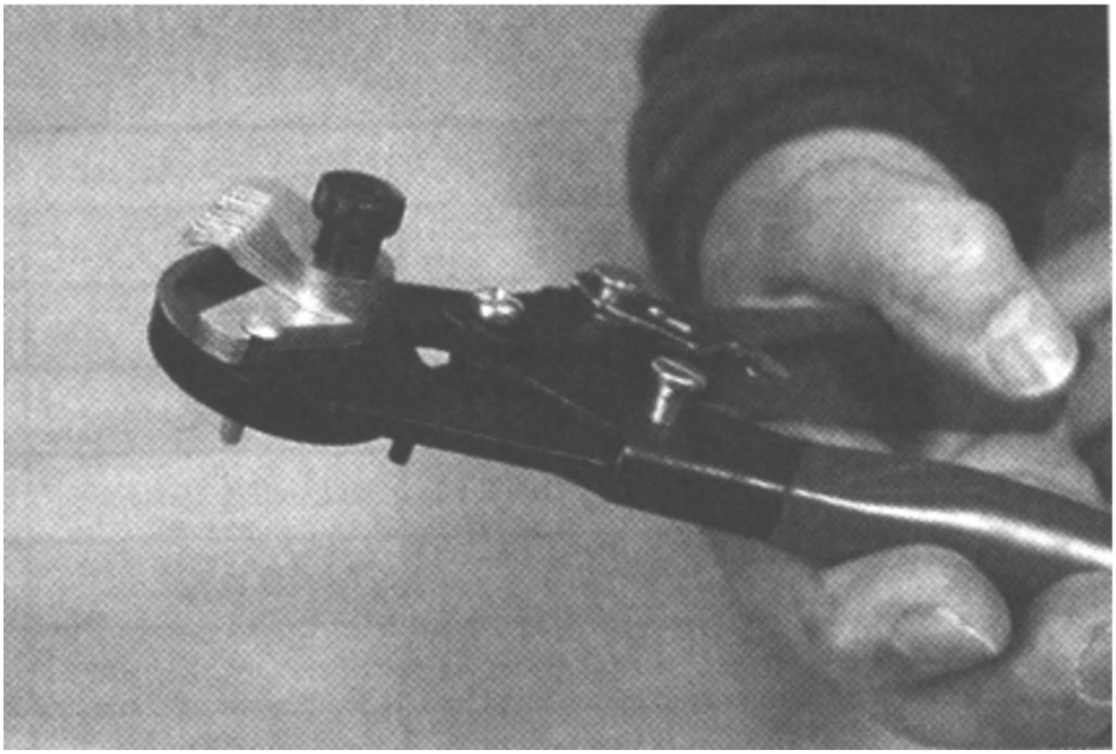
FASTENING TOOLS





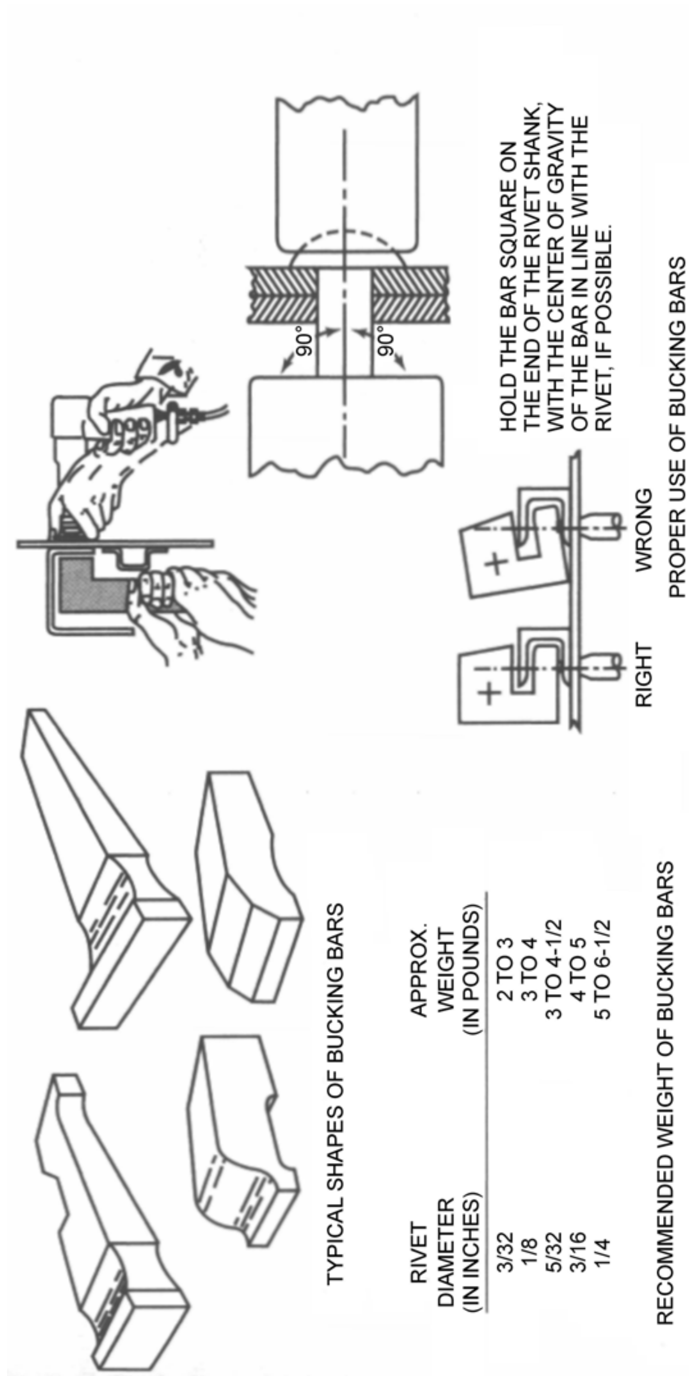
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-63 and 2-66)

Figure 17S-1 Rivet Gun



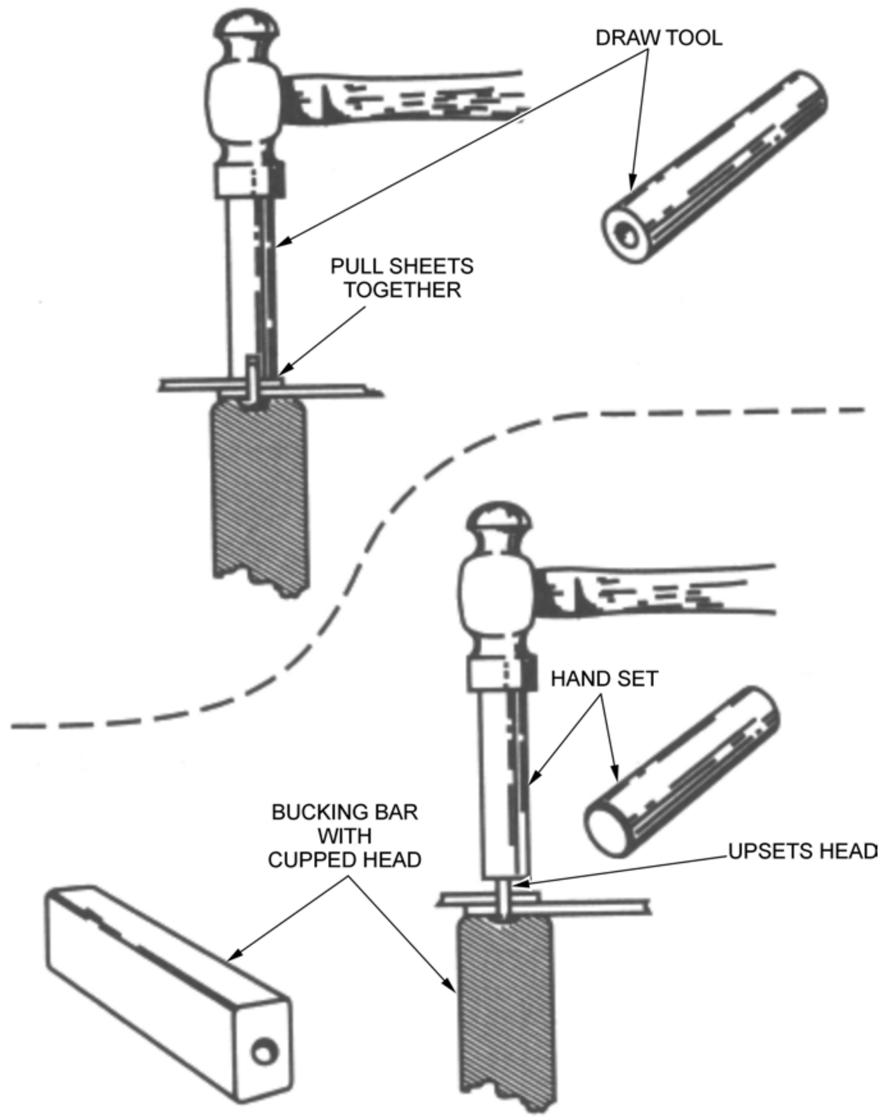
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-53)

Figure 17S-2 Rivet Cutter



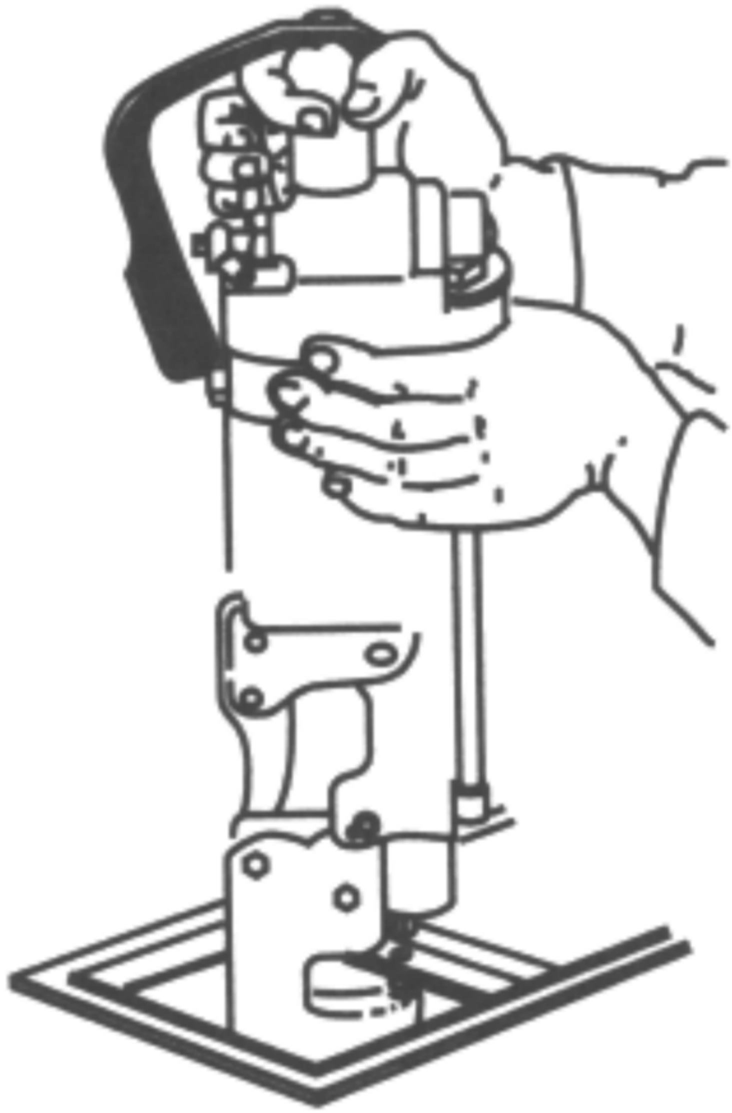
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-65)

Figure 17S-3 Bucking Bars



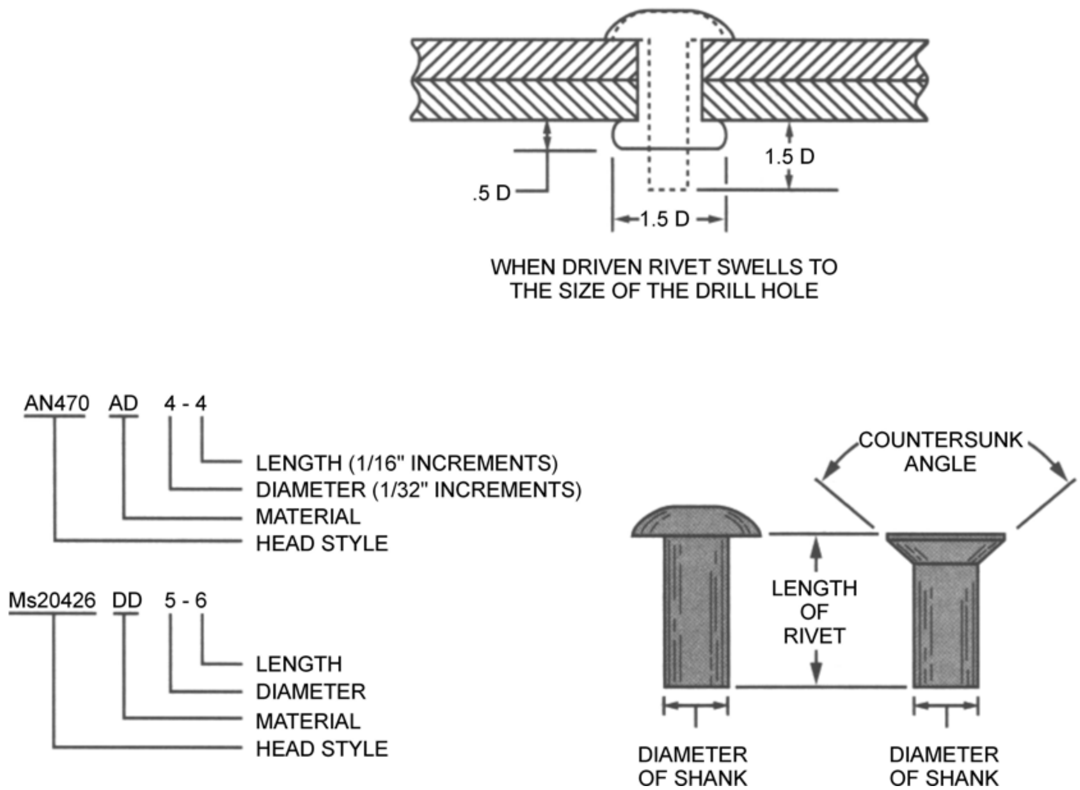
A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-61)

Figure 17S-4 Hand Riveting



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-61)

Figure 17S-5 Squeezer



A&P Technician Airframe Textbook, Sanderson Training Systems (pp. 2-36)

Figure 17S-6 Rivet Applications, Dimensions and Designations

TOOLS AND MATERIALS REQUIRED TO CONSTRUCT AN ALUMINUM MODEL BIPLANE

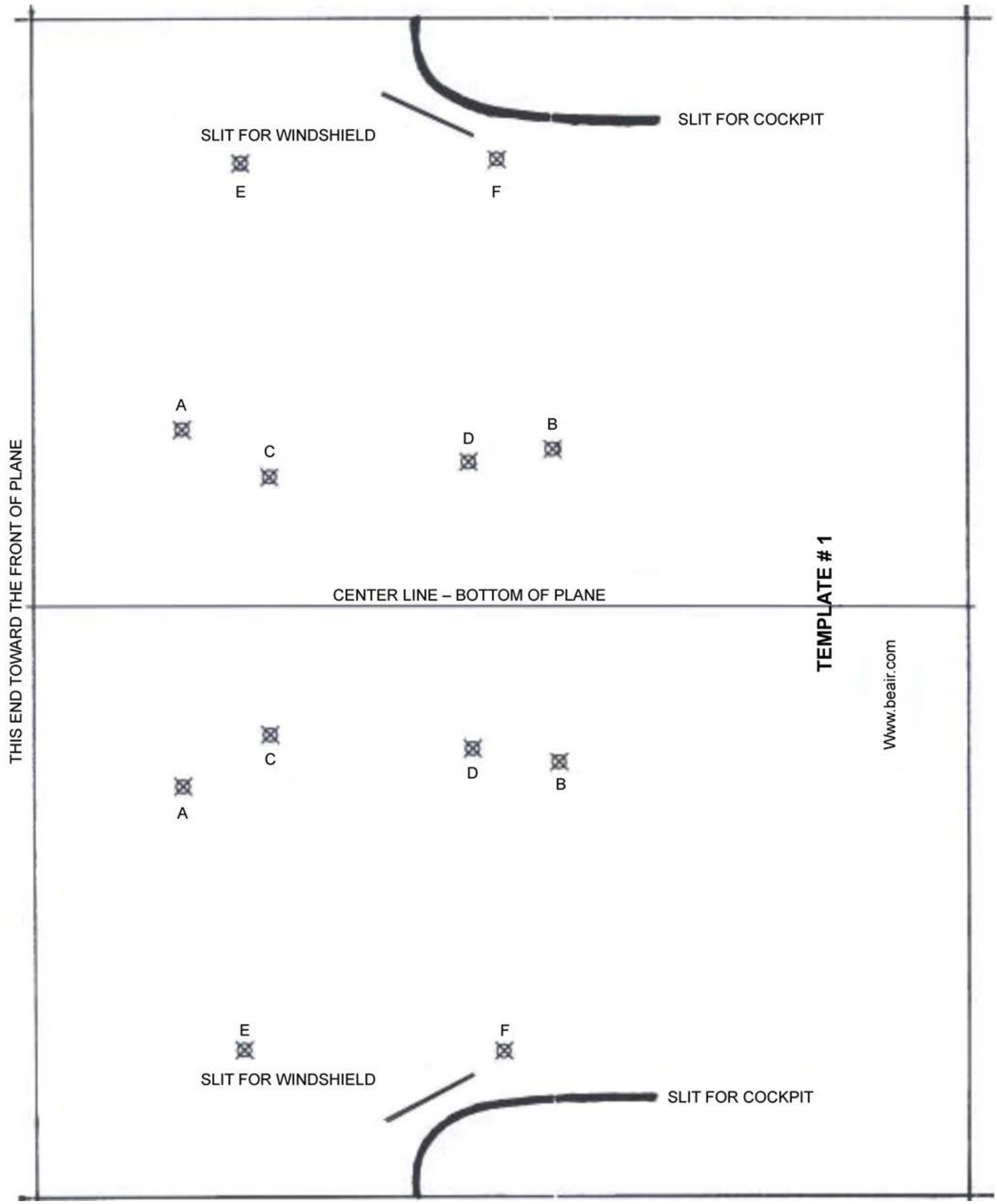
Tools

- Mechanic's gloves,
- Ball-peen hammer,
- Pliers,
- Flat screwdriver,
- Rasp,
- Hand stapler,
- Staple gun,
- Push-pin,
- Hot glue gun,
- Awl,
- Wire cutters,
- Box knife,
- Scissors,
- Ruler,
- Felt-tipped pen,
- Needle-nose pliers,
- Adjustable wrench,
- Electric hand drill,
- Hole saw 2-3/4 inch bits, and
- Hole saw 1-7/8 inch bits.

Materials

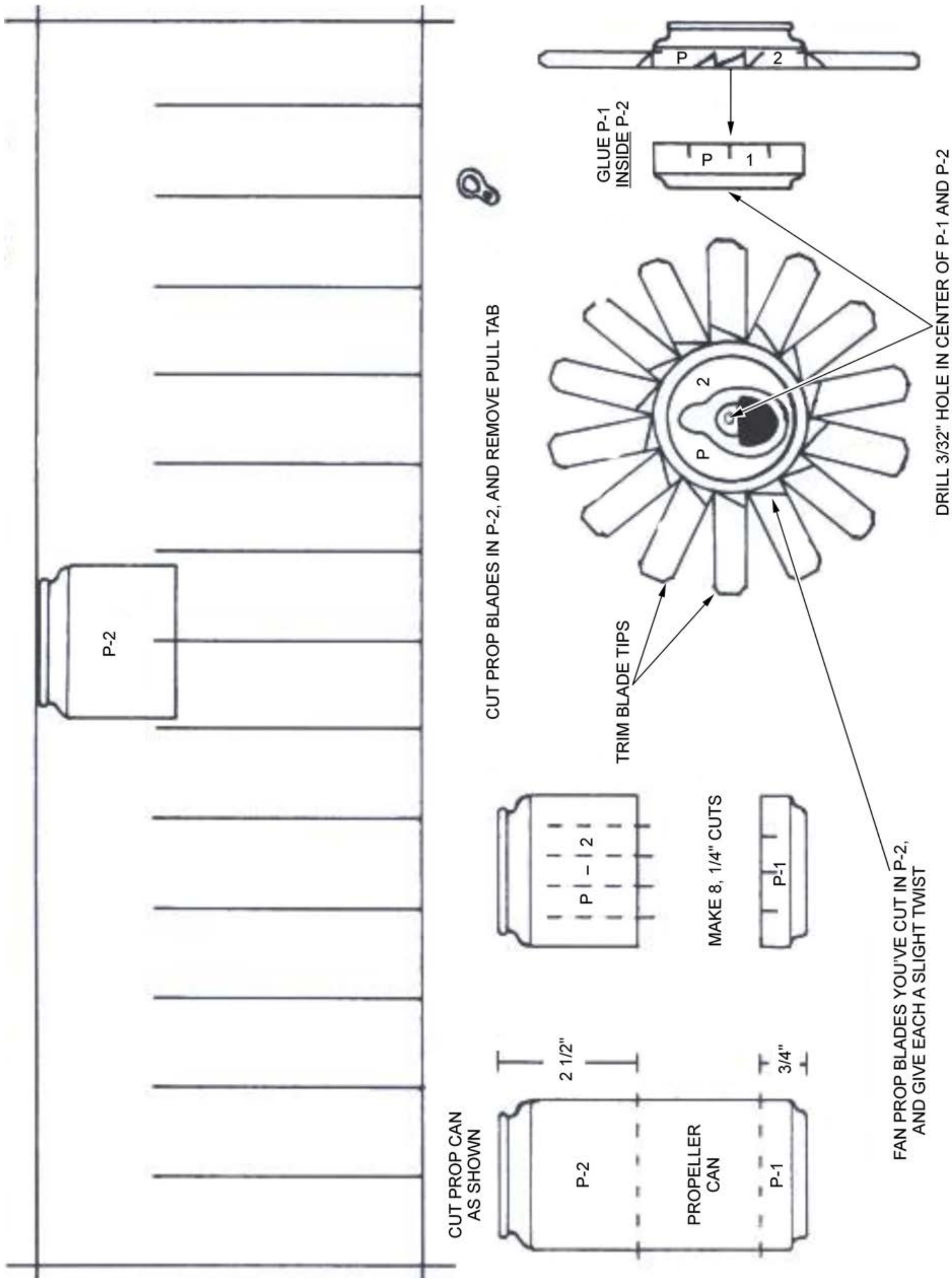
- Empty aluminum beverage cans (36 per cadet),
- Softwood, 20 mm thick (fence boards),
- Bottle caps (ten per cadet),
- Corrugated cardboard,
- Poster board,
- Tape (masking),
- Glue,
- Mylar,
- Copper-coated welding rod (2 sizes 1/16 inch and 3/32 inch),
- Cap nuts or toothpaste tube caps (two per aluminum model biplane),
- Bolts, 2-1/2 inch 10-24, with nuts (four per aluminum model biplane),

- Bolts, 3-1/2 inch 10-24, with nuts (eight per aluminum model biplane), and
- Wire clip (speed nut) to fit the copper coated welding rod (two per aluminum model biplane).



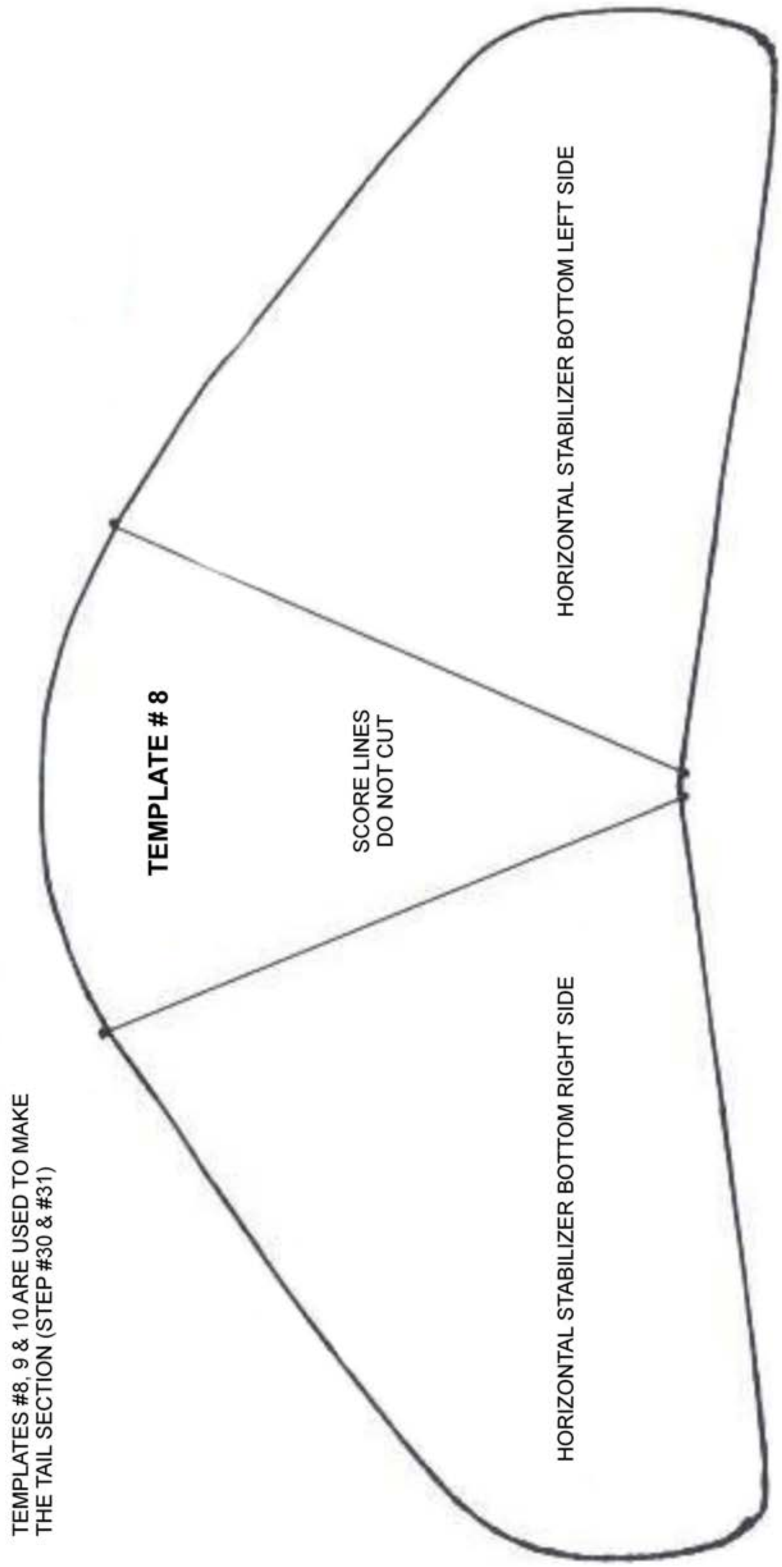
D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 3)

Figure 17T-1 Fuselage Template



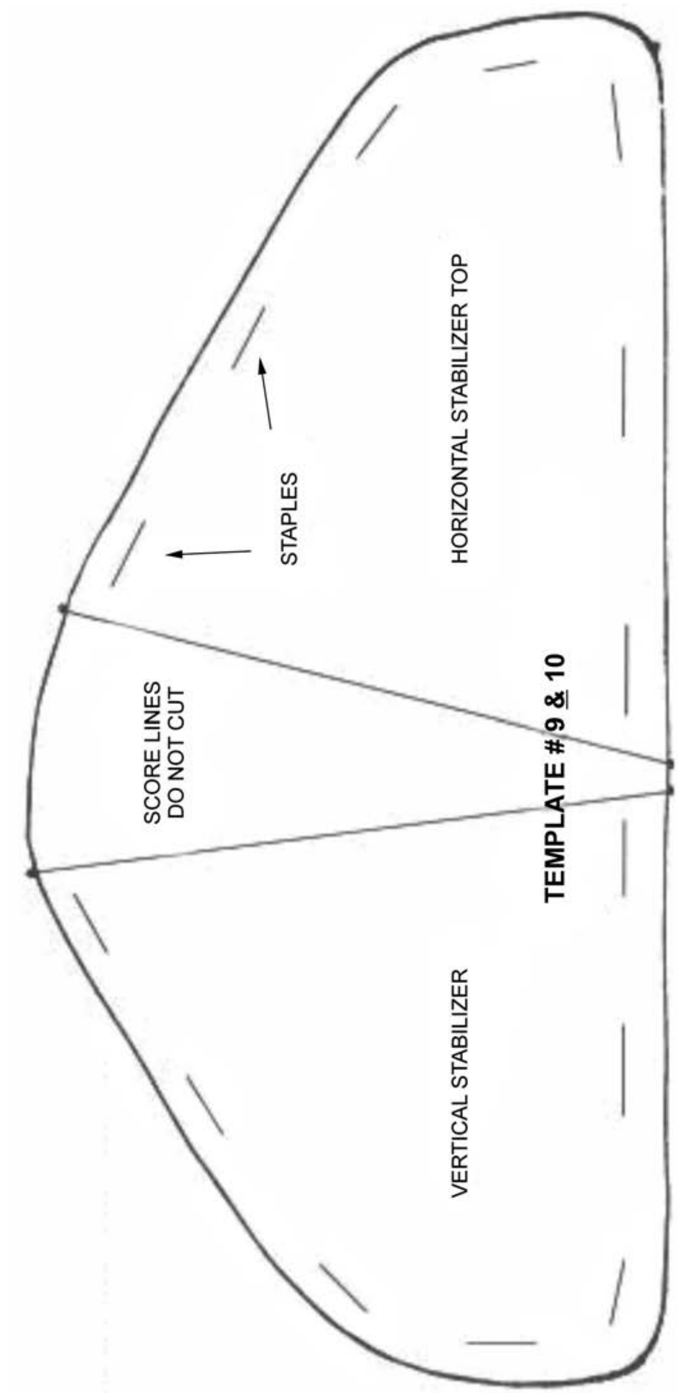
D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 21)

Figure 17T-2 Fuselage Template



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 20)

Figure 17T-3 Horizontal Stabilizer Bottom Template



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 20)

Figure 17T-4 Left and Right Vertical Stabilizer Template

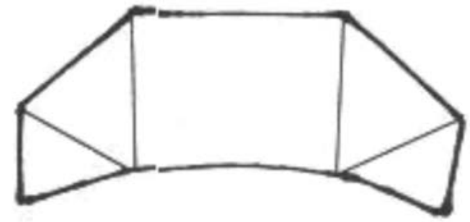


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Figure 17T-5 Windshield Template

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RAW ALUMINUM MATERIAL ASSEMBLY LINE

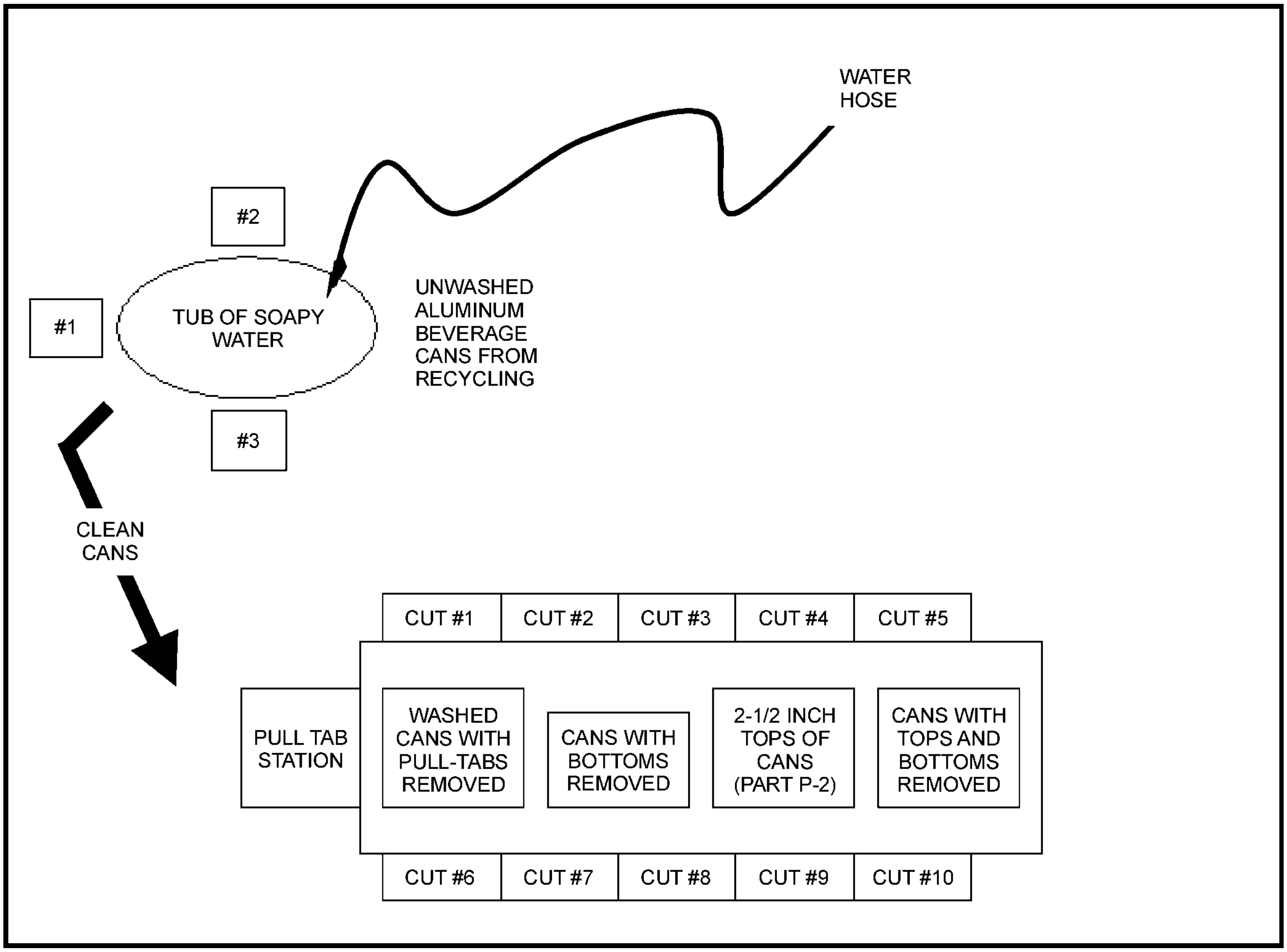

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Figure 17U-1 Raw Aluminum Material Assembly Line

1. Wash 17 cans.
2. Remove pull-tabs from all cans.
3. Cut tops and bottoms from 15 cans using box knives (to stock as raw material) (Figure 17U-2).
4. Cut bottom from one can (can B-1 to stock for fuselage) (Figure 17U-3).
5. Cut one 2-1/2-inch top from can for propeller (can-top P2 to stock) (Figure 17U-4).
6. Cut one 3/4-inch bottom from can for propeller cover (can bottom P1 to stock).

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Figure 17U-2 Unended Can

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Figure 17U-3 Bottomless Can

2-1/2 INCHES

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Figure 17U-4 Can Top P-2

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WOOD ASSEMBLY LINE

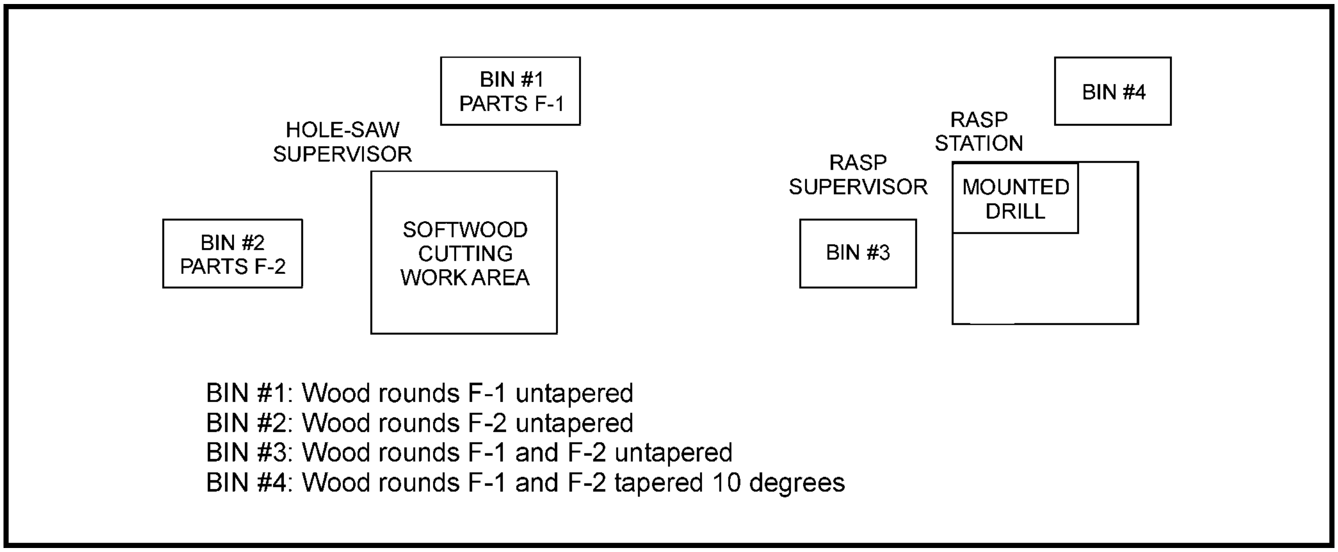

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Figure 17V-1 Wood Assembly Line

For each aluminum model biplane to be constructed:

1. Cut one 3/4 inch thick softwood round 2-1/2 inch diameter for F-1.
2. Cut one 3/4 inch thick softwood round 1-5/8 inch diameter for F-2.
3. Place bolt through hole in centre of wood round.
4. Place nut on bolt and tighten.
5. Place bolt with wood round in electric drill.
6. Use the drill to spin the wood round (F-1) and use the rasp to taper the edge to 10 degrees (to stock as F-1).
7. Use the drill to spin the wood round (F-2) and use the rasp to taper the edge to 10 degrees (to stock as F-2).

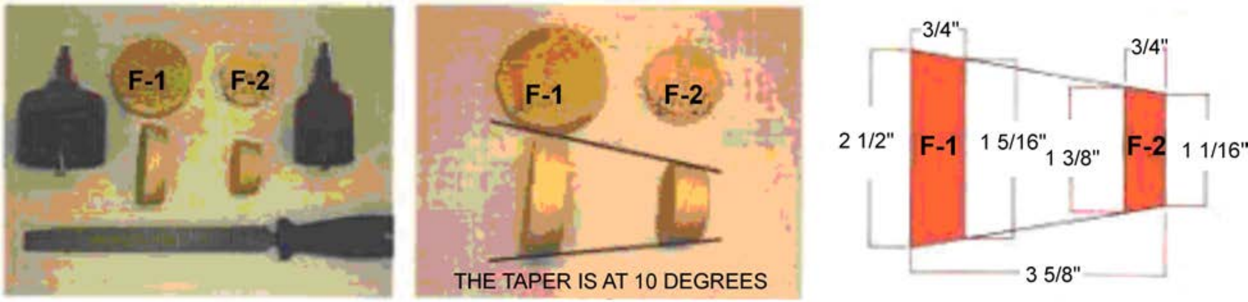

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Figure 17V-2 Steps to Make Rear Fuselage Parts

ALUMINUM BILLET ASSEMBLY LINE

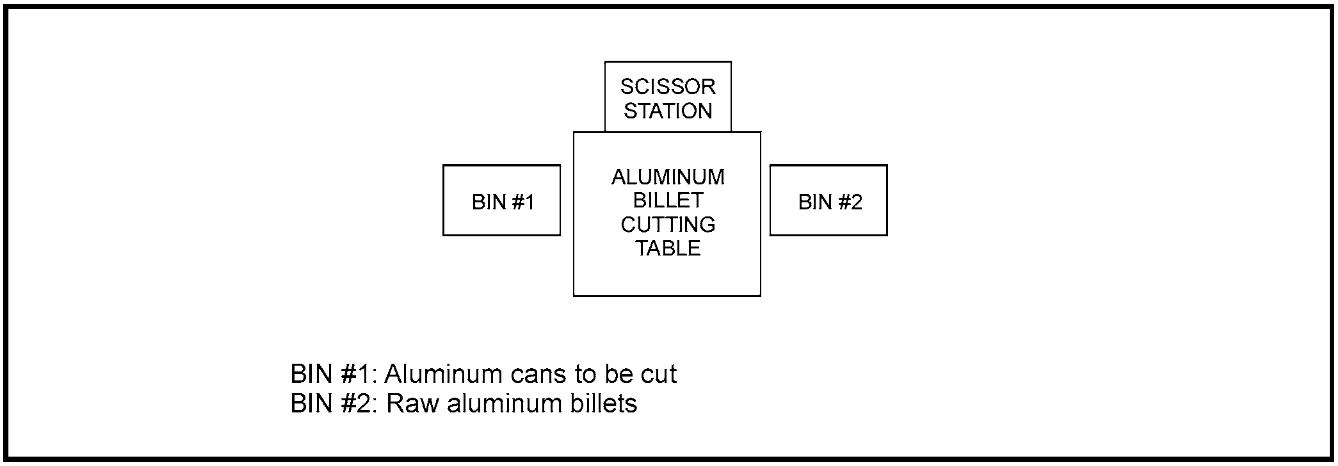

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Figure 17W-1 Aluminum Billet Assembly Line

For each aluminum model biplane to be constructed:

1. Cut 15 unended cans vertically through the nutrition label.
2. Do not attempt to flatten cans (to stock as raw billets).

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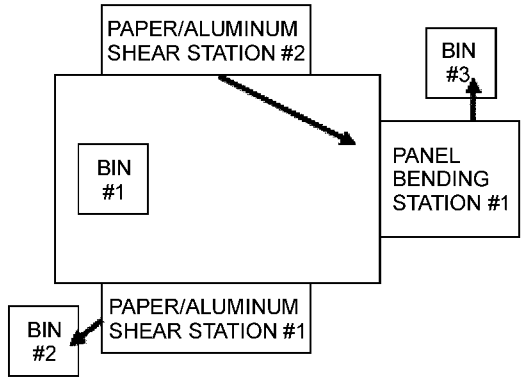
ALUMINUM PANEL SHEARING ASSEMBLY LINE



BIN #1: Raw aluminum billets from stock
BIN #2: Aluminum billets (dimensions of 2-5/8 inch by 8-1/8 inch) for under-wing panels
BIN #3: Aluminum billets (dimensions of 3-5/8 inch by 8-1/8 inch) for wing panels bent to 90 degrees on the 1/8-inch edge

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Figure 17X-1 Aluminum Panel Shearing Assembly Line

For each aluminum model biplane to be constructed:

1. Cut five billets to dimensions of 3-5/8 inch by 8-1/8 inch for wing panels (Figure 17X-2).
2. Bend these wing panels edges down 90 degrees on each 8-1/8 inch edge (to stock).
3. Cut five cans to dimensions of 2-5/8 inch by 8-1/8 inch for under-wing panels (Figure 17X-3) (to stock).

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Figure 17X-2 Wing Top Panels

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Figure 17X-3 Under-Wing Panels

CARDBOARD INSERT ASSEMBLY LINE

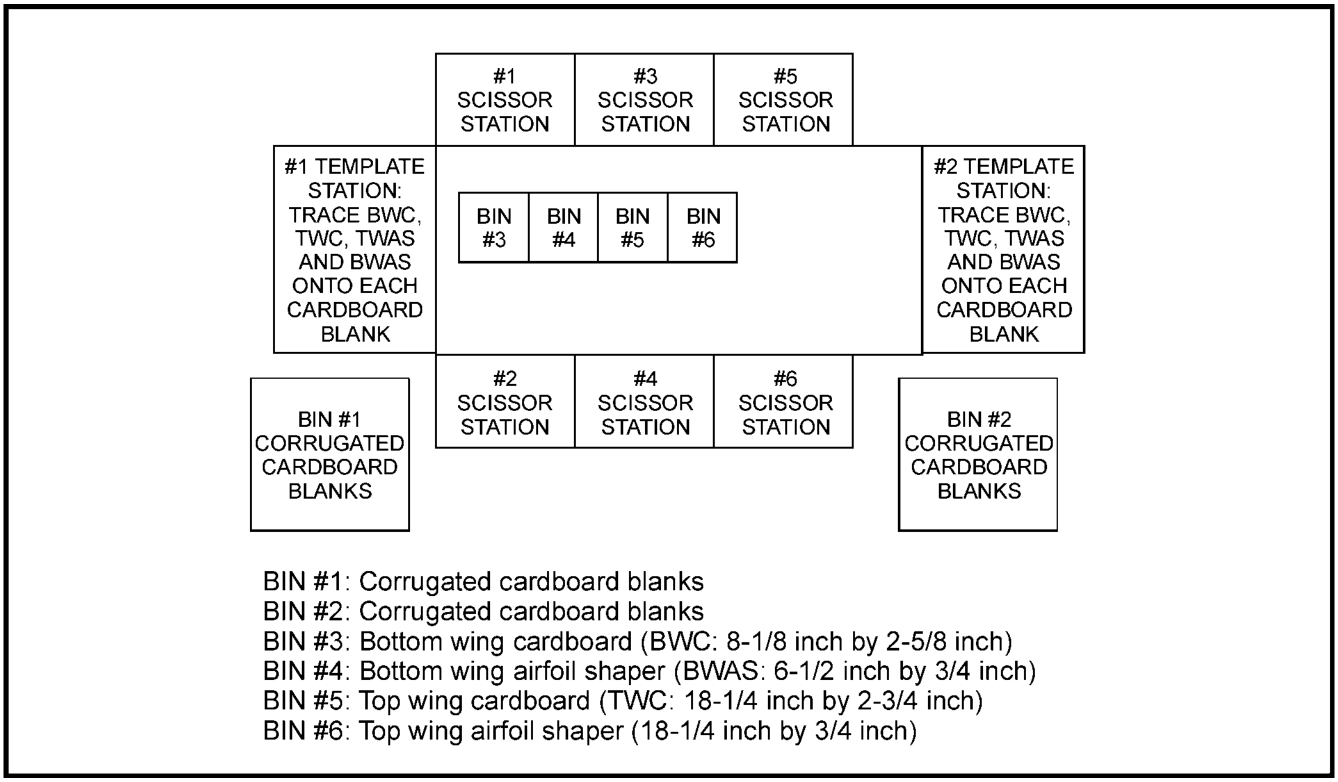

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Figure 17Y-1 Cardboard Insert Assembly Line

For each aluminum model biplane to be constructed, cut and place into stock:

1. two bottom wing cardboard sections (BWC) 8-1/8 inch by 2-5/8 inch,
2. two cardboard bottom wing airfoil sections (BWAS) 6-1/2 inch by 3/4 inch,
3. two top wing cardboard sections (TWC) 18-1/4 inch by 2-3/4 inch, and
4. two cardboard top wing airfoil sections (TWAS) 18-1/4 inch by 3/4 inch.

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WIRE STATION ASSEMBLY LINE

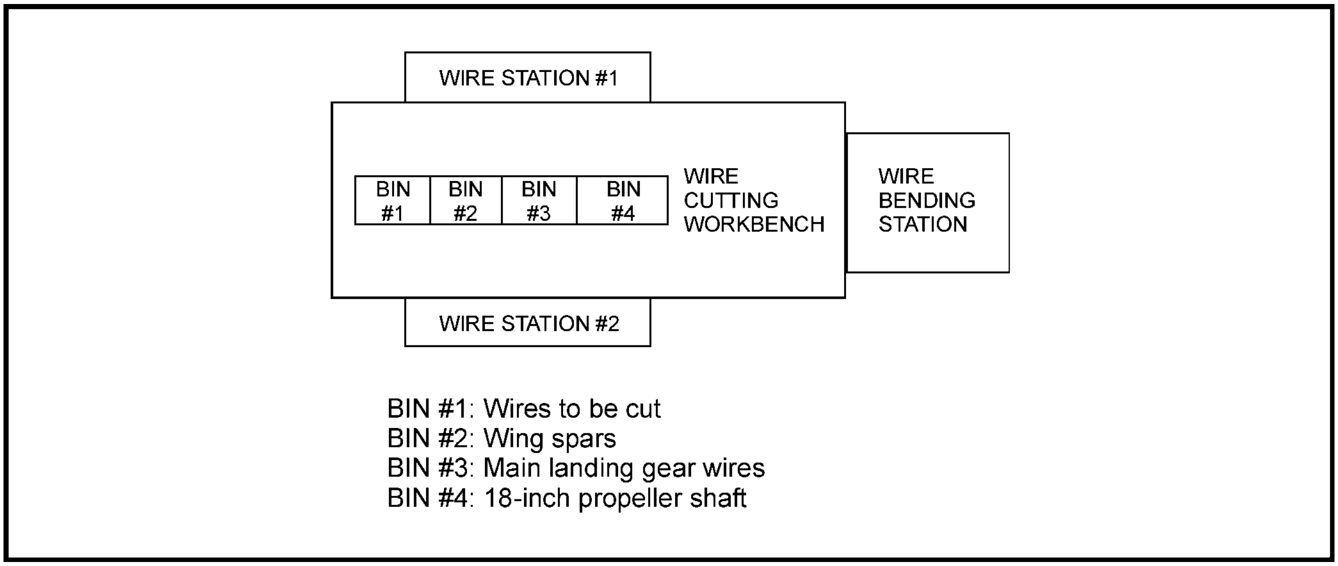

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Figure 17Z-1 Wire Station Assembly Line

For each aluminum model biplane to be constructed:

1. Cut two pieces of 3/32-inch wire 15-3/4 inches long (to stock for wing spars).
2. Cut one piece of 3/32-inch wire 18 inches long (to stock for propeller shaft).
3. Cut one piece of 3/32-inch wire 7-3/4 inches long (for main landing gear).
4. Bend the wire that is 7-3/4 inches long to main landing gear shape (Figure 17Z-2) (to stock).

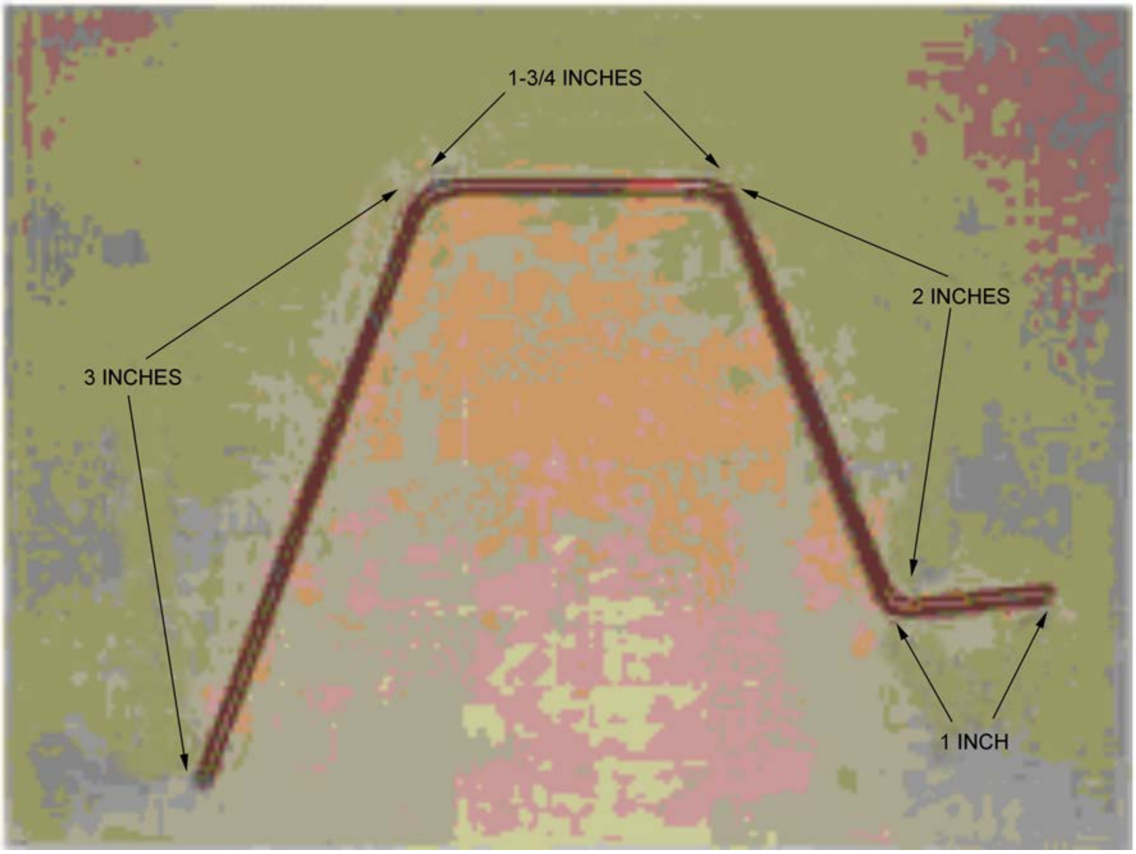

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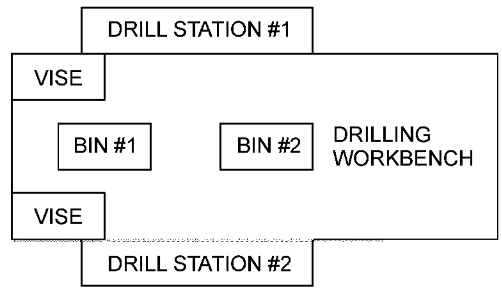
Figure 17Z-2 First Bends of the Landing Gear

DRILL STATION ASSEMBLY LINE



BIN #1: Parts requiring drilling
BIN #2: Parts drilled

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Figure 17AA-1 Drill Station Assembly Line

For each aluminum model biplane to be constructed:

1. Drill a 3/32-inch hole in the centre of four bottle caps (to stock for wheels).
2. Drill a 3/32-inch hole in the centre of one can B-1 (Figure 17AA-2) (to stock for front fuselage).
3. Drill a 3/32-inch hole in the centre of one can P-2 (to stock for propeller).
4. Drill a 3/32-inch hole in the centre of one can P-1 (to stock for propeller face).
5. Get fuselage from stock.
6. Enlarge holes A, B and C in fuselage assembly to 3/32 inch (fuselage from stock).
7. Enlarge hole D in fuselage assembly to 1/16 inch (fuselage from stock).
8. Enlarge holes E and F in fuselage assembly to bolt size, as required.
9. Get top wing from stock.
10. Enlarge eight bolt holes in top wing for bolts as required (return top wing to stock).
11. Get fuselage and attached bottom wing from stock.
12. Enlarge four bolt holes in bottom wing as required (return fuselage and bottom wing to stock).
13. Insert under-wing panel (dimensions 2-5/8 inch by 8-1/8 inch) into right wing.

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Figure 17AA-2 The Fuselage Centre-Line Hole

ALUMINUM REAR FUSELAGE ASSEMBLY LINE

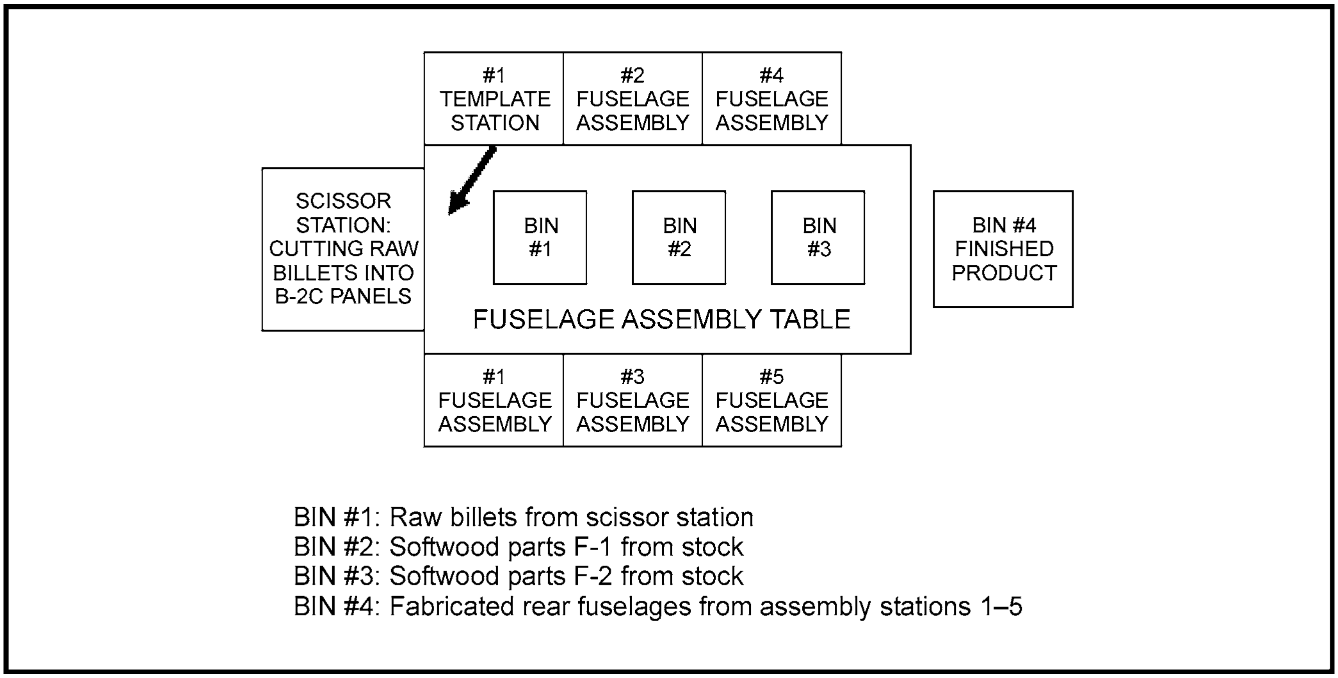

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Figure 17AB-1 Aluminum Rear Fuselage Assembly Line

For each aluminum model biplane to be constructed:

1. Mark one raw billet as B-2C rear fuselage.
2. Cut triangle from one raw billet to create B-2C rear fuselage (Figure 17AB-2) (to stock as B-2C).
3. Combine wood F1 and F2 with B-2C and staple to make rear fuselage B-2 (Figure 17AB-3) (to stock as B-2).

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Figure 17AB-2 Triangle Cut

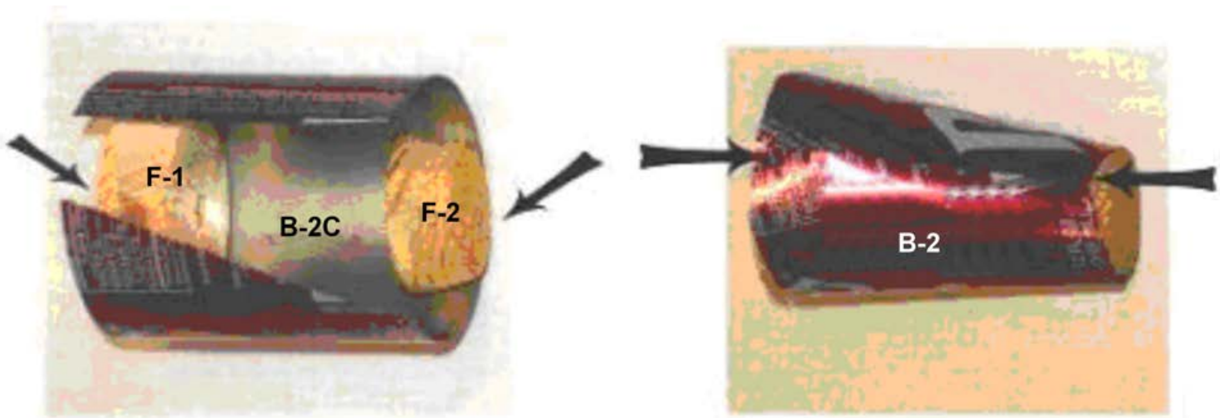

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Figure 17AB-3 Completing the Rear Fuselage

FUSELAGE AND BOTTOM WING ASSEMBLY LINE

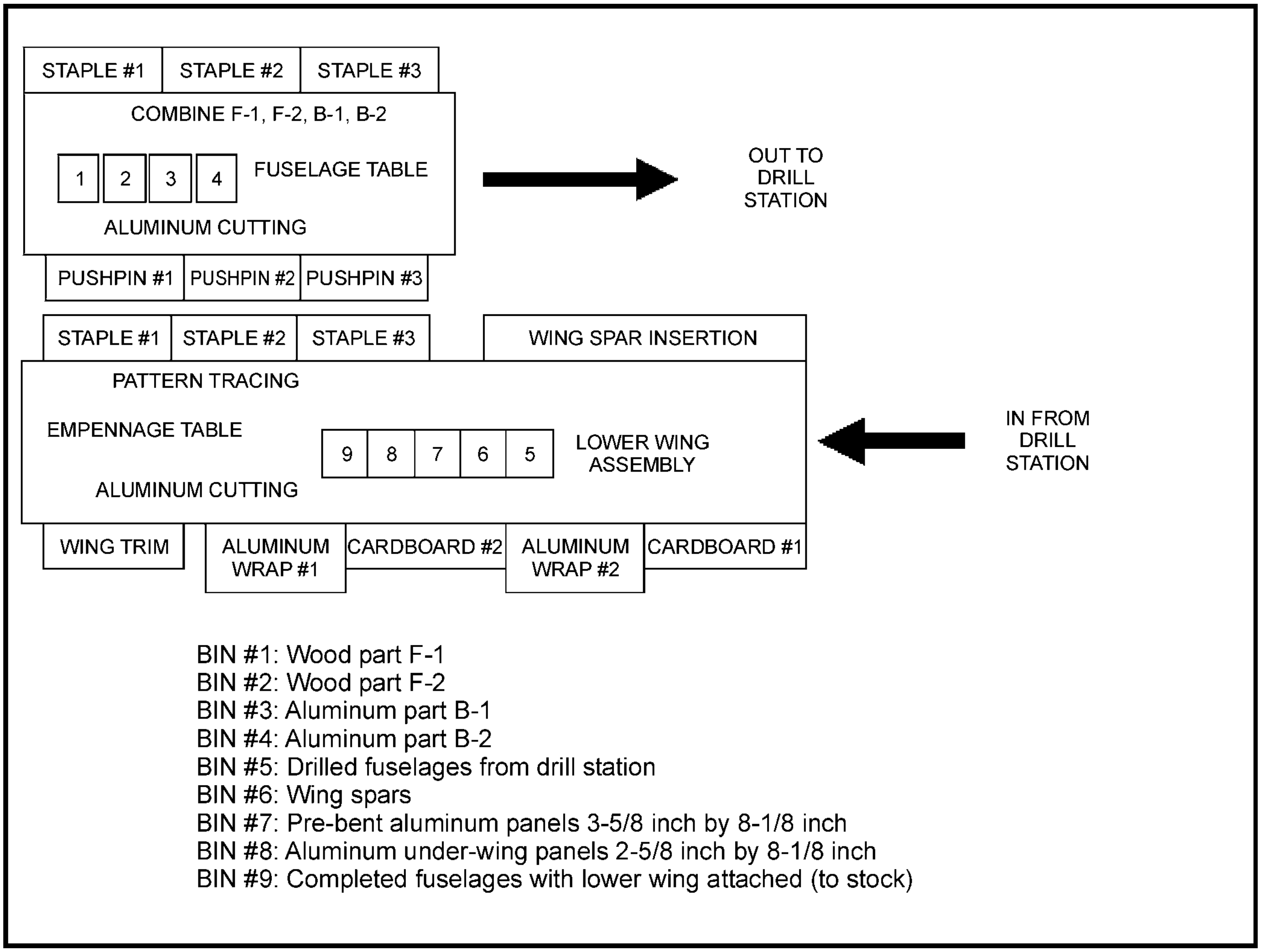

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Figure 17AC-1 Fuselage and Bottom Wing Assembly Line

For each aluminum model biplane to be constructed:

1. Combine parts F-1, F-2, B-1 and B-2 with staples to make a full fuselage (Figure 17AC-2).
2. Slide Template No. 1 over full fuselage (Figure 17AC-3).
3. Use push-pins to create holes in fuselage through Template No. 1.
4. Trace, but do not cut, the openings for the cockpit and windshield.
5. Remove Template No. 1 from fuselage (to stock for Drill Station).
6. Insert bottom wing spars in fuselage holes A and B (spars/fuselage from stock).
7. Tape cardboard parts BWC to bottom wing spars (BWC and spars from stock) (Figure 17AC-4).
8. Tape or glue cardboard part BWAS to top of BWC (BWAS/BWC from stock).
9. Repeat Steps 7. and 8. for other wing.
10. Wrap top of left bottom wing with pre-bent aluminum panel (from stock) (Figure 17AC-5).

11. Wrap top of right bottom wing with pre-bent aluminum panel (Figure 17AC-6) (from stock).
12. Insert under-wing panel (dimensions 2-5/8 inch by 8-1/8 inch) into left wing (Figure 17AC-7).
13. Insert under-wing panel (dimensions 2-5/8 inch by 8-1/8 inch) into right wing (Figure 17AC-7).
14. Staple panels (three staples) at left wing tip (Figure 17AC-8).
15. Staple panels (three staples) at right wing tip (Figure 17AC-8).
16. Trim wing tips to desired shape.
17. Make two slits for the windshield (Figure 17AC-9).
18. Trim cockpit aluminum to avoid blocking pilot hole in F-1 (Figure 17AC-10).
19. Carefully turn biplane upside down.
20. Split cockpit back in half so it will fold down and place wire insulation on cockpit edging (Figure 17AC-11).
21. Turn the Wing Bolt Hole Placement Template (WBHPT) upside down also, and apply WBHPT to the underside of the bottom wing Figure 17AC-12).
22. With a push-pin, make holes for four outer bolts in the bottom wing near the wing tips. Do not make holes near the fuselage (fuselage with bottom wing to stock).

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Figure 17AC-2 Fuselage Assembly

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Figure 17AC-3 Fuselage With Clear Mylar Template Placed Around

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Figure 17AC-4 Getting Its Wings

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Figure 17AC-5 Cladding the Wings

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Figure 17AC-6 Under the Wings

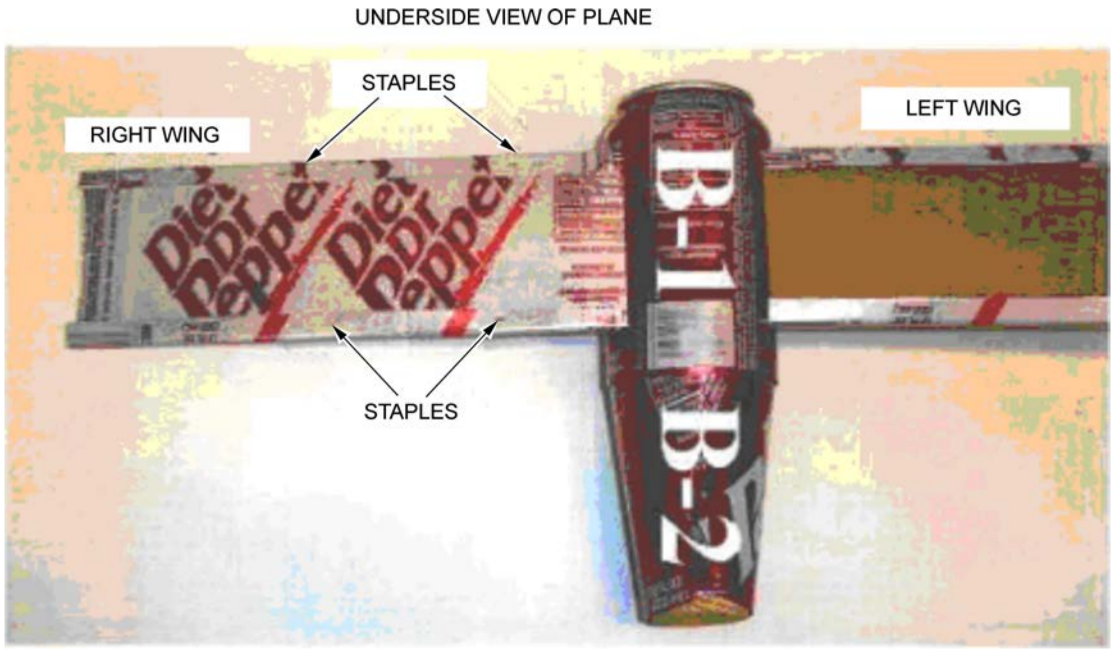

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Figure 17AC-7 Cladding the Under-wing

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Figure 17AC-8 Securing the Wing Tip

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Figure 17AC-9 Roughing the Cockpit and Windscreen

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Figure 17AC-10 Clearing the Centre Line

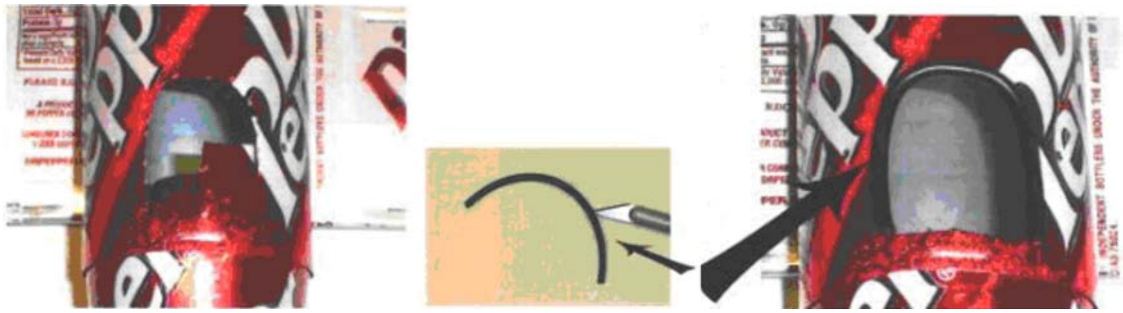

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Figure 17AC-11 Opening and Trimming the Cockpit

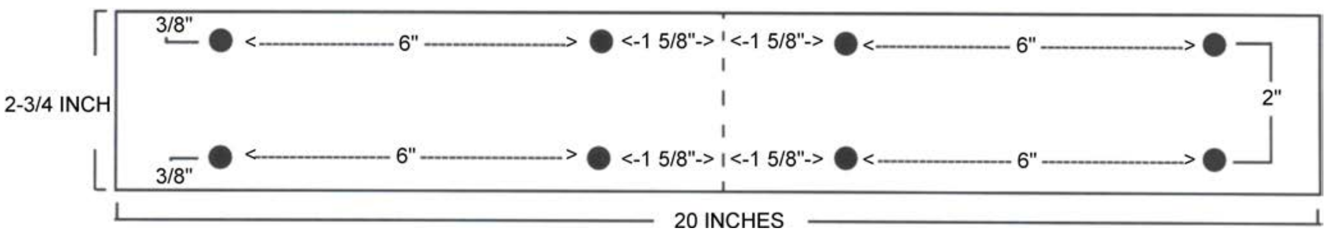

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Figure 17AC-12 Wing Bolt Hole Placement Template (WBHPT)

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TOP WING ASSEMBLY LINE

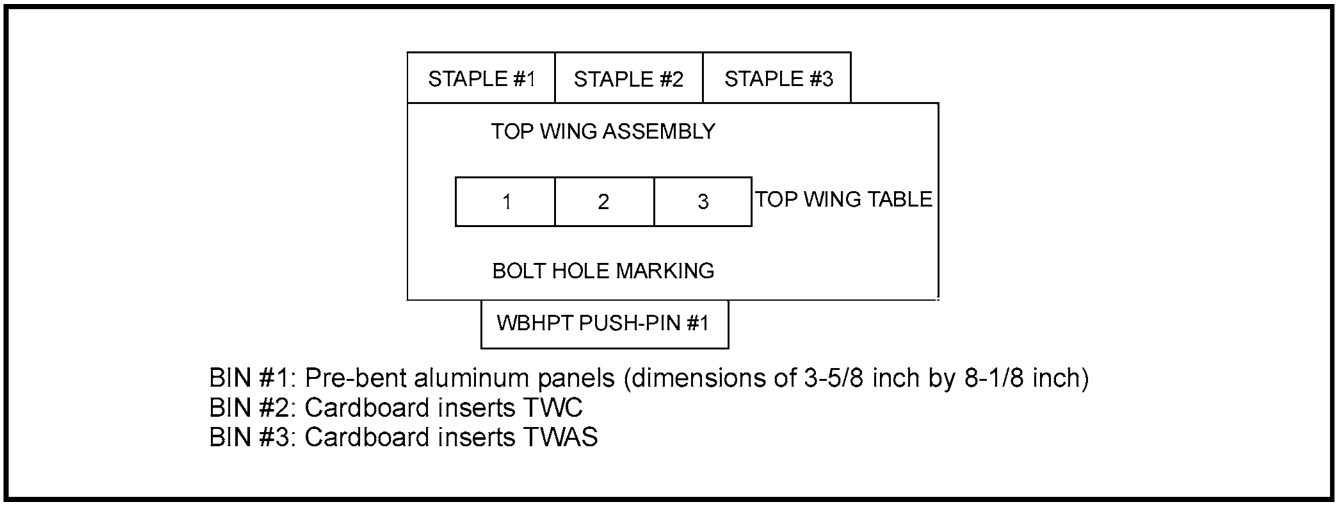

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Figure 17AD-1 Top Wing Assembly Line

For each aluminum model biplane to be constructed:

1. Combine cardboard parts TWC, TWAS and three pre-bent aluminum panels (dimensions of 3-5/8 inch by 8-1/8 inch) to form top wing (all from stock).
2. Insert panels (dimensions of 2-5/8 inch by 8-1/8 inch) under wing (from stock).
3. Staple top wing (ten staples).
4. Apply Wing Bolt Hole Placement Template (WBHPT) to top of top wing and with a push-pin, make eight holes for bolts in the top wing (top wing to stock).

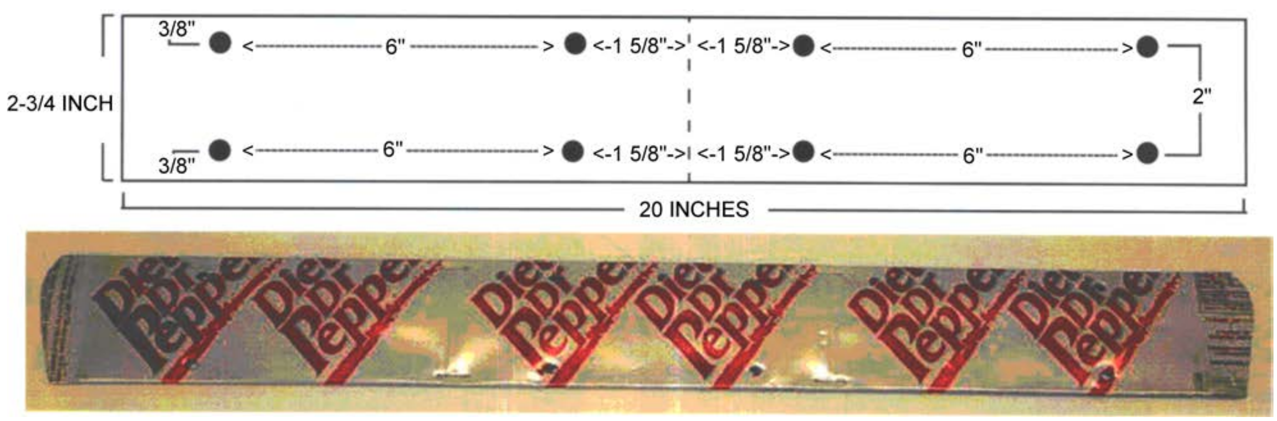

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Figure 17AD-2 Wing Bolt Hole Placement Template (WBHPT)

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EMPENNAGE ASSEMBLY LINE

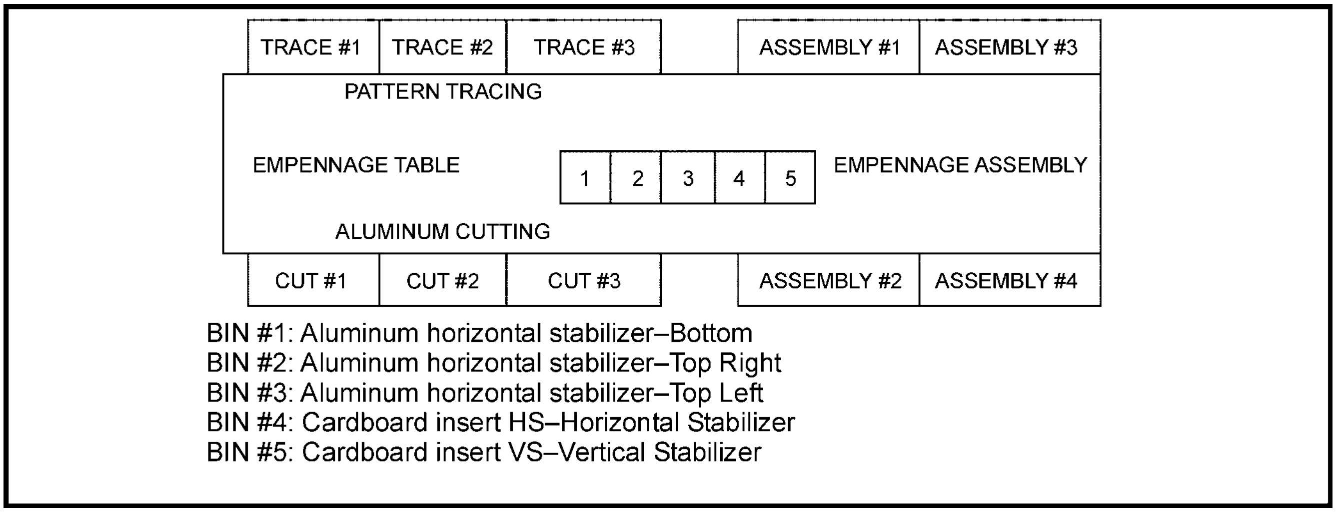

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Figure 17AE-1 Empennage Assembly Line

For each aluminum model biplane to be constructed:

1. Trace Template No. 8 onto one raw aluminum billet (from stock).
2. Cut with scissors (Figure 17AE-2).
3. Trace Template No. 9 onto one raw aluminum billet (from stock).
4. Cut with scissors one horizontal stabilizer top right (Template No. 9) (Figure 17AE-2).
5. Trace Template No. 10 onto one raw aluminum billet (from stock).
6. Cut with scissors one horizontal stabilizer top left (Template No. 10) (Figure 17AE-2).
7. Score one horizontal stabilizer bottom (Template No. 8).
8. Score one horizontal stabilizer top right (Template No. 9).
9. Score one horizontal stabilizer top left (Template No. 10).
10. Combine cardboard pieces HS and VS with aluminum parts (Figure 17AE-3), to include:
    (a) one scored horizontal stabilizer bottom (Template No. 8),
    (b) one scored horizontal stabilizer top right (Template No. 9), and
    (c) one scored horizontal stabilizer top left (Template No. 10).
11. Carefully bend the aluminum parts to form a complete empennage (Figure 17AE-4).
12. Staple the complete empennage.

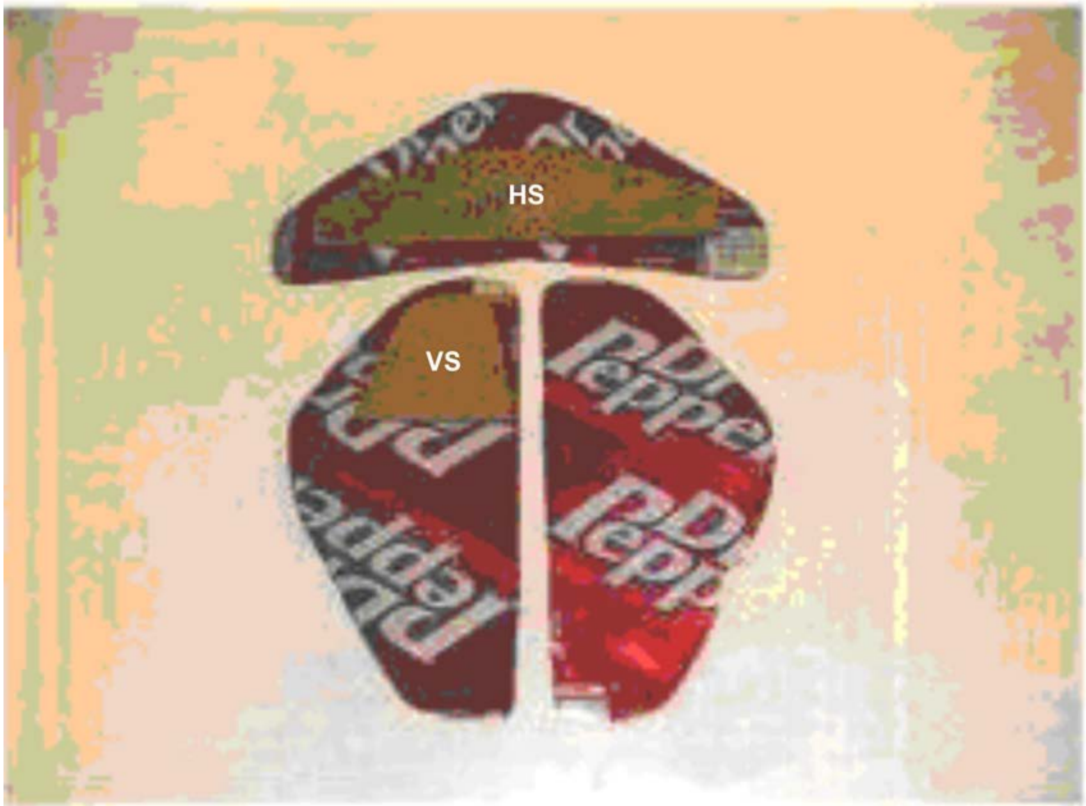

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Figure 17AE-2 Parts of the Empennage

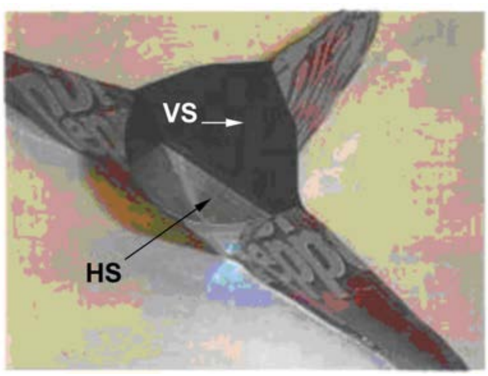

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Figure 17AE-3 Forming the Empennage

Match up the left and right Vertical Stabilizer parts and staple them together, placing staples approximately 3/8 inch from the outside edge. Insert cardboard VS between the two Vertical Stabilizer halves.

Match up the Horizontal Stabilizer parts and staple only the back end together. Insert the cardboard HS between the Horizontal Stabilizer panels.

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Figure 17AE-4 Forming the Empennage

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PROPELLER ASSEMBLY LINE

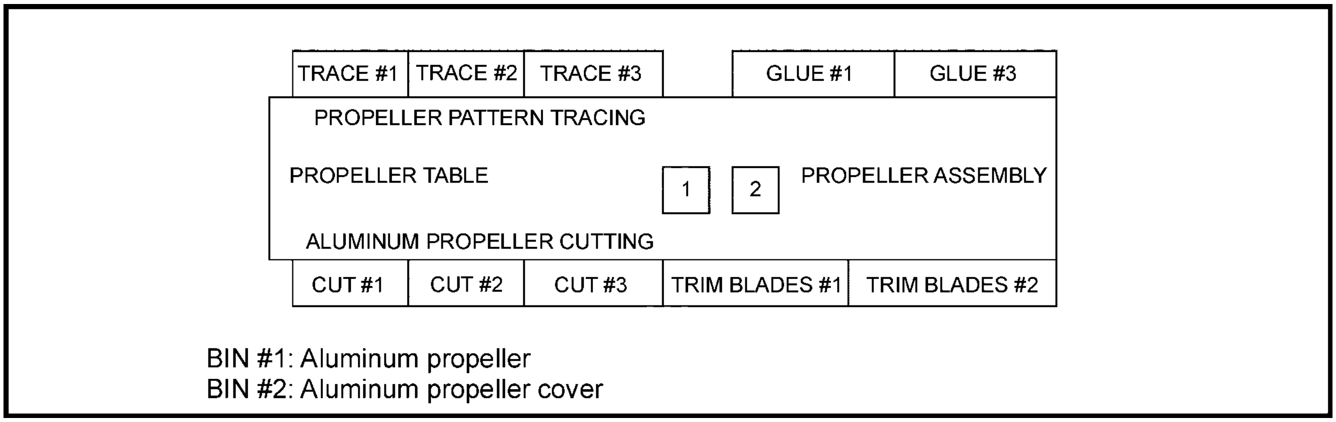

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Figure 17AF-1 Propeller Assembly Line

For each aluminum model biplane to be constructed:

1. Place fan propeller template over part P-2 (from stock) and mark propeller blades of part P-2.
2. Cut propeller blades into part P-2.
3. Bend propeller blades out from part P-2 (Figure 17AF-3).
4. Trim propeller blade tip corner edges (completed propeller to stock).

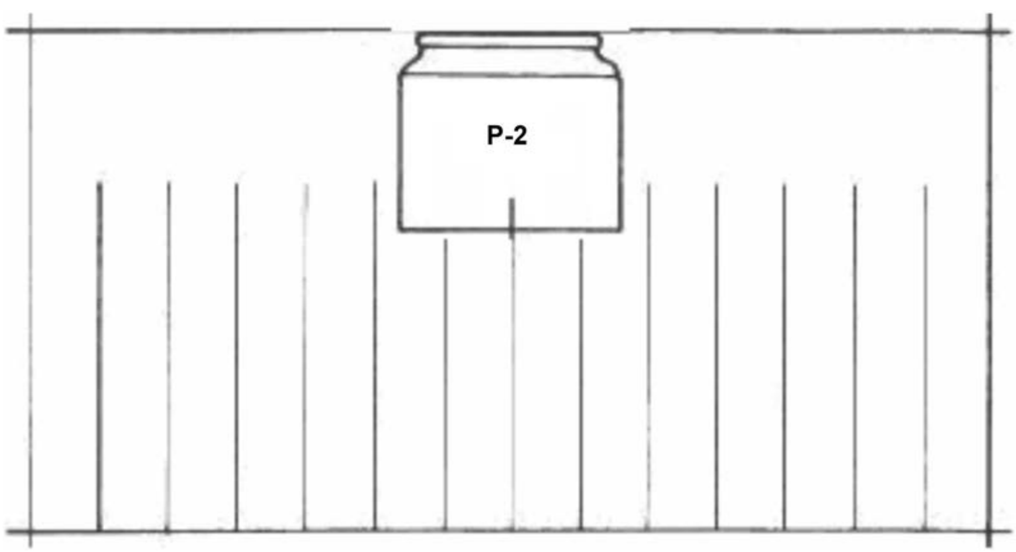

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Figure 17AF-2 Marking the Propeller

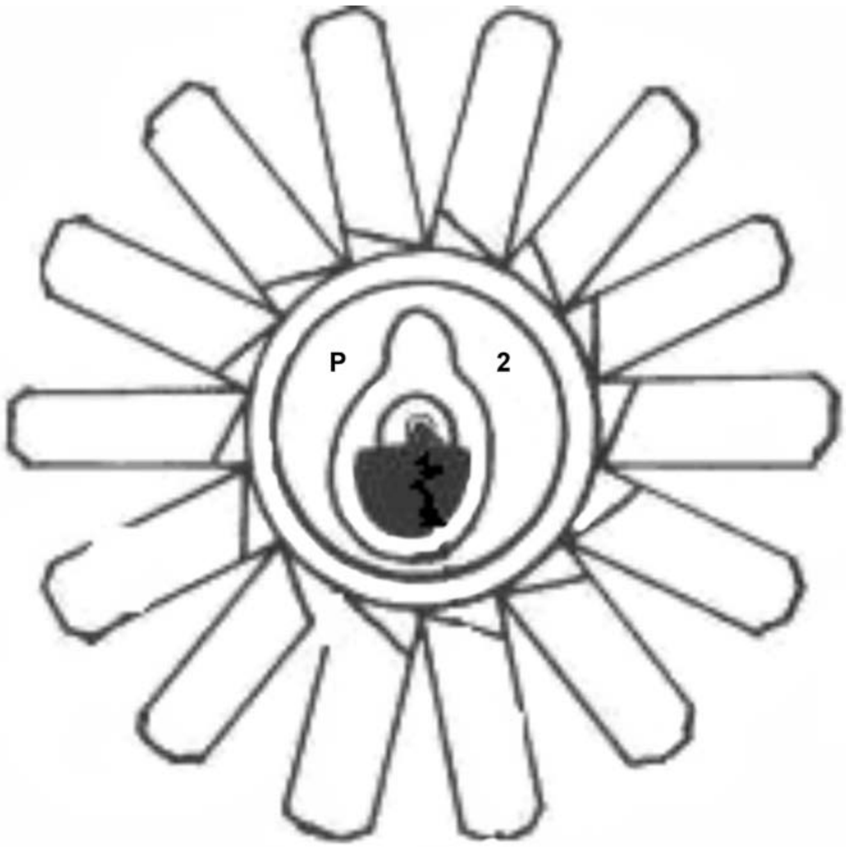

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Figure 17AF-3 Fan Propeller

FINAL ASSEMBLY

Each cadet will receive a full set of aluminum model biplane assemblies and parts, to include:

- one completed empennage assembly,
- one completed fan propeller assembly,
- one completed top wing assembly,
- one completed fuselage with bottom wing assembly,
- one landing gear wire,
- four 3-1/2-inch 10/24 bolts c/w 12 nuts to act as interplane struts,
- four 2-1/2-inch 10/24 bolts c/w eight nuts to act as cabane or centre-section struts,
- one metre of heavy-duty black thread to act as flying and landing wires,
- a length of 3/32-inch wire 18 inches long to act as the propeller shaft, and
- a length of 1/16-inch wire 6-3/4 inches long for a landing gear support wire.

1. Place four 3-1/2-inch 10/24 bolts through the outer holes in the top wing and secure snugly with a nut under the top wing and place another nut near the bottom of the bolts.

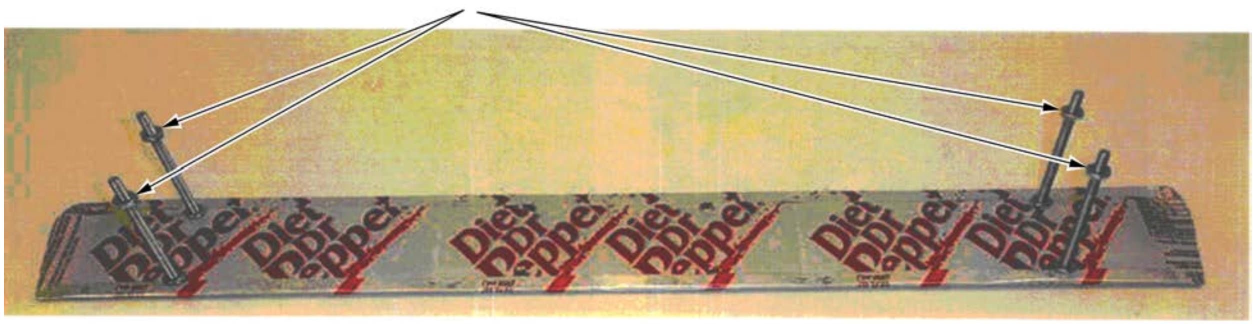

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Figure 17AG-1 Interplane Struts

2. Secure the top wing to the bottom wing by pushing the four outer bolts through the bottom wing outer holes and threading the nuts down the bolts until they touch the upper surface of the bottom wing.

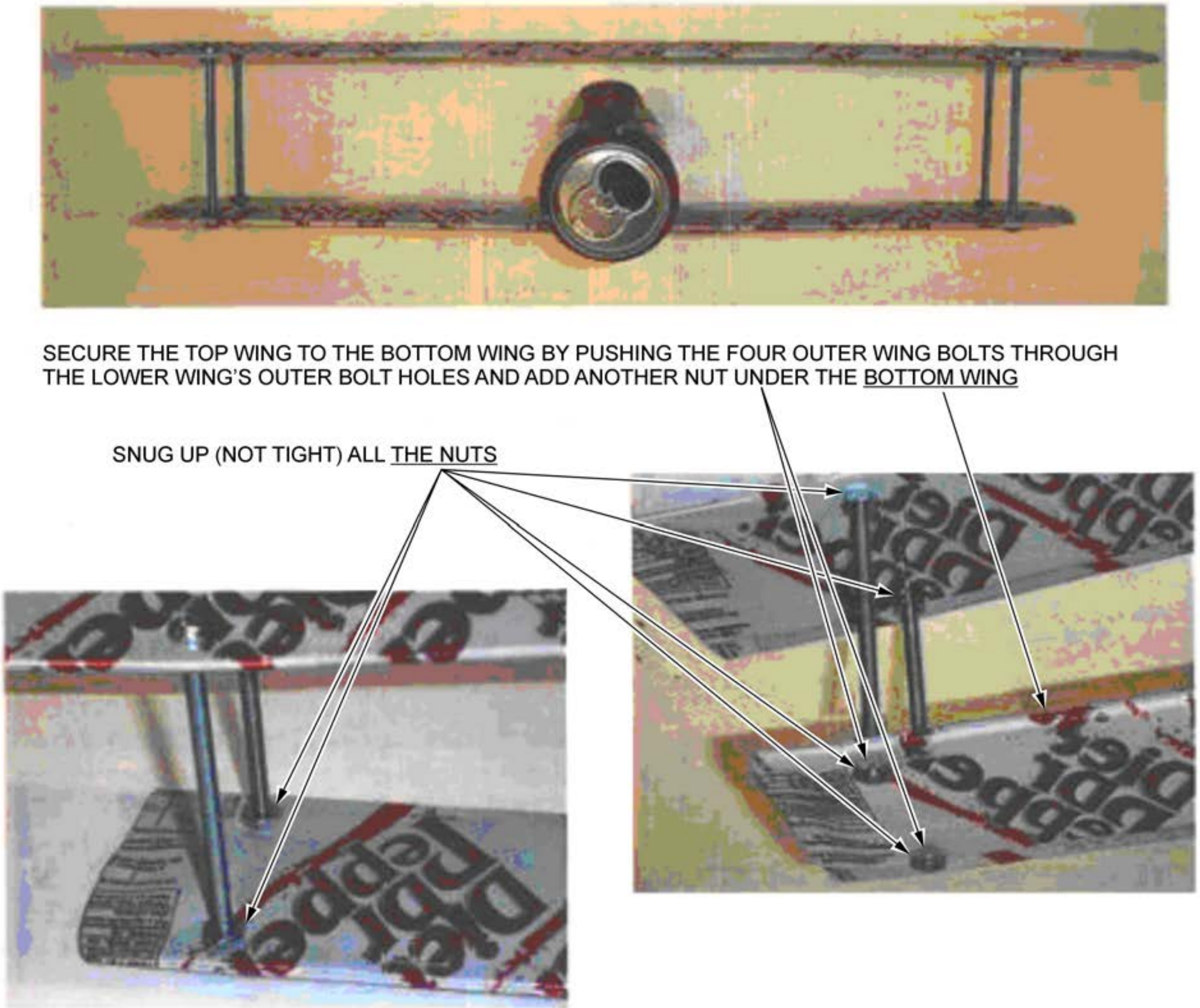

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Figure 17AG-2 Top Wing

3. Secure the top wing to the fuselage by inserting four 2-1/2-inch 10/24 bolts through the top wing and threading two nuts on the ends of the bolts; then thread the bolt ends into the two front holes E and the two back holes F in the fuselage, making the nuts snug against the underside of the top wing and also the fuselage.

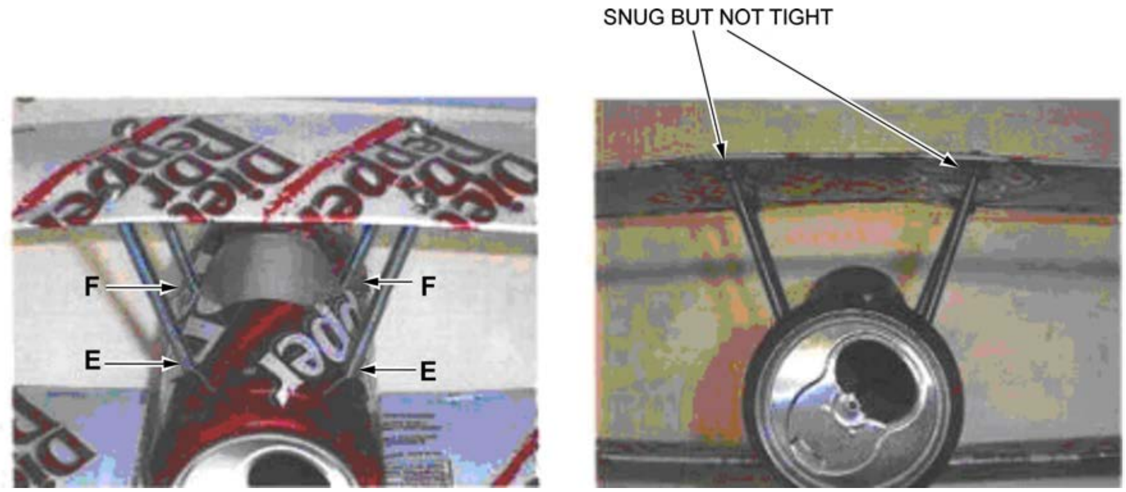

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Figure 17AG-3 Cabane Struts

4. Install the landing wires.

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Figure 17AG-4 Landing Wires

(a) To rig the plane, start by loosening the nut under the top wing outer front bolt (position 1 above).

(b) Wrap the line twice, between the nut and the aluminum, then tighten the nut.

(c) Now draw the line down to where the front wing spar goes into hole A in B-1 (position 2 above).

(d) Thread the line around the front wing spar, then draw it to the back wing spar (position 3 above).

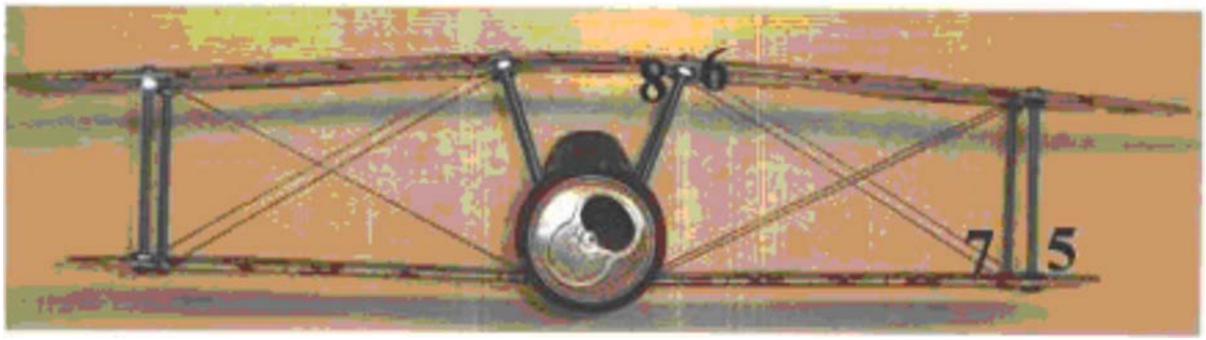
(e) Thread the line around the back wing spar where it goes into hole B in B-1, then draw it up to the nut under the top wing outer back (position 4 above).

(f) Loosen this nut, wrap the line twice around the bolt between the nut and the aluminum, then tighten the nut.

(g) Repeat this on the other wing of the biplane.

5. Install the flying wires.

(a) Loosen the outer front nut on the top of the bottom wing (position 5 below) and wrap the line twice around the bolt, between the nut and the aluminum, and then tighten the nut.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 14)

Figure 17AG-5 Flying Wires

(b) Draw the line up to the inner front nut on the top wing (position 6 above).

(c) Loosen the nut, wrap the line twice around the bolt, between the nut and the aluminum, and tighten the nut.

(d) Repeat this on the other wing of the biplane.

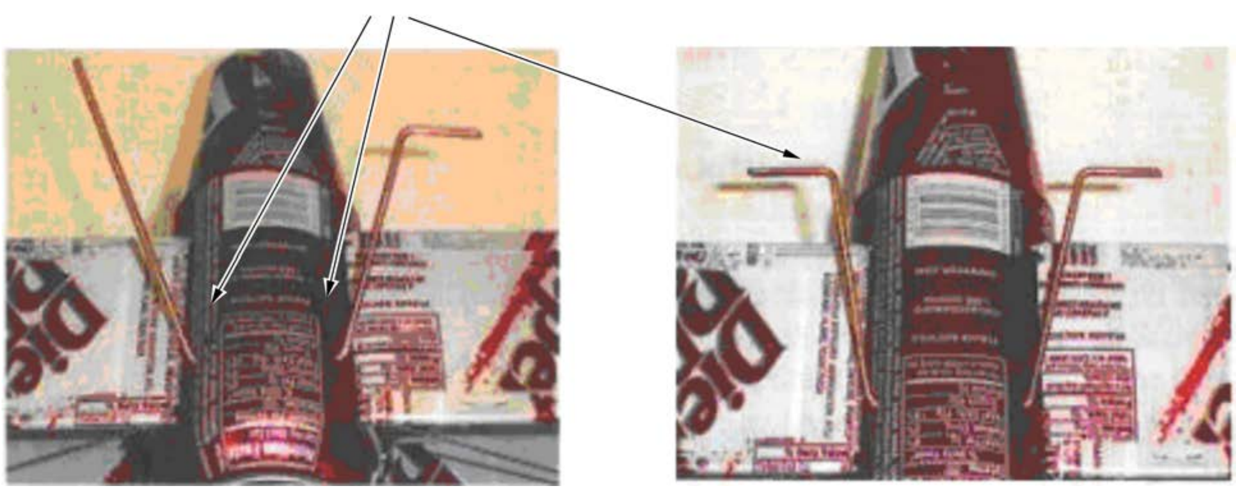
(e) Loosen the outer back nut on the top of the bottom wing (position 7 above) and wrap the line twice around the bolt, between the nut and the aluminum, then tighten the nut.

(f) Draw the line up to the inner back nut on the top wing (8). Loosen the nut and wrap the line twice around the bolt and tighten the nut.

(g) Cut off all excess line.

(h) Repeat this on the other wing of the biplane.

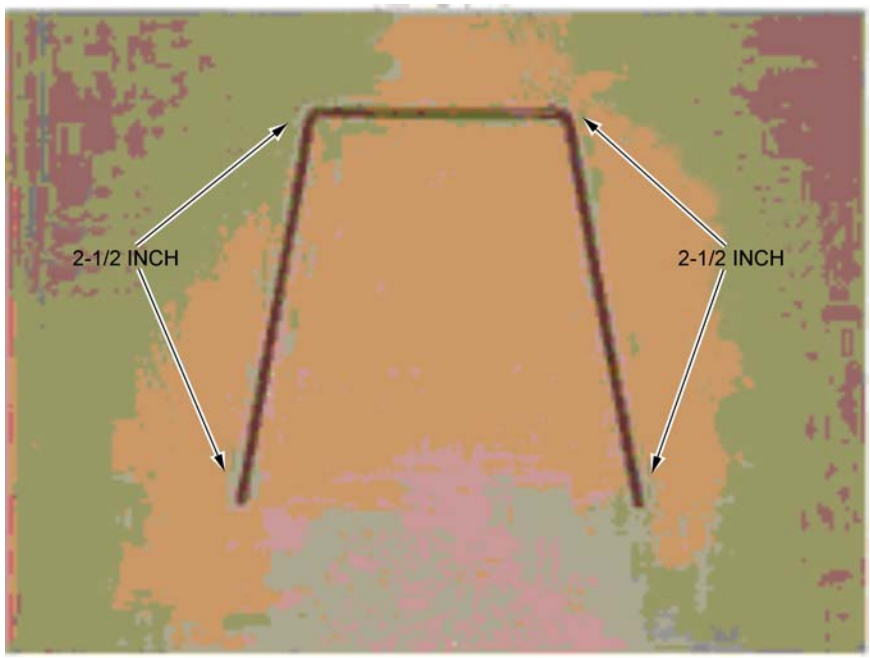
6. Insert the landing gear wire through holes C and have the instructor make the final bend.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 15)

Figure 17AG-6 Main Landing Gear

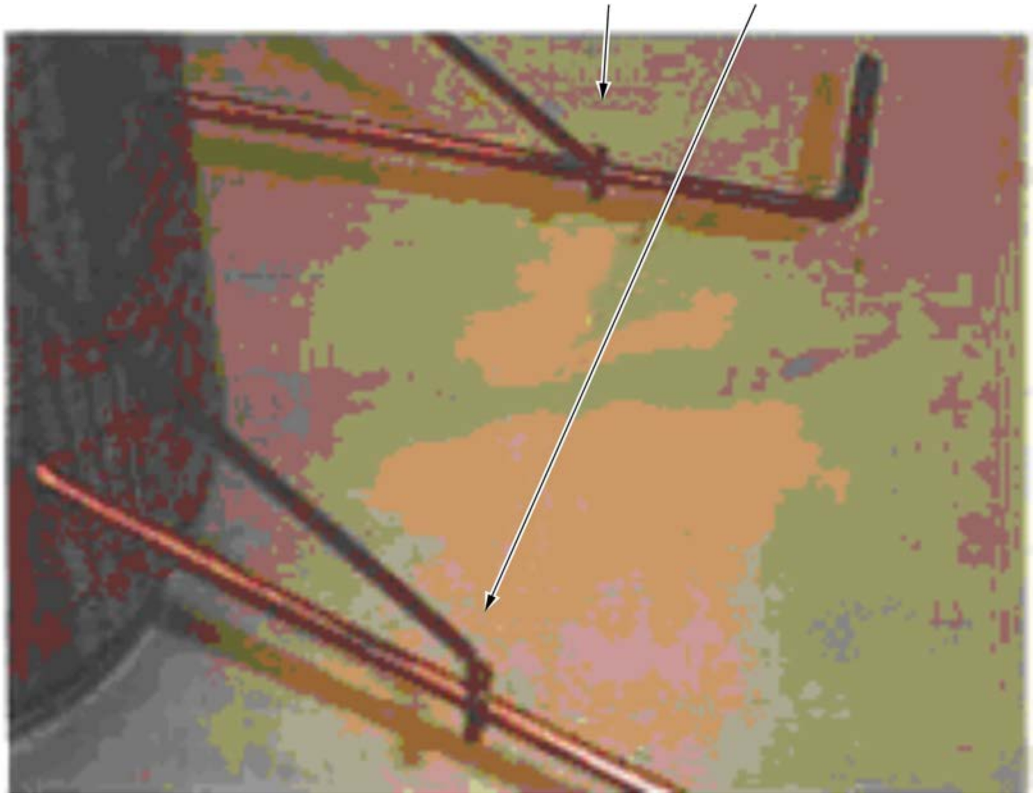
7. Bend the 1/16-inch wire that is 6-3/4 inches long into shape as a support wire.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 15)

Figure 17AG-7 Main Landing Gear Support Structure

8. Insert the support wire through holes D in the fuselage and crimp it around the main landing gear wire.

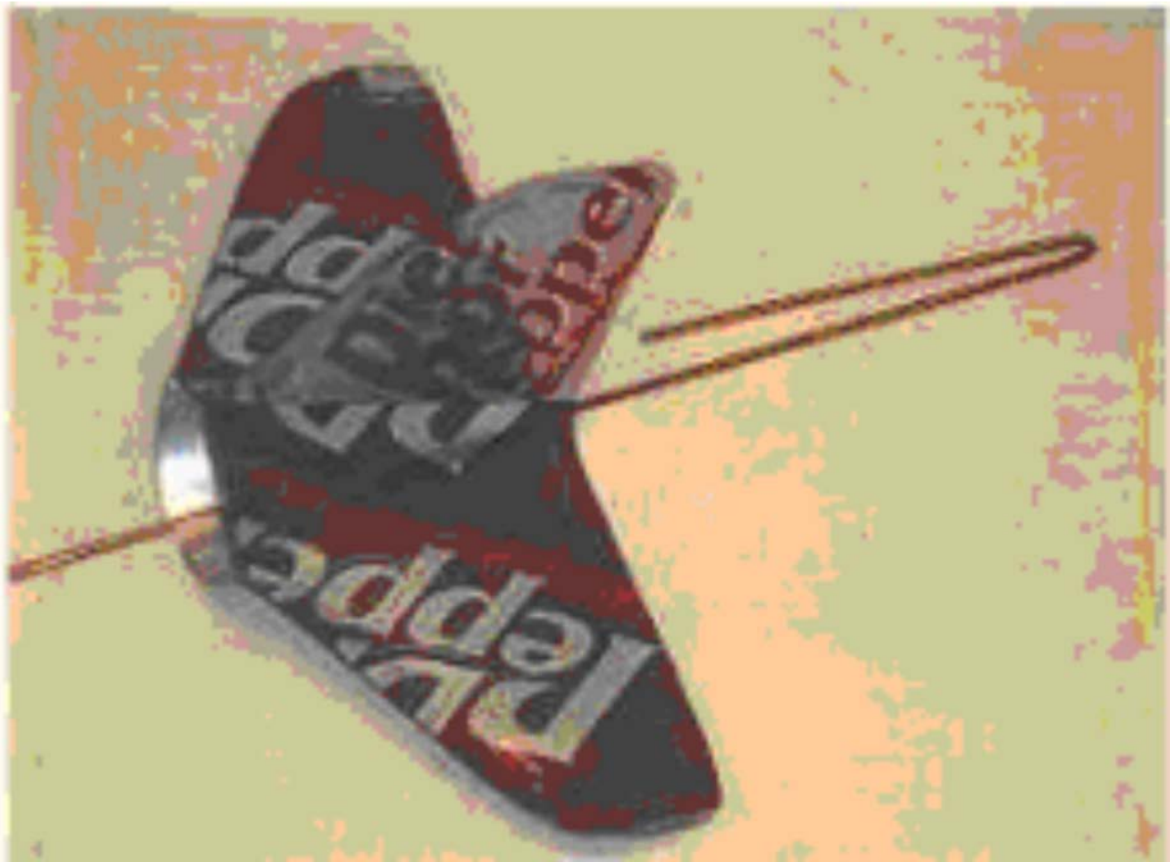


D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 15)

Figure 17AG-8 Crimping the Landing Gear Support

9. To attach the empennage to the fuselage, take a piece of 3/32-inch wire 18 inches long and make a 4-inch hook on one end to make the propeller shaft:

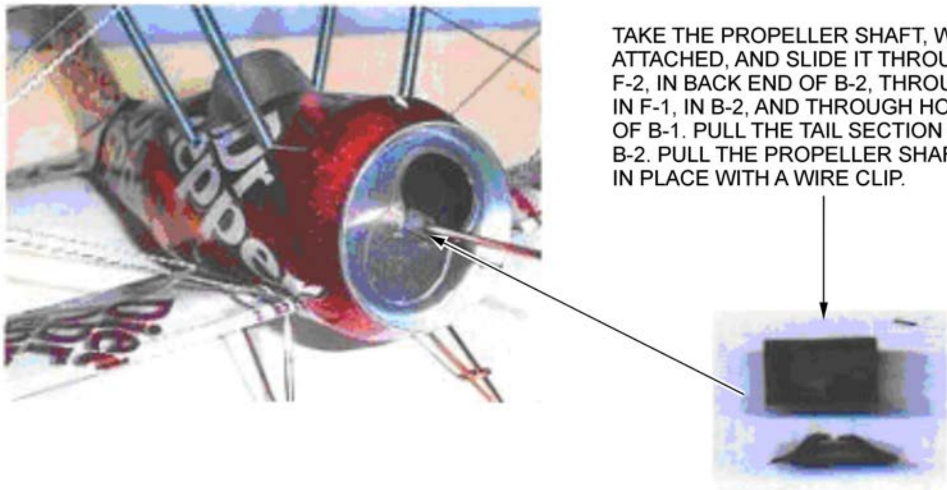
   (a) insert the propeller shaft through the hole in the back of the empennage under the horizontal stabilizer cardboard and the smaller section of wire goes over the horizontal stabilizer cardboard; and



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 16)

Figure 17AG-9 Propeller Shaft Installation

   (b) insert the propeller shaft, with the empennage attached, through the pilot hole in the wood piece F-2, through the pilot hole in wood piece F-1 and through hole G in the front fuselage section part B-1. Pull the empennage over the rear of part B-2 at the rear of the fuselage. Pull the propeller shaft snug and hold it in place with a wire clip at the front of the fuselage part B-1.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 17)

Figure 17AG-10 Propeller Shaft Wire Clip Installation

10. To fabricate the rear skid, take a piece of 3/32-inch wire and form it into the shape shown. Drill a hole through the fuselage into the bottom of wood piece F-2. Insert and glue the tail skid into place.

D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 17)

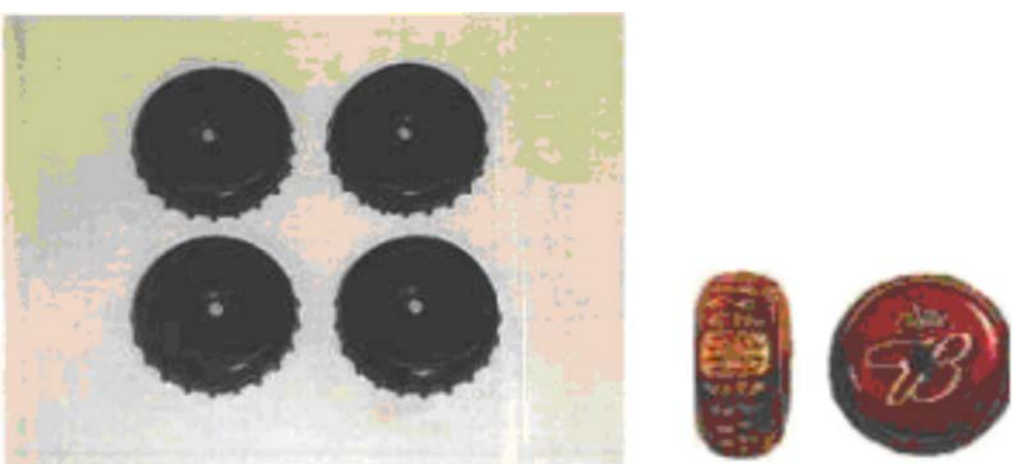
Figure 17AG-11 Tail Skid Fabrication

11. Insert two windshield tabs into their slits as shown. Glue the windshield and the cockpit rubber into place.

D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 17)

Figure 17AG-12 Windscreen Installation

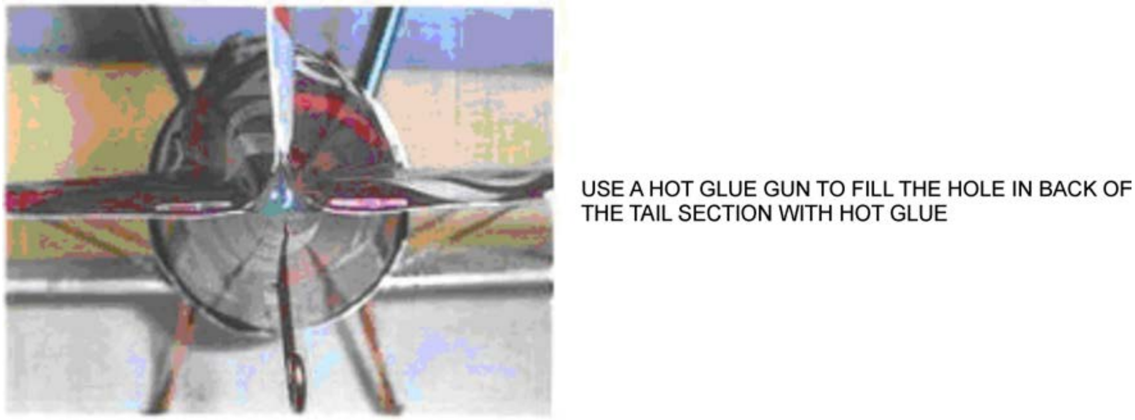
12. Using four bottle caps with holes through the centre, glue pairs together to make wheels as shown. Place and glue the two wheels on the main landing gear wires.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 18)

Figure 17AG-13 Bottle-Cap Wheels

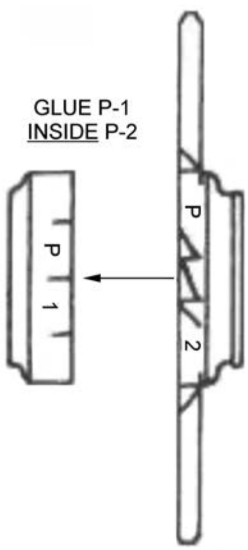
13. Fill the hole at the rear of the empennage with glue.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 17)

Figure 17AG-14 Tail Light

14. Attach the propeller part P-2 to the front of the fuselage by slipping it over the propeller shaft. Place the propeller cover part P-1 over the face of P-2 and glue it into place inside of P-2.



D. P. Mathis, Building the B.C. Air Originals Biplane, B.C. Air Originals (p. 21)

Figure 17AG-15 Finishing Touch

B.C. Air Originals "FAQ" Biplane. Retrieved November 19, 2007, from http://www.bcair.com/faq/index.htm

Figure 17AG-16 Aluminum Model Biplane

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CHAPTER 18

PO 390 – NAVIGATE A ROUTE USING A MAP AND COMPASS

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 1

EO M390.01 – IDENTIFY PARTS OF THE COMPASS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to present background material and introduce the parts of a compass to the cadets.

Demonstration and performance was chosen for TP 3 as it allows the instructor to explain and demonstrate the skill the cadet is expected to acquire while providing an opportunity for the cadets to practice setting a predetermined declination under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified the parts of the compass and set a predetermined declination.

IMPORTANCE

It is important for cadets to understand the principles on how a compass works, recognize the parts of the compass and be able to set the magnetic declination on the compass. This basic knowledge will aid the cadet in learning how to use the compass as a navigational tool.

Teaching Point 1 | **Explain the Principles Behind the Workings of a Compass**

Time: 5 min | Method: Interactive Lecture

INTRODUCTION

The compass is an important tool used in wilderness navigation. It is not a replacement for good map-reading skills; however it is a trustworthy tool to complement and complete ground navigation. A compass user must take care to be precise in compass measurements. A small error in calculation or measurement can equal a significant error in the field.

A magnetic compass remains viable as a navigational aid, even with the advent of Global Positioning System devices, because it does not require batteries and remains reliable year after year.

CHINESE FLOATING COMPASS

Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-33)

Figure 18-1-1 Chinese Floating Compass

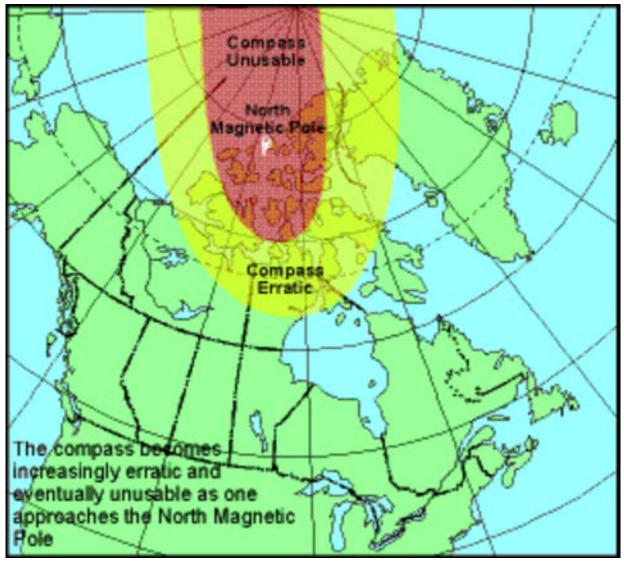
The Chinese had discovered the orienting effect of magnetite, or lodestone as early as the 4th century BC. In 101 BC, Chinese ships reached the east coast of India for the first time, possibly with help from a magnetic compass. By the 10th century, they had developed a floating compass for use at sea. Western Europeans had developed one by 1187, Arabs by 1220, and Scandinavians by 1300. Columbus used a magnetic compass on his first transatlantic trip in 1492.

HOW A COMPASS WORKS

Regardless of intended purpose or complexity of construction, most compasses operate on the same basic principle. A small, elongated, permanently magnetized needle is placed on a pivot so that it may rotate freely on the horizontal plane. The earth's magnetic field, which is shaped approximately like the field around a simple bar magnet, exerts forces on the compass needle causing it to rotate until it comes to rest in the same horizontal direction as the magnetic field. Over much of the earth this direction is roughly running between north and south, which accounts for the compass's importance in navigation.

The earth has a north and south magnetic pole. These magnetic poles correspond roughly with the actual geographical poles. The north magnetic pole is located (2005 estimate) at approximately 82.7 degrees N latitude and 114.4 degrees W longitude, which lies over 800 km from the north geographic pole.

The horizontal force of the magnetic field, responsible for the direction in which a compass needle is oriented, decreases in strength as one approaches the north magnetic pole. This decrease is due to the lines of force changing direction towards the vertical as they bend back into the earth at the north magnetic pole towards the south magnetic pole. The compass starts to behave erratically, and eventually as the horizontal force decreases even more, the compass becomes unusable.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-33)

Figure 18-1-2 Earth's Magnetic Field

The nature of the earth's magnetic field is such that the magnetic north pole shifts geographic position about 5–10 km per year. Natural phenomena, like earthquakes, may also shift the magnetic field.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why is the compass such an important navigational tool?

Q2. Approximately how far can the north magnetic pole shift in a year?

Q3. Why does a compass become less accurate the further north a person travels?

ANTICIPATED ANSWERS

A1. Over much of the earth, a compass roughly indicates the direction of true north, which accounts for the compass's importance in navigation.

A2. The magnetic north pole shifts geographic position about 5–10 km per year.

A3. The horizontal force of the magnetic field, responsible for the direction in which a compass needle is oriented, decreases in strength as one approaches the north magnetic pole. This decrease is due to the lines of force changing direction towards the vertical as they bend back into the earth at the north magnetic pole towards the south magnetic pole. The compass starts to behave erratically, and eventually as the horizontal force decreases even more, the compass becomes unusable.

Teaching Point 2 — **Identify and Describe the Parts of the Compass**

Time: 10 min — Method: Interactive Lecture

Divide the cadets into equal groups according to the number of compasses available. Starting with the compass opened, use Figures 8-1-3 and 8-1-4 to identify the parts of the compass.

PARTS OF THE COMPASS

A – Sight. Located at the top of the compass cover. Used to align on an objective when taking a bearing or to observe one along a given bearing.

B – Compass Cover. Protects the compass dial and houses the sighting mirror.

C – Sighting Mirror. Used to see the compass dial while taking a bearing.

D – Sighting Line. Used when aligning an objective or observing along a bearing.

E – Luminous Index Point. At the top of the compass dial and where a bearing is set or read from.

F – Compass Dial. Houses the magnetic needle, the orienting arrow, the meridian lines, the declination scale (on the inside) and the dial graduations (on the outside).

G – Dial Graduations. The compass dial is graduated in 2-degree divisions from 0 to 360 degrees. The dial is rotated by hand.

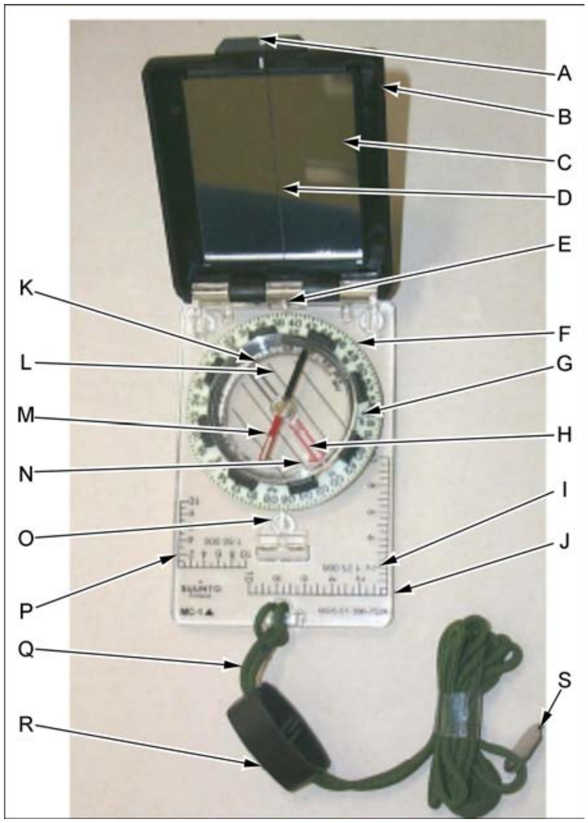
H – Orienting Arrow. The black and red orienting arrow is located inside the compass dial and is used to line up with the magnetic needle when taking a bearing on the ground. The orienting arrow is what is adjusted when the magnetic declination is set.

I – Romer 1 : 25 000. Used to measure six-figure grid references (GRs) on maps with a 1 : 25 000 scale.

J – Compass Base Plate. A clear piece of flat plastic to which the cover, dial and lanyard are attached.

K – Declination Scale. Used when adjusting the orienting arrow and while setting the magnetic declination for the map being used. It is graduated in 2-degree divisions.

L – Compass Meridian Lines. Black or red lines inside the compass dial. They are used to line up the compass dial with the grid lines (eastings) on a map.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-33)

Figure 18-1-3 Compass

M – Magnetic Needle. Spins freely and points towards magnetic north. The south end of the compass needle is black and the north end, with a luminous patch, is red.

When the magnetic needle is lined up in the red end of the orienting arrow, the mnemonic device "Red in the Bed" is used to remember that the red end of the needle belongs in the red end of the arrow.

N – Luminous Orienting Points. There are two luminous orienting points located on either side of the red end of the orienting arrow.

O – Luminous Index Point. At the bottom of the compass dial; where a back bearing is read from.

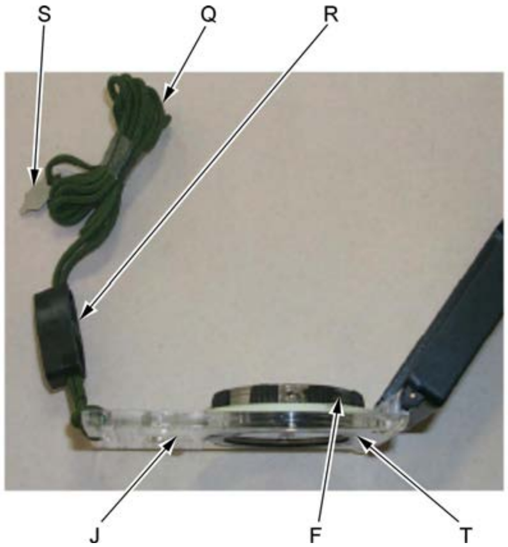
P – Romer 1 : 50 000. Used to measure six-figure GRs on maps with a 1 : 50 000 scale.

Q – Safety Cord or Lanyard. Used to fasten the compass to the wrist (never around the neck).

R – Adjustable Wrist Lock. Used to attach the compass to the wrist.

S – Screwdriver. Located at the end of the safety cord and is used to turn the screw to adjust the orienting arrow's position on the declination scale.

T – Declination Adjusting Screw. Located on the back side of the compass dial and is used to adjust the orienting arrow's position on the declination scale.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-34)

Figure 18-1-4 Compass

After being exposed to a strong light source, the luminous parts of the compass will glow in the dark making operating the compass at night possible.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the purpose of the 1 : 25 000 and 1 : 50 000 romers?

Q2. What colour is the north end of the magnetic needle?

Q3. Where should the safety cord or lanyard of the compass never be placed?

ANTICIPATED ANSWERS

A1. The purpose of these romers is to measure six-figure GRs on maps with 1 : 25 000 and 1 : 50 000 scale respectively.

A2. The north end of the magnetic needle is red.

A3. The safety cord or lanyard of the compass should never be placed around a person's neck.

Teaching Point 3 — **Explain, Demonstrate and Have Cadets Set a Predetermined Declination**

Time: 10 min — Method: Demonstration and Performance

Explain and demonstrate setting a predetermined declination as listed below, prior to the cadets' practicing. Calculating declination may be taught in EO C390.05 (Calculate Magnetic Declination, Section 10).

Do not go into too much detail about the three norths as this material will be covered in EO M390.05 (Determine Bearings on a Map and on the Ground, Section 5).

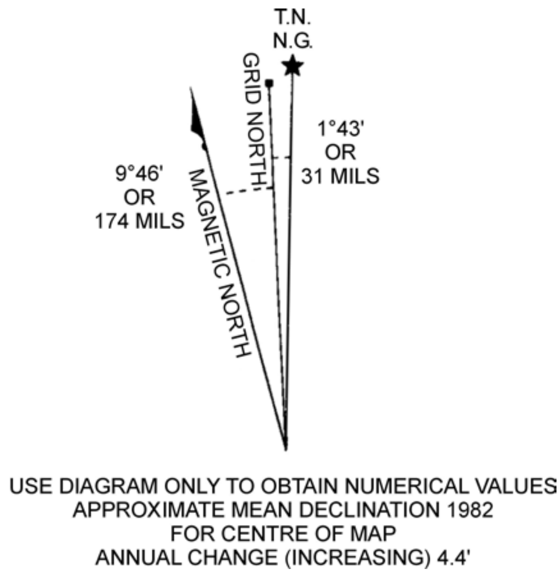
DECLINATION

Magnetic declination is the difference in bearing either between grid north and magnetic north or between true north and magnetic north. Declination will change for each topographical map and it also changes annually due to the shifting north magnetic pole.

Cadets will almost always use the magnetic declination value between grid north and magnetic north (grid declination) when navigating using a map and compass. By setting the magnetic declination on the compass, magnetic bearings are converted to grid bearings which allow bearings taken from the map to be used on the ground and vice versa.

Declination is further described by stating whether the declination is east or west of magnetic north. The declination for the map being used is calculated using the information in the declination diagram (as illustrated in Figure 18-1-5) found in the marginal information of the map.

Declinations are stated in degrees and minutes. Each degree is subdivided into 60 minutes. This is important when setting the declination as the declination scale is graduated in 2-degree divisions.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-39)

Figure 18-1-5 Declination Diagram

ADJUSTING THE DECLINATION ON A COMPASS

The compass's declination scale must be set to compensate for the difference between grid north and magnetic north. To do this we must first have the amount of declination in degrees east or west. Then, turn the compass over and look at the back of the dial.

From the zero point, using the screwdriver, turn the declination adjusting screw to the right for west and to the left for east declination (as illustrated in Figure 18-1-6). Each small black line represents two degrees of declination.

> When setting declination on a compass, it is easier to hold the screwdriver and turn the compass, especially in cold weather. The declination shall *never* be turned past the last number of the declination scale.

Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-1-6 Declination Screw

If a person were to follow a compass bearing for one km without first adjusting for declination, for every one degree of declination, that person would be over 17 m to the left or right of their plotted bearing. This is how important declination is.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have cadets set magnetic declination on a compass.

RESOURCES

- Compasses, and
- Predetermined declination.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups based on the number of compasses available.
2. Give the cadets a declination value.
3. Have the cadets turn the compass over (on its back with the declination adjusting screw facing up).
4. With the other hand have the cadet grasp the screwdriver that is attached to the safety cord/lanyard.
5. Using the screwdriver, have the cadet turn the declination adjusting screw to the right for west and to the left for east declination values.
6. Check the set declination.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in setting declination will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. A compass is a tool used to complement what other ground navigation skill?

Q2. What must be done to the luminous marks of the compass to make them glow?

Q3. In what direction would the declination adjusting screw be turned for an east declination value?

ANTICIPATED ANSWERS

A1. A compass is used to complement map-reading skills.

A2. The luminous marks need to be exposed to a strong light source.

A3. The declination adjusting screw would be turned to the left.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 5 (390 PC).

CLOSING STATEMENT

Map and compass skills are the core of the cadets' Proficiency Level Three survival training. Being familiar with the compass and how it works is one of the bases on which the rest of the lessons are anchored.

INSTRUCTOR NOTES/REMARKS

TP 2 may need to be modified to reflect the type of compass used for the lesson.

REFERENCES

A2-036 A-CR-CCP-121/PT-001 Director Cadets 3. (2003). *Royal Canadian Army Cadet Reference Book*. Ottawa, ON: Department of National Defence.

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M390.02 – IDENTIFY MARGINAL INFORMATION AND CONVENTIONAL SIGNS

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Distribute topographical maps before beginning the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to introduce the details of marginal information to the cadet.

An in-class activity was chosen for TP 2 as it is an interactive way to introduce conventional signs to the cadet.

INTRODUCTION

REVIEW

The review for this lesson will be from EO M390.01 (Identify Parts of the Compass, Section 1).

QUESTIONS

Q1. What is the purpose of the sighting mirror?

Q2. What is the function of the meridian lines found inside the compass dial?

Q3. The mnemonic device “Red in the Bed” is used to remember what?

ANTICIPATED ANSWERS

A1. The sighting mirror is used to see the compass dial while taking a bearing.

A2. Compass meridian lines are used to line up the compass dial with the grid lines (eastings) on a map.

A3. The mnemonic device “Red in the Bed” is used to remember that the red end of magnetic needle is lined up within the red end of the orienting arrow.

OBJECTIVES

By the end of this lesson the cadet shall have to identified marginal information and conventional signs found on a topographical map.

IMPORTANCE

Cadets need to be able to identify features on the map as they relate to objects on the ground. The cadets will apply this knowledge during training where any type of map is used.

Teaching Point 1	**Identify and Describe Marginal Information on a Topographical Map**
Time: 20 min	Method: Interactive Lecture

MARGINAL INFORMATION

The margins provide information important to the understanding and use of the map. Before using an unfamiliar map, it is important to have a good look at the information contained in its margins. The layout and contents of the marginal information is normally in the same place for all topographical maps, but will always be found within the margins. This information includes:

Have cadets point out each piece of marginal information on a topographical map as it is being described.

Name of Map Sheet. For ease of reference the name of the map is usually a major community or district located on the map (found at the bottom centre of the margin, as well as in the top or bottom right corner).

Number of the Map and Index of Adjoining Maps. A diagram showing the position of the map sheet in relation to adjoining sheets is shown near the lower right-hand margin. The diagram shows the sheet numbers of the adjoining sheets and accentuates the sheet in hand.

Date of Map Data. Helps to indicate the amount of change that may have occurred since the map was printed (found in the bottom left corner).

Map Scale. Indicates the scale of the map, most commonly 1 : 25 000 or 1 : 50 000. Scale is used to represent distances on the map in direct relation to the ground. On a 1 : 50 000 scale map 1 cm on the map represents 50 000 cm (500 m) on the ground.

Scale Bars. Used as a measuring aid for determining distance on the map (found bottom centre below the map name). The left end of the scale bars is divided into tenths for measuring distances more accurately.

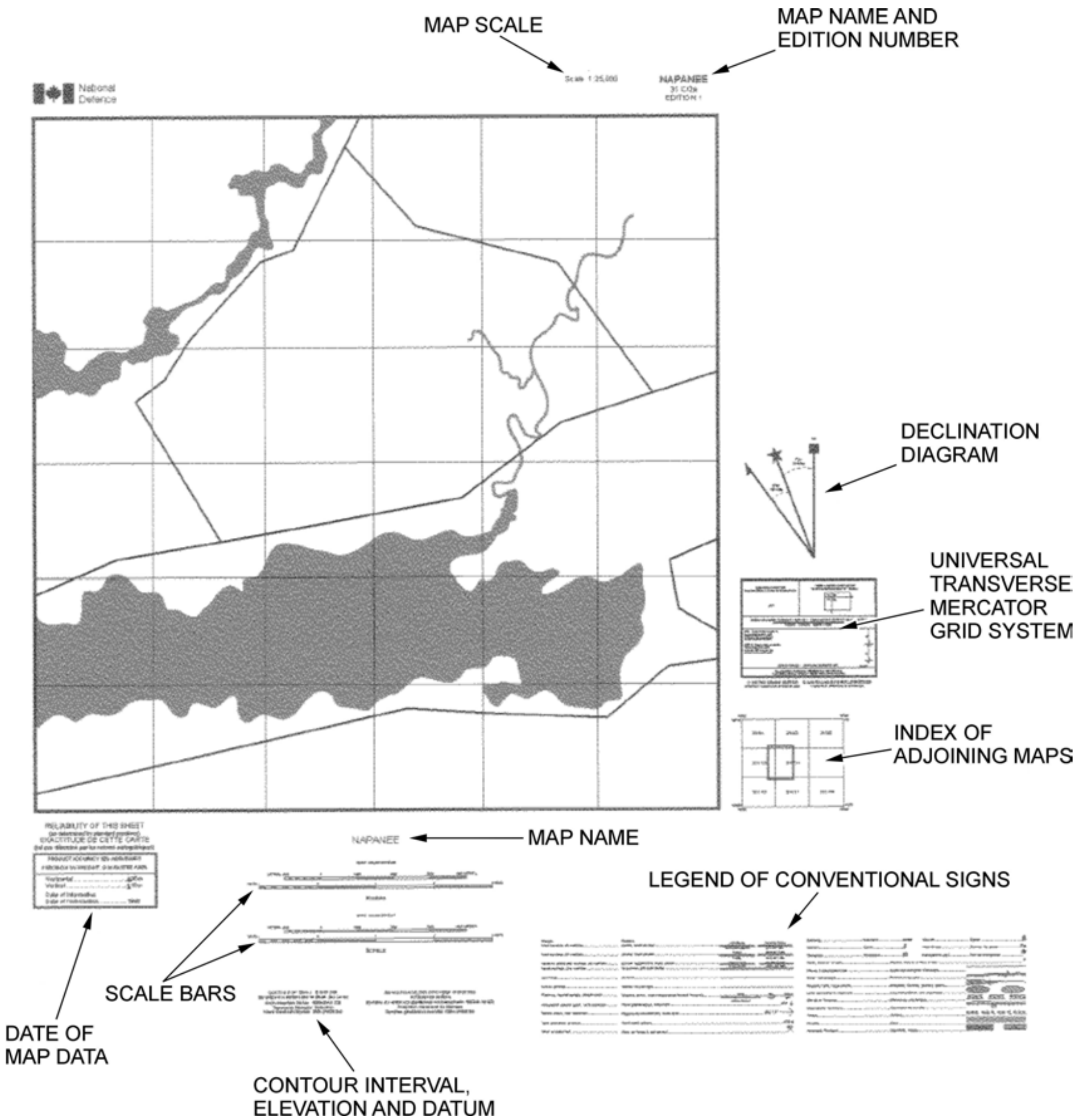
Contour Interval. Indicates the vertical (height) interval between contour lines and is given in metres or feet. The contour interval is found in the bottom margin.

Legend of Conventional Signs. A table showing the conventional signs used on the sheet in their correct colours with their descriptions is shown in the bottom or side margin, plus in a more complete list on the back of the map.

Military Index Number. The index is found in the top right corner of the map sheet and used for ordering additional maps.

Declination Diagram. Contains the information for the map on how true, grid, and magnetic north relate to each other. This information is given in the form of a diagram with explanatory notes. The diagram is in the right side margin.

Universal Transverse Mercator Grid System (UTM). The UTM grid system divides the earth's surface into zones, each covering six degrees of longitude and eight degrees of latitude. The 60 longitude bands are numbered and the 20 latitude bands are lettered. Each grid zone is one rectangle of the grid pattern, established by the bands and designated by the figures of the longitude band followed by the letter of latitude band.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 11)

Figure 18-2-1 Marginal Information

Military users, refer to this map as:	SERIES **A901** MCE 320 EDITION 1

Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 12)

Figure 18-2-2 Military Index Number

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Besides the margins, where else may the legend of conventional signs be found?

Q2. How is a map usually named?

Q3. What is the purpose of the declination diagram?

ANTICIPATED ANSWERS

A1. The legend of conventional signs may also be found on the back of the map.

A2. A map is usually named for a major community or district located on the map.

A3. The declination diagram contains the information for the map on how true, grid, and magnetic north relate to each other.

Teaching Point 2 — **Conduct an Activity Where the Cadets Identify Conventional Signs by Colour**

Time: 30 min — Method: In-Class Activity

Discuss the information with the cadets prior to the commencement of the activity outlined below.

CONVENTIONAL SIGNS

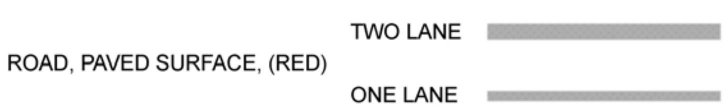
A number of symbols are used to indicate an object or item of detail that cannot be shown either by outline or by a line symbol. Most have been established through long usage and standardization agreements. The meaning of most symbols is obvious. However, if there is doubt consult the table of conventional symbols located on every map. Located on the back of most maps you will find many additional conventional signs.

Map-reading not only involves the ability to interpret the symbols shown on the map and to understand the information given in pictorial or written form, but it also involves a true understanding of the ground portrayed and an appreciation of the reliability and value of the particular map being used.

Where the symbol may have more than one meaning, the sign or symbol will be accompanied by a descriptive word (eg, tank or tower).

The use of colour aids in distinguishing details.

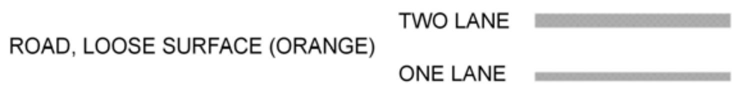
Red. Used to identify paved roads and highway numbers. Red is also used to shade in areas of urban development.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-3 Red Conventional Signs

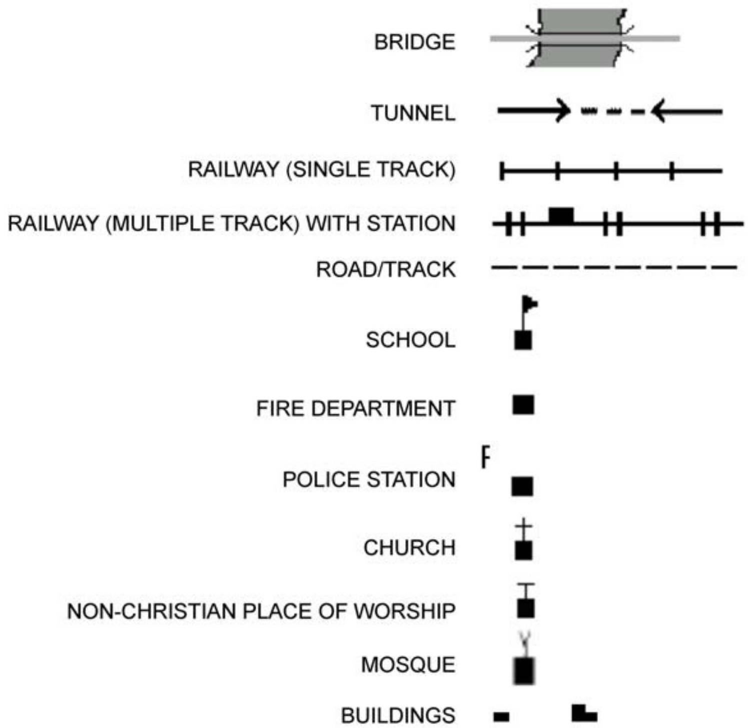
Orange. Used to represent unpaved roads.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-4 Orange Conventional Signs

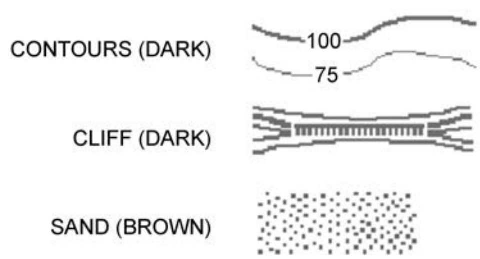
Black. Used for cultural features, toponyms (place names), some symbols and precise elevations.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-5 Black Conventional Signs

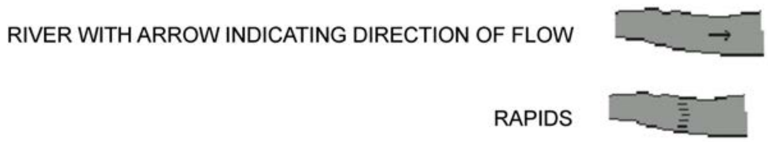
Brown. Used for contour lines, contour elevations, spot elevations, sand, cliffs, and other geographical features.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-6 Brown Conventional Signs

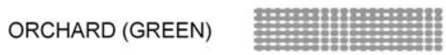
Blue. Used for water or permanent ice features (eg, rivers, lakes, swamps and ice fields), names of water features and the grid lines.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-7 Blue Conventional Signs

Green. Used for vegetation features such as woods, orchards and vineyards.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-2-8 Green Conventional Signs

White. Used to represent open fields.

Grey. Used for the legend of conventional signs on the back of the map.

Purple. Used for updates that are made over top of the original map information.

ACTIVITY

Time: 20 min

OBJECTIVE

The objective of this activity is to have the cadet identify conventional signs through the creation of a topographical map of Mapville.

RESOURCES

- Flip chart/whiteboard,
- Markers/dry erase markers, and
- Topographical maps.

ACTIVITY LAYOUT

The cadets should be seated in front of a flip chart/whiteboard with topographical maps available.

ACTIVITY INSTRUCTIONS

1. Draw a large outline of a topographical map on the flip chart/whiteboard at the front of the room.
2. Have the cadets approach the front, one at a time, and draw a conventional sign on the developing map of Mapville.
3. Have the cadets explain what the sign is for and why they chose to put it where they did. No sign may be used more than once.
4. Have cadets continue to add conventional signs until the time is used up.

Based upon the number of cadets in the class, each cadet may have to add several different conventional signs to the map.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the in-class activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the creation of the topographical map of Mapville will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 5 (390 PC).

CLOSING STATEMENT

Map-reading not only involves the ability to interpret the symbols shown on the map and to understand the information given in pictorial or written form, but it also involves a true understanding of the ground portrayed and an appreciation of the reliability and value of the particular map being used. This information will aid the cadet during their map and compass practical assessment.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO M390.03 – DETERMINE GRID REFERENCES (GRS)

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Topographical maps are the preferred training aid for TP 2, however, the worksheet located at Annex A may be used. If required, photocopy Annex A for each cadet.

Create a slide or photocopy the training aid located at Annex B for each cadet.

Photocopy the worksheet located at Annex C for each cadet.

Based on the topographical map being used, create a list of objects for the cadets to determine six-figure GRs for, and a list of six-figure GRs for the cadets to determine what objects they represent.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1 and 4 to introduce the grid system used to identify locations on a map.

Demonstration and performance was chosen for TPs 2, 3, 5 and 6 as it allows the instructor to explain and demonstrate determining four- and six-figure GRs and the construction and use of romers while providing an opportunity for the cadet to practice these skills under supervision.

INTRODUCTION

REVIEW

The following questions are a review of EO M390.02 (Identify Marginal Information and Conventional Signs, Section 2).

QUESTIONS

Q1. What does the contour interval on a topographical map represent?

Q2. What are conventional signs?

Q3. What is the colour green used for on topographical maps?

ANTICIPATED ANSWERS

A1. Indicates the vertical (height) interval between contour lines and is given in metres or feet.

A2. These are symbols used to indicate an object or item of detail that cannot be shown either by an outline or by a line symbol.

A3. It is used for vegetation features such as woods, orchards and vineyards.

OBJECTIVES

By the end of this lesson the cadet shall have determined four- and six-figure GRs.

IMPORTANCE

It is important for cadets to accurately determine four- and six-figure GRs in order to convey their location to others, for others to convey their location, and to plot a route on a topographical map.

Teaching Point 1	**Explain the Use of Grid Lines and GR Accuracy**
Time: 5 min	Method: Interactive Lecture

USE OF GRID LINES

Grid lines are used to convey a person's location to others and to plot a route on a topographical map using GRs.

The grid system is a network of intersecting vertical and horizontal blue lines superimposed on a topographical map. Maps are normally printed so that north is at the top of the sheet. The lines of the grid system are drawn evenly spaced, one scale kilometre apart, so that one set of lines run north-south (vertically) and the second set of lines run east-west (horizontally). The lines are assigned a sequential number and count up from the bottom left corner. The numbers are written along the edges of the map and occasionally within it. The intersecting grid lines at the lower left corner designate a grid square.

Eastings. Similar to the X-axis in mathematical graphing, eastings are a series of vertical parallel lines plotted as an overlay to the map sheet, which are drawn from top to bottom and numbered, with two digits, sequentially from west to east. They run north-south, similar to lines of longitude.

It is important to note that while eastings run parallel to each other, lines of longitude do not. The spacing between lines of longitude is widest at the equator and come together at the north and south poles. It is because of this difference that a bearing taken from a topographical map is a grid bearing, not a true bearing.

Northings. Similar to the Y-axis in mathematical graphing, northings are a series of horizontal parallel lines plotted as an overlay to the map sheet, which are drawn from left to right and numbered, with two digits, sequentially from south to north. They run east-west, the same as lines of latitude.

GR ACCURACY

A four-figure GR represents one grid square and is accurate within a 1 000 m square (1 km^2 or 1 000 000 m^2).

A six-figure GR represents one one-hundredth of a grid square and is accurate within a 100 m square (0.01 km^2 or 10 000 m^2).

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the grid system of a topographical map?

Q2. What is the spacing between lines of the grid system of a topographical map?

Q3. What is a northing?

ANTICIPATED ANSWERS

A1. The grid system is a network of intersecting vertical and horizontal blue lines superimposed on a topographical map.

A2. The lines of the grid system are drawn evenly spaced, 1 km apart.

A3. Similar to the Y-axis in mathematical graphing, northings are a series of horizontal parallel lines plotted as an overlay to the map sheet, which are drawn from left to right and numbered, with two digits, sequentially from south to north. They run east-west, the same as lines of latitude.

Teaching Point 2 — **Explain, Demonstrate, and Have the Cadet Practice Determining a Four-Figure GR**

Time: 10 min — Method: Demonstration and Performance

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor cadet performance.

Characteristics of a four-figure GR:

- Four-figure GRs will have four numerical digits derived from the numbers assigned to the eastings and northings on the map sheet.
- The numbers are listed by recording the two-digit easting followed by the two-digit northing.

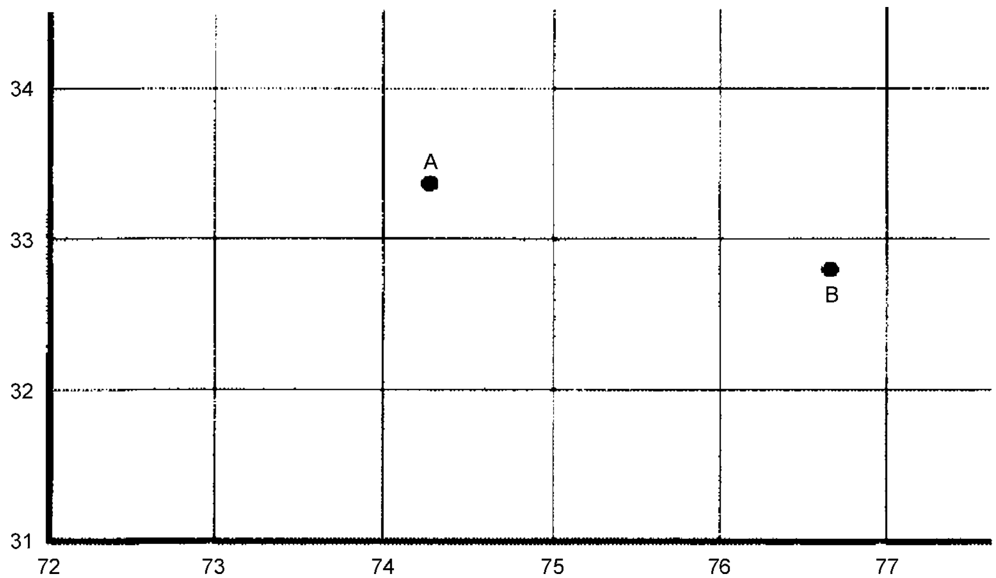
The grid lines that intersect in the bottom left corner of the grid square are used to identify that grid square.

Steps to determine a four-figure GR:

1. Confirm the correct grid square.
2. Place a finger at the bottom left corner of the map.
3. Move that finger along the bottom of the map (left to right) up to the grid line (easting) before the grid square.

4. Record the two-digit easting.
5. Place a finger at the bottom left corner of the map.
6. Move that finger along the left side of the map (bottom to top) up to the grid line (northing) before the grid square.
7. Record the two-digit northing after the two-digit easting to create the four-figure GR.
8. Confirm the four-figure GR.

In Figure 18-3-1 Building A is located at GR 7433 and Building B at GR 7632.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 37)

Figure 18-3-1 Four-Figure Grid References

Steps to determine a grid square using a four-figure GR:

1. Confirm the four-figure GR.
2. Place a right-hand finger at the bottom left corner of the map.
3. Move that finger along the bottom of the map (left to right) up to the grid line (easting) numbered the same as the first two digits of the four-figure GR.
4. Place a left-hand finger at the bottom left corner of the map.
5. Move that finger along the left side of the map (bottom to top) up to the grid line (northing) numbered the same as the last two digits of the four-figure GR.
6. Move the right-hand finger up the grid line and the left-hand finger right along the grid line.
7. Where the two grid lines intersect is the bottom left corner of the grid square.
8. Confirm the correct grid square.

In Figure 18-3-1, GR 7532 represents the grid square southeast of Building A and west of Building B.

Have the cadets practice the skill either on a topographical map or the worksheet located at Annex A.

If using Annex A, check the cadets' answers using the answer key located at Annex D.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 3 | **Explain, Demonstrate, and Have the Cadet Practice Estimating a Six-Figure GR**

Time: 10 min | Method: Demonstration and Performance

Using either the overhead or the handout created from Annex B, explain and demonstrate how to determine a six-figure GR. Care must be taken to ensure that all cadets understand each step before proceeding to the next step.

For this skill lesson, it is recommended that instruction takes the following format:

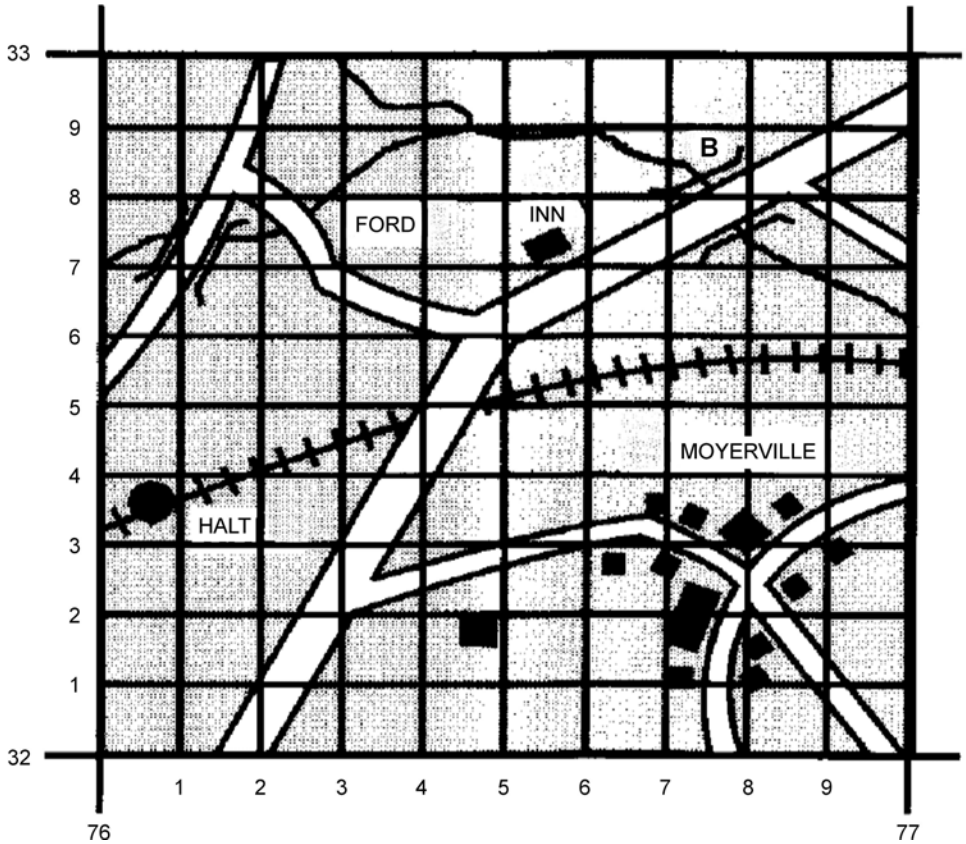
1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor cadet performance.

Estimate a six-figure GR by:

1. creating an imaginary grid system to divide a grid square into 100 equally sized smaller grid squares with 10 along the bottom edge and 10 along the left-side edge (as illustrated at Figure 18-3-2);
2. noting that six-figure GRs will have six numerical digits derived from the numbers assigned to the eastings and northings on the map sheet and their estimated tenths;
3. recognizing that the numbers are listed by recording the three-digit easting followed by the three-digit northing; and
4. remembering that the grid lines that intersect in the bottom left corner of the grid square are used to identify that imaginary grid square.
   Steps to determine a six-figure GR:
   (1) Identify the object within the grid square. Note the four-figure GR.
   (2) Using the imaginary grid within the square, determine the three-digit easting by using the two digits of the easting combined with the number of tenths, measured from the left, to the line before the object.
   (3) Using the imaginary grid within the square, determine the three-digit northing by using the two digits of the northing combined with the number of tenths, measured from the bottom, to the line before the object.

(4) Combine the two sets of numbers to create the six-figure GR.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 38)

Figure 18-3-2 Six-Figure Grid References

Example 1: Determine the six-figure GR for the building west of the town of Moyerville.

1. Building west of the town of Moyerville is within GR 7632.
2. 76 combined with 4 tenths creates ’764’.
3. 32 combined with 1 tenth creates ’321’.
4. Building west of the town of Moyerville is located at GR 764321.

Example 2: Determine the six-figure GR for the Inn north-north-west of the town of Moyerville.

1. The Inn at the north part of the grid square at GR 7632.
2. 76 combined with 5 tenths creates ’765’.
3. 32 combined with 7 tenths creates ’327’.
4. The Inn at the north part of the grid square is located at GR 765327.

Have the cadets complete the worksheet located at Annex C.

CONFIRMATION OF TEACHING POINT 3

The cadets’ completion of the worksheet will serve as the confirmation of this TP.

Teaching Point 4 | **Define a Romer as a Device Used for Measuring a Point Within a Grid Square and Identify the Types of Romers Available for Use and Where to Find Them**

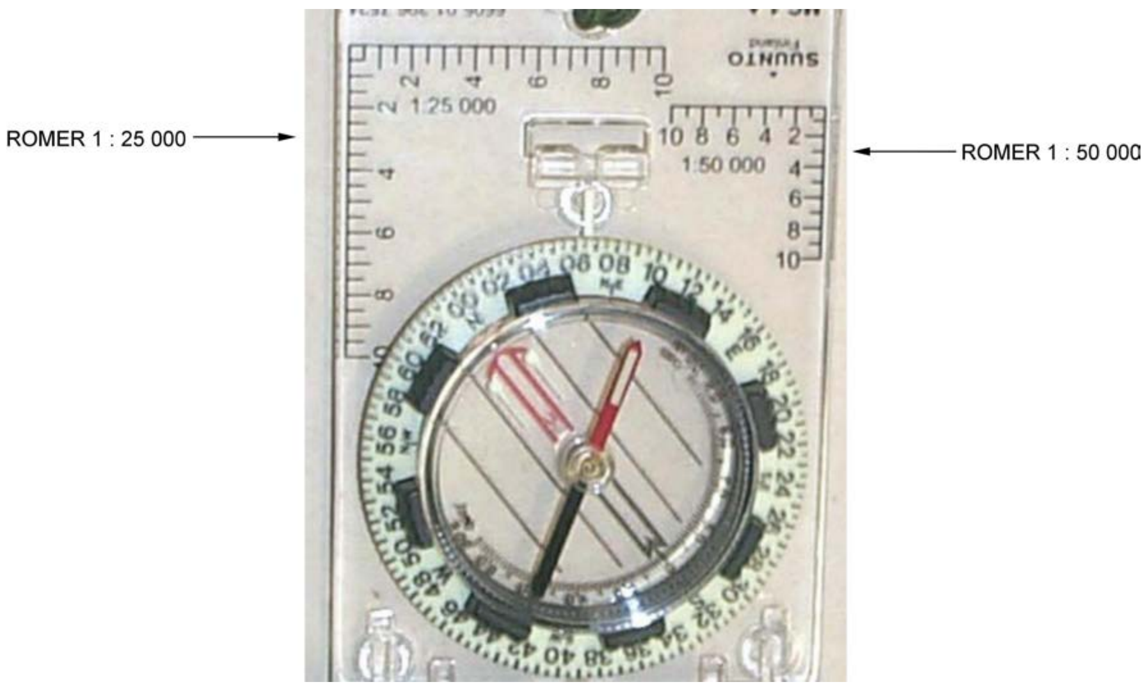
Time: 5 min | Method: Interactive Lecture

Romer. A device used for measuring a point within a grid square to determine its six-figure GR.

Romers may be purchased or created. Purchased romers include compasses and protractors. Constructed romers use a small piece of paper and the scale bars of a topographical map.

COMPASS

Many compasses include romers already printed on the compass base plate. There are commonly two romers, for use with 1 : 25 000 and 1 : 50 000 scale topographical maps.

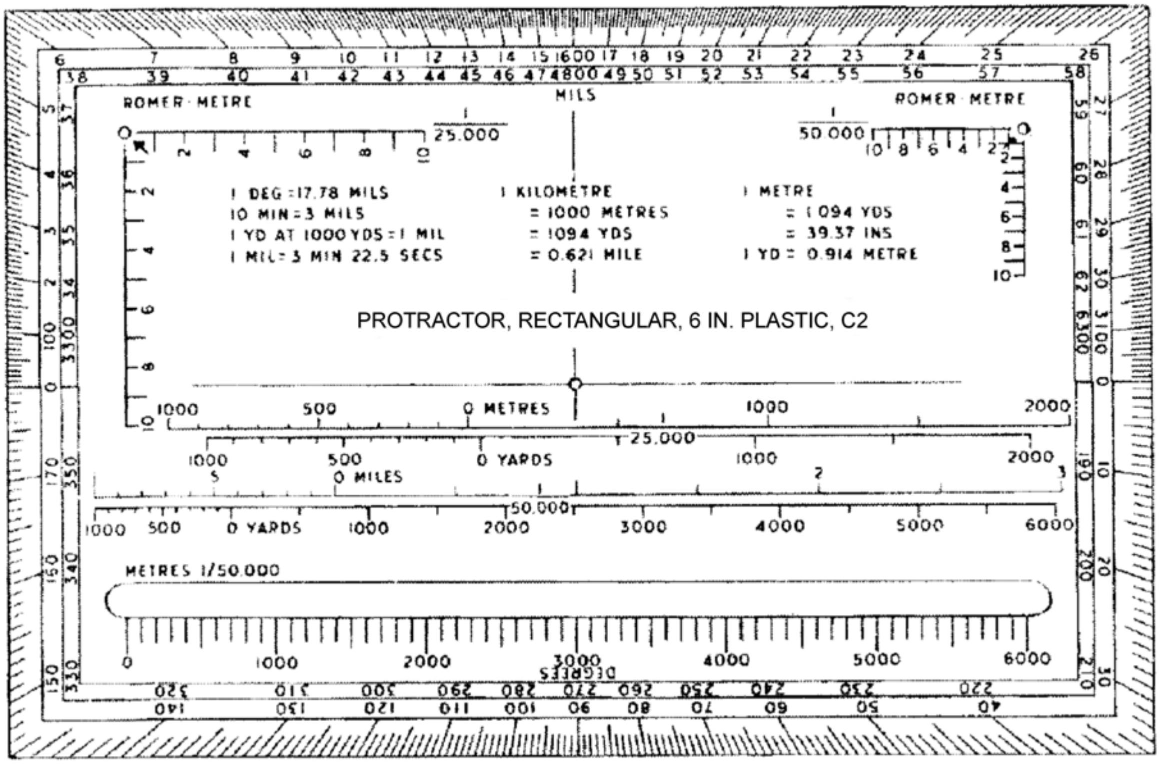


Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-3-3 Compass

PROTRACTOR

All protractors may be used to determine a bearing on a map, however, few have romers already printed on them. The Canadian Forces has created the C2 protractor (as illustrated in Figure 18-3-4) specifically designed for use on topographical maps.

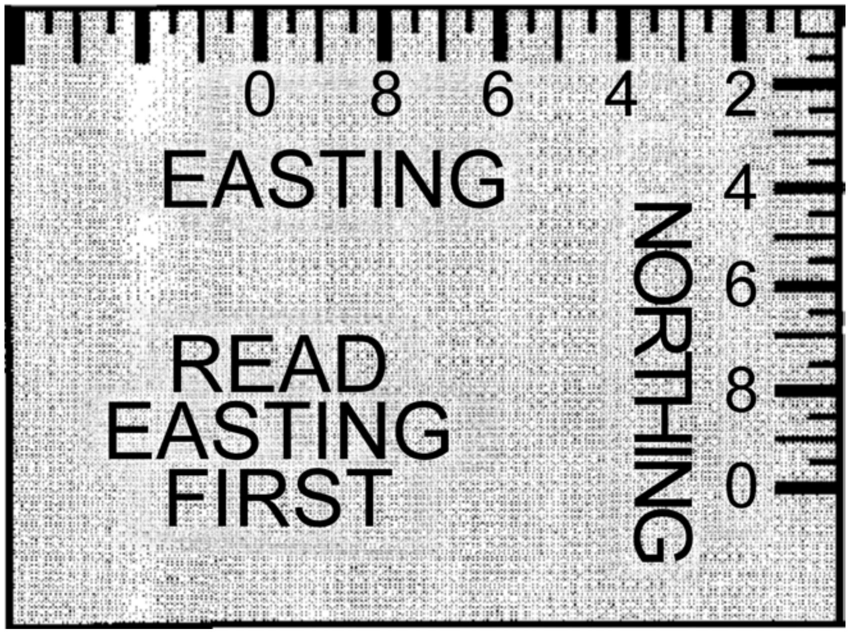


Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 41)

Figure 18-3-4 C2 Protractor

CONSTRUCTED

A constructed romer requires a piece of paper with at least one square corner and the scale bars of the topographical map. Using the scale bars of the topographical map, a romer can be constructed as illustrated in Figure 18-3-5.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 41)

Figure 18-3-5 Constructed Romer

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is a romer?

Q2. Where are the romers on a compass found?

Q3. What two things are required to construct a romer?

ANTICIPATED ANSWERS

A1. A device used for measuring a point within a grid square to determine its six-figure GR.

A2. The romers are printed on the compass base plate.

A3. A constructed romer requires a piece of paper with at least one square corner and the scale bars of the topographical map.

Teaching Point 5	**Explain, Demonstrate, and Have the Cadet Construct a Romer for Use in Determining Six-Figure GRs**
Time: 10 min	Method: Demonstration and Performance

Accuracy must be stressed to the cadets when constructing a romer. Have the cadets ensure that their pencils are sharp or their pens are fine tipped.

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor cadet performance.

Construct a romer for determining six-figure GRs by:

1. obtaining a blank piece of paper with a square edge;
2. placing one side of the square edge along the 100-m scale bars;
3. marking off 100-m segments beginning at the corner of the paper and working outward;
4. numbering these markings from zero (at the corner of the paper) to ten; and
5. repeating Steps 2. to 4. on the adjacent edge (eg, completed romer as illustrated in Figure 18-3-5).

It is important to use the correct scale bar. The constructed romer's markings should match the grid lines of the topographical map; the side of a grid square must be equal to ten 100-m marks on each of the romer's two edges.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 6	Explain, Demonstrate, and Have Cadet Practice Determining a Six-Figure GR Using a Constructed Romer
Time: 10 min	Method: Demonstration and Performance

This TP uses all the skills from the previous TPs and it is essential that this TP not be covered until problems from the previous TPs have been corrected.

Unlike TP 3, where the cadets used the very visible ’imaginary’ grid (eg, Figure 18-3-2) to determine a six-figure GR, the cadets will now be using their constructed romer from TP 5 to determine a six-figure GR and to locate objects with a six-figure GR. Much greater care and attention to detail must used by the cadets in order to ensure accuracy.

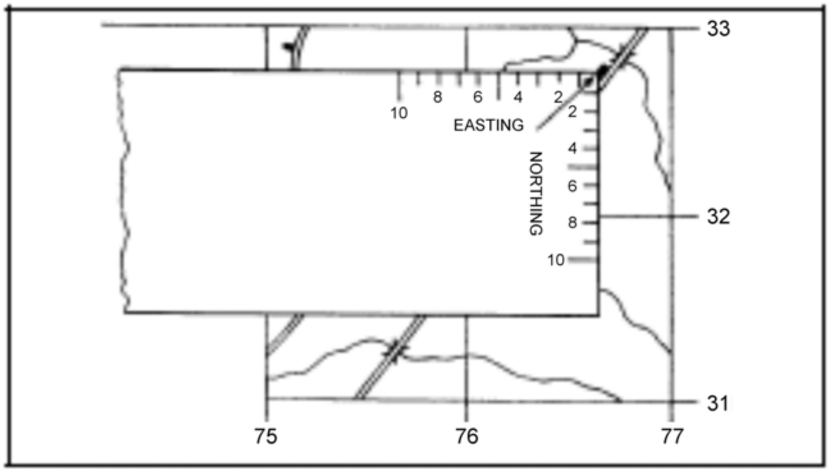
For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets’ performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor cadet performance.

Determine a six-figure GR using a constructed romer, by:

1. placing the corner of the constructed romer on the bottom left corner of the grid square, noting the four-figure GR;
2. moving the constructed romer to the right the number of tenths required to align the romer directly to or before (never past) the conventional sign or location for which the GR is being determined;
3. reading the value along the X-axis of the romer where it crosses the easting on the map sheet (the value at this intersection becomes the value for the third digit of the six-figure GR);
4. moving the constructed romer up the number of tenths required for the corner of the romer to be positioned on or before (never past) the conventional sign or location for which the GR is being determined;
5. reading the value along the Y-axis of the romer where it crosses the northing on the map sheet (the value at this intersection becomes the value for the sixth digit of the six-figure GR); and
6. combining the two sets of digits to create the six-figure GR.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-20)

Figure 18-3-6 Using a Constructed Romer

Determine what a six-figure GR represents using a constructed romer, by:

1. determining the four-figure GR, by removing the third and sixth digits from the six-figure GR, to identify and locate the correct grid square;
2. placing the corner of the constructed romer on the bottom left corner of the grid square;
3. moving the constructed romer to the right the number of tenths, as identified by the third digit;
4. moving the constructed romer up the number of tenths, as identified by the sixth digit; and
5. determining the object (that is up and to the right from the tip of the romer).

Examples used will be from Annex C.

Example 1:

From Figure 18C-1, determine the six-figure GR for the Post Office.

1. Grid square GR 7632.
2. Four tenths to the right.
3. 76 combined with 4 tenths creates ‘764’.
4. Four tenths up.
5. 32 combined with 4 tenths creates ‘324’.
6. The Post Office is located at GR 764324.

Example 2:

From Figure 18C-1, determine the object located at GR 766323.

1. Four-figure GR is 7632.

2. Place romer at the bottom left corner of grid square 7632.
3. Move the romer to the right six tenths.
4. Move the romer up three tenths.
5. GR 766323 identifies the Train Station.

Have the cadets practice using the lists created before the lesson, of objects for the cadets to determine six-figure GRs for, and of six-figure GRs for the cadets to determine what objects they represent, on the appropriate topographical map.

CONFIRMATION OF TEACHING POINT 6

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in determining six-figure GRs will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 5 (390 PC).

CLOSING STATEMENT

It is important for cadets to accurately determine four- and six-figure GRs in order to convey their location to others, determine where others are, and to plot a route on a topographical map. This skill will be of great benefit whenever the cadets are using topographical maps.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 4

EO M390.04 – DETERMINE DISTANCE ON A MAP AND ON THE GROUND

Total Time:	90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Create five 'point-to-point' and five 'along a route between two points' distances for the topographical map being used. Four- and six-figure grid references (GRs) should be used to designate the start and end points.

Measure and mark three 100-m pace courses. One should be on a flat trail/road, another through light bush, and the last through heavier bush, with slopes if possible. Pace courses should be wide enough to allow several cadets to use them at the same time.

Calculate personal pace for 100 m.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for TPs 1 and 2 as it allows the instructor to explain and demonstrate measuring distances on a map and determining personal pace, while providing an opportunity for the cadet to practice these skills under supervision.

An interactive lecture was chosen for TP 3 to introduce the factors that can affect the cadets' personal pace.

A practical activity was chosen for TP 4 as it is an interactive way for the cadet to experience pacing and the factors that affect it in a safe, controlled environment. This activity contributes to the development of pacing skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

The following questions are a review of EO M390.03 (Determine Grid References [GRs], Section 3).

QUESTIONS

Q1. What are eastings?

Q2. Which grid line intersection is used to represent a grid square?

Q3. What is a romer?

ANTICIPATED ANSWERS

A1. Similar to the X-axis in mathematical graphing, eastings are a series of vertical parallel lines plotted as an overlay to the map sheet, which are drawn from top to bottom and numbered, with two digits, sequentially from west to east. They run north-south, similar to lines of longitude.

A2. The grid lines that intersect in the bottom left corner of the grid square are used to identify that grid square.

A3. A device used for measuring a point within a grid square to determine its six-figure GR.

OBJECTIVES

By the end of this lesson the cadet shall have determined distance on the map and on the ground.

IMPORTANCE

It is important for cadets to be able to accurately determine distance on the map and on the ground in order to effectively use a topographical map to plot a route that will be followed on the ground.

Teaching Point 1	**Explain, Demonstrate and Have the Cadet Determine Distance on a Map**
Time: 30 min	Method: Demonstration and Performance

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

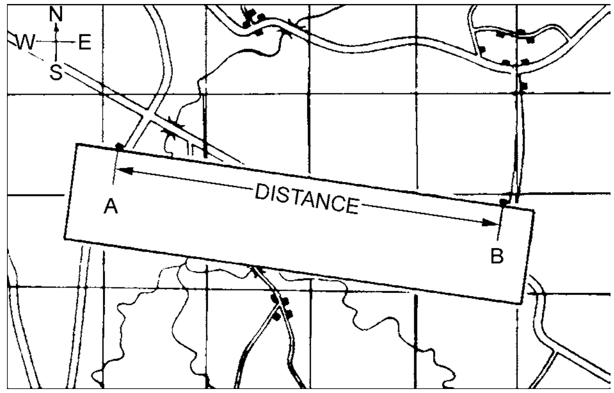
Note: Assistant instructors may be used to monitor cadet performance.

DETERMINING DISTANCE ON A MAP

Cadets can use a map to measure the distance between two points (eg, points A and B as illustrated at Figure 18-4-1) on the ground. All maps are drawn to scale; therefore, a specified distance on a map equals a specified distance on the ground. The scale of a map is printed at the top and bottom of each map (eg, scale 1 : 50 000). This means that 1 cm on the map equals 50 000 cm (500 m) on the ground.

There are two ways to determine distance on a topographical map – point-to-point and along a route.

Measuring Point-to-Point

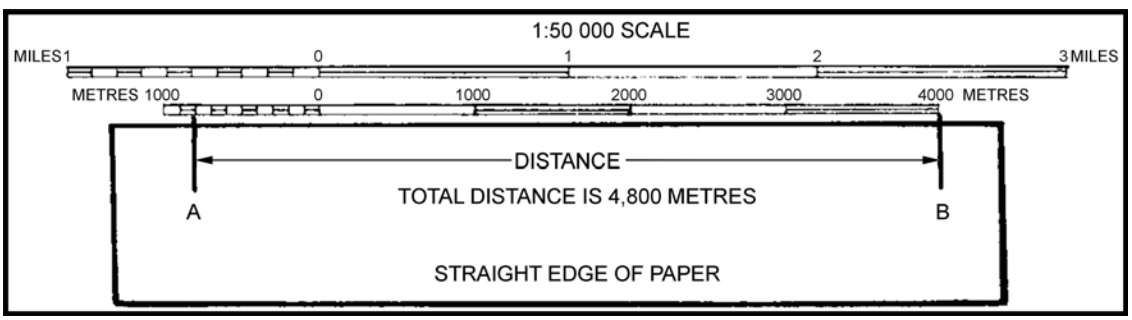


Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-24)

Figure 18-4-1 Measure Distance Point-to-Point

To measure a distance point-to-point:

1. Lay the straight edge of a piece of paper against the two points.
2. With a sharp pencil, mark the paper at the A (start) and B (end) points.
3. Lay the paper just under the metres scale bar with the B mark at the right end of the scale. Move the paper to the left aligning the B mark with each thousand metre mark until the A mark falls within the subdivided thousands (hundreds) to the left of the zero.
4. To calculate the total distance, add the number of thousands where the B mark is, plus the number of subdivided thousands where the A mark is to the left of the zero.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-25)

Figure 18-4-2 Calculate Distance

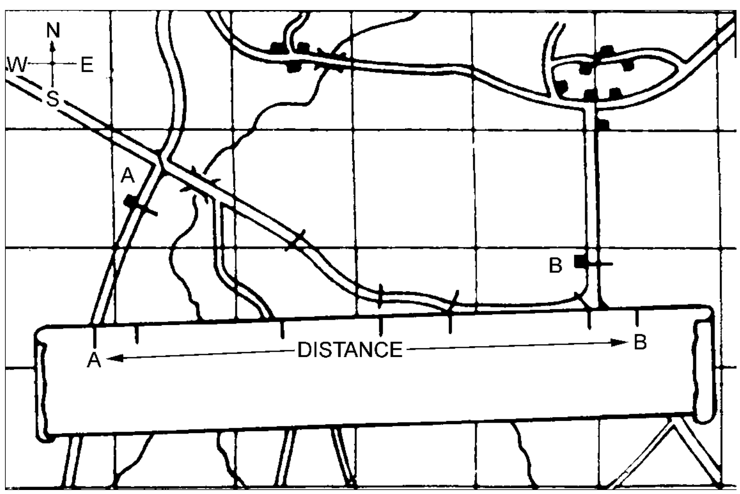
For a distance that is longer than 5 000 m, measure the first 5 000 m and mark the paper with a new line and label it ‘5 000 m’. Place the new mark at the zero or thousands mark until the A mark fits within the subdivided thousands (hundreds) bar. Add the total of that distance to the 5 000 m to create the total distance.

Measuring Along a Route Between Two Points

Sometimes cadets need to find the distance between A and B around the curves in a road along a planned route.

To measure a distance along a route between two points:

1. Lay the straight edge of a piece of paper against point A.
2. With a sharp pencil, mark point A on the paper and the map.
3. Line up the paper with the edge of the road until a curve is reached and make another mark on the paper and on the map.
4. Pivot the paper so that it continues to follow the road edge. Repeat until you reach point B.
5. Mark the paper and the map at point B.
6. Lay the paper just under the metres scale bar with the B mark at the right end of the scale. Move the paper to the left aligning the B mark with each thousand metre mark until the A mark falls within the subdivided thousands (hundreds) to the left of the zero.
7. Add the number of thousands where the B mark is, plus the number of subdivided thousands (hundreds) where the A mark is to the left of the zero, to determine the total distance.



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-25)

Figure 18-4-3 Measure Distance Along a Route

ACTIVITY

Time: 15 min

OBJECTIVE

The objective of this activity is to have the cadets measure distance on a map.

RESOURCES

- Topographical map,
- Paper, and

- Pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Distribute a map to each pair.
3. Have the cadets determine the distance:
   (a) point-to-point, and
   (b) along a route.
4. Check answers.
5. Repeat Steps 3. to 4. until complete or the time is up.

> All marks should be carefully erased from the map after each distance is determined.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

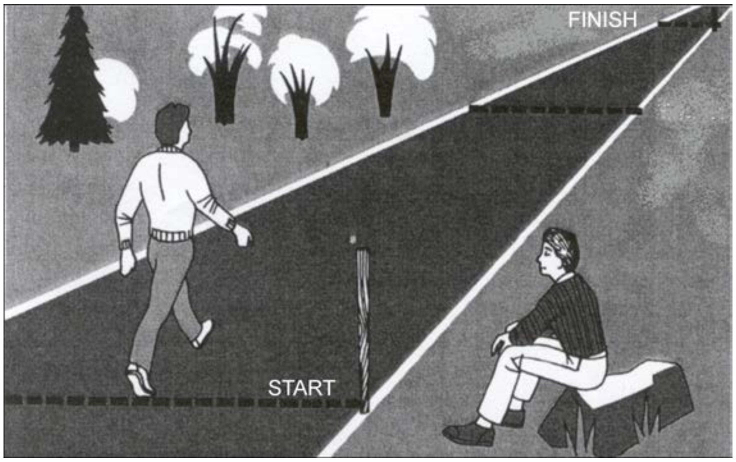
The cadets' participation in determining distance on a map will serve as the confirmation of this TP.

Teaching Point 2	**Explain, Demonstrate and Have the Cadet Pace**
Time: 15 min	Method: Demonstration and Performance

> For this skill lesson, it is recommended that instruction take the following format:
>
> 1. Explain and demonstrate the complete skill while cadets observe.
> 2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
> 3. Monitor the cadets' performance as they practice the complete skill.
>
> **Note:** Assistant instructors may be used to monitor cadet performance.

DETERMINING A PERSONAL PACE FOR 100 M

Being able to determine distance is a key skill for ground navigation. By learning how to determine distance using a personal pace, a cadet will have the skill to determine how far they have travelled, and how far they have to travel to reach their destination.



B. Kjellstrom, Be Expert With Map & Compass, Hungry Minds, Inc. (p. 53)

Figure 18-4-4 Determining Distance Using Pacing

Personal Pace. The number of paces a person walks over a distance of 100 m.

COUNTING PACES

There are two basic methods to count pace:

- count every pace (count every step); or
- count every other pace (count every left or every right step).

For example:

- count every pace: 140 paces = 100 m; or
- count every other pace: 70 paces = 100 m.

CALCULATING DISTANCE

In order to determine distance travelled, the total number of paces travelled is divided by the personal pace and multiplied by 100 m to calculate the number of metres travelled.

Formula:

$$\frac{\text{total number of paces}}{\text{personal pace}} \times 100\text{ m} = \text{total distance travelled (m)}$$

Example:

$$\frac{140\text{ paces}}{70} \times 100\text{ m} = 200\text{ m}$$

Common methods of keeping track of the number of paces travelled include:

- transferring pebbles from one pocket to another: one pebble for each 100 paces;
- using a length of cord with knots – the knotted cord is held with the hand gripping a knot and the hand is advanced one knot down the cord for every 100 paces; and

- combining the knotted cord and pebbles (eg, cord with 10 knots, pebbles transferred for each completed cord [10 knots x 100 paces each = 1000 paces/pebble]).

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have the cadets determine their personal pace.

RESOURCES

- Calculator (one per pair of cadets),
- Paper, and
- Pen/pencil.

ACTIVITY LAYOUT

Measure a 100-m course and mark it with a clearly defined start and end point on a flat trail/road.

ACTIVITY INSTRUCTIONS

1. Have the cadets walk the pace course, counting out loud, being careful to keep an accurate count.
2. Have the cadets walk the pace course three times, noting their pace count each time.
3. Have the cadets calculate their personal pace by averaging their three pace counts.
4. Have the cadets record their personal pace.

Do not walk with someone when determining a personal pace. When people walk together, they automatically adjust their pace length to match the other person's in order to stay together.

SAFETY

Boundaries must be marked and supervised.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in determining personal pace will serve as the confirmation of this TP.

Teaching Point 3 | **Describe Factors That Affect Pacing**

Time: 5 min | Method: Interactive Lecture

FACTORS THAT AFFECT PACING

This teaching point should be presented by asking the cadets what they think could affect their personal pace. Ensure to cover any points that are not suggested by the cadets.

Factors that will affect personal pace include:

Terrain. The rougher the ground, the shorter the pace.

Slopes. Pace is shorter going uphill and longer going downhill.

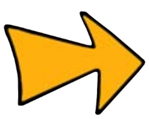
Fatigue. Will shorten a person's pace.

Equipment. Footwear with poor traction will shorten a person's pace. Carrying a heavy load will also shorten a person's pace.

Weather. Snow and rain will shorten a person's pace. The wind will increase/decrease pace length if a person is travelling with/against the wind.

Obstacles. Going around small features (eg, trees, bushes) will affect pace count unless compensated for. Compensation methods include:

- **Sidestepping.** Stepping to the side (left/right) enough paces to bypass the obstacle, pacing forward past the obstacle and sidestepping back (right/left) to return to the original line of travel. This method maintains pace accuracy, but takes time.



The paces that the cadets sidestep are not added to their total pace count.

- **Alternating sides.** In this method, the cadet alternates which side (left/right) of the obstacle they pass (eg, last obstacle was passed on the left, next will be on the right). This method is less accurate, but faster.

If obstacles are always bypassed on the same side, the line of travel will veer off in that direction unless a distant steering point (eg, tall tree, hill top, building) is used as a guide.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. How does slope affect pace?

Q2. How will weather affect pace?

Q3. What can happen if you always bypass obstacles on the same side?

ANTICIPATED ANSWERS

A1. Pace is shorter going uphill, and longer going downhill.

A2. Snow and rain will shorten a person's pace, the wind will increase/decrease pace length if a person is travelling with/against the wind.

A3. The line of travel will veer off in that direction unless a distant steering point (eg, tall tree, hill top, building) is used as a guide.

Teaching Point 4	**Demonstrate and Have the Cadet Practice Determining Distance Using the Pace-Counting Method Over Varied Terrain**
Time: 30 min	Method: Practical Activity

This activity combines the cadets' personal pace determined in TP 2 with the knowledge taught in TP 3. This allows the cadets to gain experience pacing and the effect varied terrain will have on their pace.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets determine their personal pace over varied terrain.

RESOURCES

- Calculator (one per pair of cadets),
- Paper, and
- Pen/pencil.

ACTIVITY LAYOUT

Measure two 100-m pace courses and mark each of them with clearly defined start and end points. One should be through light bush and the second through heavier bush, with slopes if possible.

ACTIVITY INSTRUCTIONS

1. Inform the cadets that they will be using their personal pace on two courses to determine the effect of terrain on pace.
2. Divide the cadets into two groups. Assign one group to each course.
3. Have the cadets, individually, pace the course five times, and then determine the difference between this count and their personal pace.
4. After 15 minutes, have the cadets switch courses.
5. Have the cadets, individually, pace the course five times, and then determine the difference between this count and their personal pace.
6. Have the cadets record their findings.

SAFETY

Boundaries must be marked and supervised.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the pacing activities will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in determining distance on a map and determining their personal pace will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 5 (390 PC).

CLOSING STATEMENT

It is important for cadets to be able to accurately determine distance on the map and on the ground in order to effectively use a topographical map to plot a route that will be followed on the ground. The skill gives the map reader confidence in their ability to know where they are at all times.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 (B-GL-382-005/PT-001) Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

C0-111 (ISBN 978-0-9740820-2-8) Tawrell, P. (2006). *Camping and Wilderness Survival: The Ultimate Outdoors Book* (2nd ed.). Lebanon, NH: Leonard Paul Tawrell.

C2-041 (ISBN 0-07-136110-3) Seidman, D., & Cleveland, P. (1995). *The Essential Wilderness Navigator*. Camden, ME: Ragged Mountain Press.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 5

EO M390.05 – DETERMINE BEARINGS ON A MAP AND ON THE GROUND

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Ensure sufficient topographical maps of the exercise area are available.

Create a list of points (designated by description and by grid reference [GR]) from the topographical map of the exercise area for the cadets to determine in TP 5.

A reconnaissance (recce) of the exercise area should be made to determine a site with several distinctive features to be used as prominent objects for the cadets to take bearings.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1–4 to introduce the cadets to the compass, the degree system, the three norths, and bearings.

Demonstration and performance was chosen for TPs 5 and 6 as it allows the instructor to explain and demonstrate determining bearings on a map and on the ground while providing an opportunity for the cadets to practice these skills under supervision.

INTRODUCTION

REVIEW

The following questions are a review of EO M390.04 (Determine Distance on a Map and on the Ground, Section 4).

QUESTIONS

Q1. After marking a map to assist in determining distance, what should be done with the marks?

Q2. Define personal pace.

Q3. What effect does weather have on a person's pace?

ANTICIPATED ANSWERS

A1. All marks should be carefully erased from the map after each distance is determined.

A2. The number of paces a person walks over a distance of 100 m.

A3. Snow and rain will shorten a person's pace while wind will increase/decrease the pace length if a person is travelling with/against the wind.

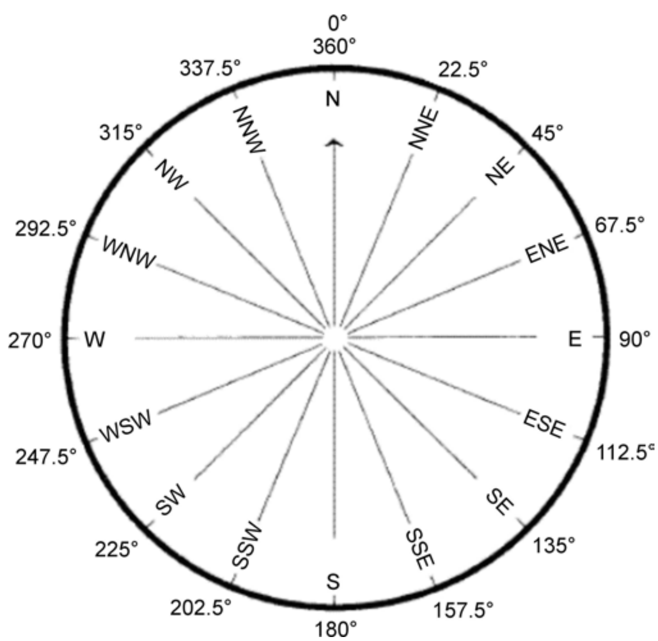
OBJECTIVES

By the end of this lesson the cadet shall have determined bearings on a map and on the ground.

IMPORTANCE

It is important for cadets to be able to determine bearings on a map and on the ground as this is one of the key skills required to navigate using a map and compass.

Teaching Point 1	**Identify and Explain the 16 Points of a Compass**
Time: 10 min	Method: Interactive Lecture



Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 18-5-1 Compass Rose

FOUR CARDINAL POINTS

The four cardinal points of the compass, measured at right angles clockwise from north are:

- north (N) at 0 and 360 degrees,
- east (E) at 90 degrees,
- south (S) at 180 degrees, and

- west (W) at 270 degrees.

FOUR INTER-CARDINAL POINTS

The four inter-cardinal points are located halfway between each of the cardinal points. Measured clockwise from north, they are:

- northeast (NE) at 45 degrees,
- southeast (SE) at 135 degrees,
- southwest (SW) at 225 degrees, and
- northwest (NW) at 315 degrees.

EIGHT INTERMEDIATE POINTS

The eight intermediate points are located halfway between each cardinal point and inter-cardinal point. Measured clockwise from north, they are:

- north-northeast (NNE) at 22.5 degrees,
- east-northeast (ENE) at 67.5 degrees,
- east-southeast (ESE) at 112.5 degrees,
- south-southeast (SSE) at 157.5 degrees,
- south-southwest (SSW) at 202.5 degrees,
- west-southwest (WSW) at 247.5 degrees,
- west-northwest (WNW) at 292.5 degrees, and
- north-northwest (NNW) at 237.5 degrees.

> As an aid to remember the different types of points:
>
> - cardinal points are designated by one letter;
> - inter-cardinal points are designated by two letters; and
> - intermediate points are designated by three letters.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Which two degree values may be used for north?

Q2. How many inter-cardinal points are there?

Q3. Name one of the intermediate points.

ANTICIPATED ANSWERS

A1. 0 and 360 degrees.

A2. Four.

A3. Either NNE, ENE, ESE, SSE, SSW, WSW, WNW, or NNW.

Teaching Point 2 | **Explain the Degree System on a Compass**

Time: 5 min | Method: Interactive Lecture

The cardinal, inter-cardinal, and intermediate points describe directions only to within one-sixteenth of a full circle. For a more precise indication of direction it is necessary to use the sub-divisions of the circle called degrees. This measurement starts and ends at north (top) and is measured in a clockwise rotation.

Degrees. The most common method of dividing a circle is by degrees. These degrees represent 360 equal angles in a complete circle and they are represented by the symbol "°" (eg, 222°).

It is important to emphasize that degrees should always be measured clockwise and always using north as the start point.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Degrees are measured in which direction?

Q2. What is the most common method of dividing a circle?

Q3. How many degrees are in a full circle?

ANTICIPATED ANSWERS

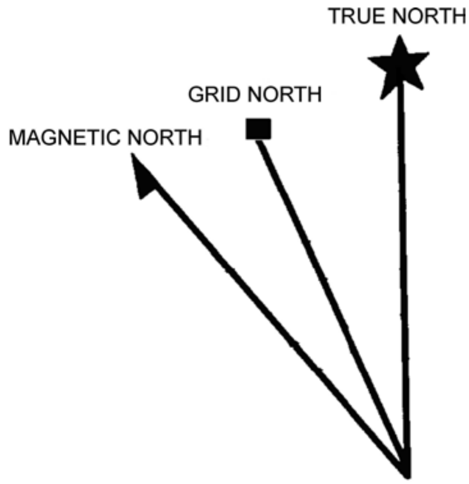
A1. Degrees are measured clockwise from north.

A2. Degrees.

A3. 360 degrees.

Teaching Point 3 | **Identify and Explain the Three Norths**

Time: 5 min | Method: Interactive Lecture



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-5-2 The Three Norths

THE THREE NORTHS

The relationship between the three norths, especially grid and magnetic, is key to using a compass on both a map and on the ground.

True North. True north is located at the top of the earth where the geographic North Pole is located, where all lines of longitude meet. In the declination diagram on the map, true north is represented by the symbol of a star, which represents the North Star, Polaris.

Grid North. Grid north is the north indicated by the grid lines (eastings) on a topographical map. The easting lines run parallel to each other and will never meet at the geographic North Pole; because of this, grid north points off slightly from true north. In the declination diagram on the map, grid north is represented by a square, which represents a map grid.

Magnetic North. Magnetic north is the location of the north magnetic pole, where the Earth's magnetic field bends back into the Earth toward the south magnetic pole. It is located in the Canadian arctic and is different from true north. It is the direction in which the compass needle points. In the declination diagram on the map, magnetic north is represented by a needle as on a compass.

The differences between the three norths affect navigation for the map and compass user, in the form of magnetic declination. Magnetic declination is the difference in bearing either between true north and magnetic north or between grid north and magnetic north.

Cadets will normally use the magnetic declination value between grid north and magnetic north when navigating using a map and compass. By setting the magnetic declination on the compass, magnetic bearings are converted to grid bearings which allow bearings taken from the map to be used on the ground and vice versa.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Which north is represented by a star?

Q2. Which north does a compass needle point towards?

Q3. Which magnetic declination value is most important to topographical map users?

ANTICIPATED ANSWERS

A1. True north.

A2. Magnetic north.

A3. The magnetic declination value between grid north and magnetic north.

Teaching Point 4	**Explain Bearings**
Time: 5 min	Method: Interactive Lecture

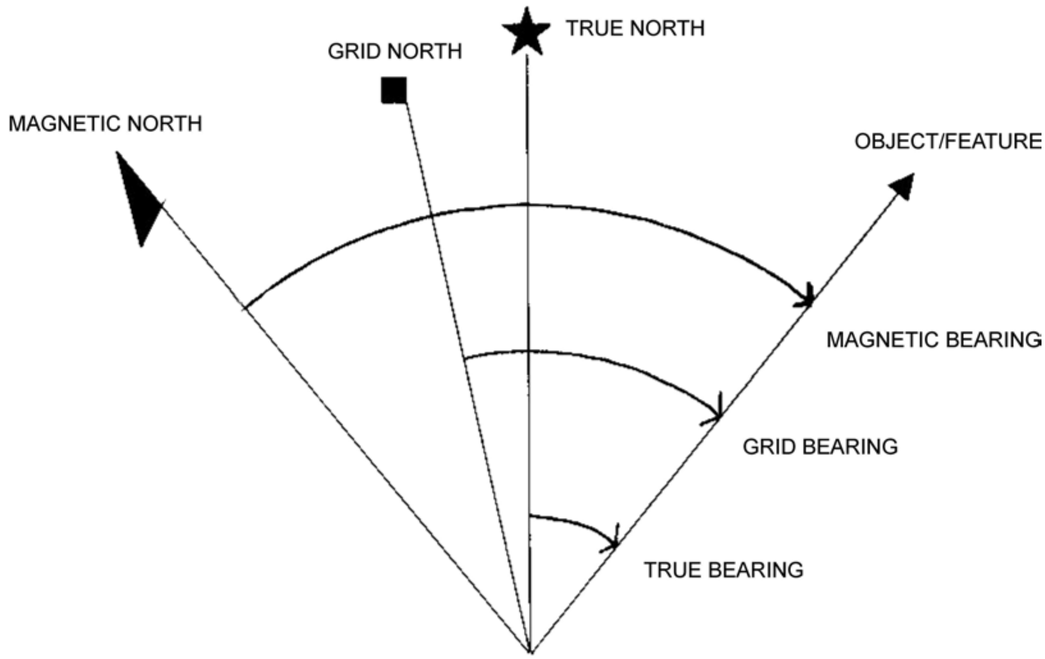
DEFINITION OF A BEARING

Bearing. A bearing is an angle that is measured clockwise, from north. It is measured in degrees and is relative to the observer.

In geometry, an angle is based on three points; a vertex, and two points, each of which designates a ray. For a bearing, the vertex is the point where the bearing is taken from, another point is north, and the last point is where the bearing is directed to. The north (either true, grid or magnetic) used identifies the type of bearing.

In ground navigation, one ray of the angle points north (usually grid north) and the other ray, known as a plotting ray, points to the object/direction.

TYPES OF BEARINGS



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-5-3 Types of Bearings

True Bearings. A true bearing is a bearing measured from true north. While map users rarely use them, directions determined using the sun, moon and stars are true bearings. Global Positioning System (GPS) receivers also use true bearings.

Grid Bearings. A grid bearing is a bearing measured from grid north. The ability to determine a bearing from a map allows a map user to plan routes or activities before going into the field, and allows an easy method of communicating information about movement or location.

Magnetic Bearings. A magnetic bearing is measured from magnetic north and is measured using a compass, which either has no option of setting magnetic declination or has the magnetic declination set to zero. A magnetic bearing is a quick and efficient method of describing a route when a map is not being used.

If a compass has its declination set to zero, bearings to objects on the ground determined by that compass are magnetic bearings. Setting the magnetic declination on a compass converts the magnetic bearings determined by that compass into grid bearings for the map being used.

Back Bearing. A back bearing is a bearing that is in exactly the opposite direction of the bearing that has been measured. A back bearing can be useful for different reasons: to return to the start location after a hike, or to calculate the bearing from an object to one's current location. The steps to calculate a back bearing are:

- if the bearing is less than 180 degrees, add 180 degrees; and
- if the bearing is greater than 180 degrees, subtract 180 degrees.

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. A bearing is another name for what?

Q2. Directions determined using the sun, moon and stars are what type of bearing?

Q3. How is knowing a back bearing useful?

ANTICIPATED ANSWERS

A1. A bearing is another name for an angle.

A2. True bearings.

A3. A back bearing can be useful for different reasons: to return to the start location after a hike, or to calculate the bearing from an object to one's current location.

Teaching Point 5 — **Explain, Demonstrate and Have the Cadets Practice Determining a Bearing on a Map**

Time: 15 min — Method: Demonstration and Performance

The ability to determine a bearing from a map allows cadets to plan routes or activities before going into the field, and allows an easy method of communicating information about movement or location. When a compass is adjusted to compensate for magnetic declination, it will allow bearings taken on the map to be used on the ground and vice versa.

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor cadet performance.

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 18-5-4 Measuring a Bearing on a Map

> A cadet will accidentally measure a back bearing if they determine the bearing in the wrong direction (eg, bearing from point B to point A instead of point A to point B).
>
> Prior to measuring a bearing on a map it is good practice to first estimate the bearing by drawing a compass rose and looking at where the bearing would be on the compass rose. This serves as a good check to ensure the cadet has not accidentally measured the back bearing.

To measure a bearing on a map:

1. Set the predetermined declination on the compass.
2. Identify and mark the start (point A) and finish (point B) points on a map.
3. Draw a plotting ray from point A to point B.
4. Lay the fully opened compass with the edge of the compass base plate along the plotting ray, and the sighting arrow pointed in the direction of travel (point A to point B).
5. Hold the compass in place, rotate the compass dial so that the compass meridian lines align with the easting lines on the map, ensuring north on the dial indicates north on the map.
6. Read the number on the compass dial at the luminous index pointer.

If the bearing is taken from point B to point A, the compass will be pointing 180 degrees in exactly the opposite direction of travel wanted. This is called a back bearing.

Have the cadets practice determining bearings on a map from the list created (before the lesson) from the topographical map of the exercise area.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in determining bearings on a map will serve as the confirmation of this TP.

Teaching Point 6 — **Explain, Demonstrate, and Have Cadets Determine the Bearing of a Prominent Object**

Time: 10 min — Method: Demonstration and Performance

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while the cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor the cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor the cadets' performance.

A compass can be used to determine the bearing for a direction of travel and from one's current location to a prominent object. The ability to take a bearing of a prominent object also allows the cadet to look for a prominent object as a steering point when they need to follow a given bearing. A bearing is a quick and accurate method for describing the direction of travel.

A prominent object is something that is usually tall and easily recognizable (eg, church steeple, tall tree or hilltop).

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Figure 18-5-5 Determining a Bearing

After the cadets have demonstrated the skill, have them practice determining the bearings of other prominent objects. This location should be predetermined by the recce IAW the pre-lesson instructions.

To determine the bearing of a prominent object:

1. Set the predetermined declination on the compass.
2. Hold the compass at eye level and at arm's length, and turn to face the prominent object (as illustrated in Figure 18-5-5).
3. Aim at the object using the compass sight, ensuring the sighting line is in line with the index pointer.
4. Adjust the compass cover so the compass dial is seen in the sighting mirror.
5. Look in the mirror and turn the compass dial until the magnetic needle is over the orienting arrow (put the red in the bed).
6. Read the number on the compass dial at the luminous index pointer.

Inform the cadets that when taking a bearing of a prominent object they will get different readings than other cadets unless they are all using the same line of sight to that prominent object (eg, standing in the same spot).

CONFIRMATION OF TEACHING POINT 6

The cadets' participation in determining bearings on the ground will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets’ participation in determining bearings on a map and on the ground will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-803/PG-001, Chapter 3, Annex B, Appendix 5 (390 PC).

CLOSING STATEMENT

It is important for cadets to be able to determine bearings on a map and on the ground as this is one of the key skills required to navigate using a map and compass. Experience in this skill will give the cadets confidence in their ability to navigate in the field.

INSTRUCTOR NOTES/REMARKS

To preserve and reuse the maps, the maps should be covered or coated to allow the use of wet-erase markers instead of pencils or pens.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 6

EO C390.01 – IDENTIFY TYPES OF MAPS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handout located at Annex E for each cadet.

The following maps are the minimum required to instruct this lesson: topographical, orienteering, street, and road. However, as many examples of different types of maps should be collected.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1–3 to orient the cadets to maps and present basic or background material on the purposes, types, and care of maps.

Demonstration and performance was chosen for TP 4 as it allows the instructor to explain and demonstrate folding a map while providing an opportunity for the cadets to practice folding a map under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified types of maps.

IMPORTANCE

It is important for cadets to understand the types of maps in order to choose the appropriate map to meet their needs.

Teaching Point 1	**Explain the Purpose of a Map**
Time: 5 min	Method: Interactive Lecture

THE PURPOSE OF A MAP

Maps are designed to give the user specific information based on its type. While there are many different types of maps, there is information that is common to most types.

> The art and science of making maps is called cartography. The oldest known maps are preserved on Babylonian clay tablets from about 2300 B.C.

A MAP IS A SCALE REPRESENTATION OF THE GROUND

A map is usually drawn to scale, that is, it is a proportionately smaller representation of the area depicted. However, many maps distort key features to highlight or emphasize them on the map. For example, roads are almost always depicted wider than they would be to scale. Scales may range from 1 : 5 000 (very high detail map) to 1 : 10 000 000 (a globe or a map of the world).

A MAP USES SYMBOLS TO REPRESENT BOTH PHYSICAL AND MAN-MADE FEATURES FOUND ON THE GROUND

Many features on a map are too small to see if depicted to scale. Cartographers (map-makers) use internationally accepted symbols to represent both natural and man-made features. These symbols are commonly known as conventional signs.

Maps Identify Locations Such as Towns, Lakes, and Rivers, by Name

Locations such as towns, lakes, and rivers are identified by name. Other important features such as mountains, highways, and political boundaries are also identified.

Map Designs Reflect the Needs of the User

Map designs reflect the individual needs of the user. Urban planners need a map that shows where water, sewer, and electrical lines are located. Travellers need to get to where they want to be, whether it is within a city or across the country. Education providers need maps that show the demographics (the statistical data of a population such as age, education, etc) of the region to know where their students may be coming from. Cadets need a map that will help them navigate, whether it is planning a flight or using a compass to trek to a survival site.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is the purpose of a map?

Q2. Internationally accepted symbols used to represent both natural and man-made features are known as what?

Q3. Maps identify many types of locations by name. Identify three.

ANTICIPATED ANSWERS

A1. Maps are designed to give the user specific information based on its type.

A2. These symbols are commonly known as conventional signs.

A3. Locations such as towns, lakes, and rivers are identified by name. Other important features such as mountains, highways, and political boundaries are also identified.

Teaching Point 2	**Describe the Various Types of Maps**
Time: 5 min	Method: Interactive Lecture

VARIOUS TYPES OF MAPS

Maps contain information based on their type.

If the type of map is available as a training aid, it should be displayed when it is being discussed.

Topographical

This type of map is commonly used by the military. The purpose of a topographical map is to present a picture of the ground as it really exists. Topographical maps show as much detail as the scale allows, generally 1 : 25 000, 1 : 50 000, or 1 : 250 000. This is the main type of map used by cadets for ground navigation.

Orienteering

Through the International Orienteering Federation (IOF), specific rules and standards have been set for the production of orienteering maps, including colour, symbols, and scales. They are more detailed than topographical maps, with reference to vegetation and landforms.

Political

Political maps show countries, provinces, counties and other political borders. Most globes show the political boundaries of the world.

Street

Street maps are designed to help commuters and tourists locate key sites such as roads and highways, police stations, fire halls, hospitals, schools, parks and more within a metropolitan area (eg, town, city).

Road

Road maps are designed to show the roads and highways over a large area like a province or territory. They show how to travel between cities, towns, parks, etc.

Statistical

Statistical maps show statistical information such as the production levels of crops or minerals across a country.

Relief

Relief maps are a three-dimensional representation, usually of terrain. The terrain elevation is usually exaggerated by a factor between five and ten. This helps to visually recognize the terrain features.

Outline

Outline maps show large areas with only borders, and coastlines showing. They normally have a high map scale (eg, 1 : 10 000 000).

Air Photo

Air photo maps are actual pictures used in reconnaissance or to create many of the maps listed. They are the most accurate in that they show the actual area. Satellites pictures now represent the next level of air photo maps with the ability to zoom in on almost any area in the world.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the main type of map used by cadets for ground navigation?

Q2. To travel from one city to another, what type of map is best?

Q3. Most maps are flat (two dimensional). What type discussed is not?

ANTICIPATED ANSWERS

A1. Topographical maps.

A2. A road map.

A3. Relief maps.

Teaching Point 3	**Describe How to Care for a Topographical Map**
Time: 5 min	Method: Interactive Lecture

HOW TO CARE FOR A TOPOGRAPHICAL MAP

Some maps produced are already waterproofed, however, most maps are not. Paper maps are expensive and may be easily damaged. Precautions must be taken to protect them from water, dirt and wind. Maps, when exposed to water, will become soggy, start to deteriorate and become very easy to tear.

Waterproofing the Map

Preparing a map for exposure to the elements is a vital step in prolonging the life of the map. Ways to prepare a map for waterproofing include:

- **Resealable Plastic Bag Method.** This method requires a large heavyweight resealable clear plastic bag and waterproof tape (eg, clear packing tape). Place the folded map into the bag with one edge at the sealed opening and an adjacent edge along one of the two sides of the bag. Cut enough tape to completely adhere to one edge of the bag from corner to corner. Stick one half of the tape along one edge of the bag that overhangs the map, from corner to corner. Flip the bag over (on to the side of the map that is not being used) and fold the tape down on itself and the other side of the bag. Fold the empty portion of the bag over the backside of the map and tape it down.
- **Contact Paper.** Sometimes called Map Tac, this is a clear plastic that has an adhesive on one side. Covering the map with contact paper will waterproof the map; however, it will become very stiff. A wet-erase marker or grease pencil will be required to write on the map. Use rubbing alcohol to remove permanent marker.
- **Chemical Coatings.** Chemical coatings are effective in waterproofing maps; however, they must be applied carefully in a well-ventilated area. They are sprayed or brushed onto the map. The coating must be allowed to fully dry before using the map.

Drying Technique

If a map gets wet, carefully open it fully and let it dry completely on a flat clean surface. If it dries when it is folded, it may stick together, ruining the map.

Only Partially Opening in a Strong Wind

A map should never be fully opened in a strong wind. It should be opened to the area being used, and refolded along the original fold lines.

Using Pencil and Erasing When Work is Complete

Use only pencil to mark your maps and erase all markings gently. Maps that are protected by plastic can be marked using wet-erase markers or grease pencils.

Storing the Map

Maps should be stored in a dry place, rolled, folded, or laid flat.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Name the three types of waterproofing techniques discussed.

Q2. How should a map be handled in a strong wind?

Q3. Where should maps be stored?

ANTICIPATED ANSWERS

A1. Resealable plastic bag method, contact paper, and chemical coatings.

A2. It should be opened to the area being used, and refolded along the original fold lines.

A3. Maps should be stored in a dry place.

Teaching Point 4	**Explain, Demonstrate, and Have Cadets Practice Folding a Map**
Time: 10 min	Method: Demonstration and Performance

For this skill lesson, it is recommended that the instruction take the following format:

1. Explain and demonstrate folding the map.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

The cadets will use Annex E as their map. This annex also shows the steps in pictorial format.

Note: Assistant instructors may be used to monitor the cadets' performance.

The steps to fold a map:

Lay map face up (north at the top), fold map in half by bringing the top of the map sheet down to the bottom of the map sheet.

Fold the top half of the map sheet up in half again, then turn the map over and fold the bottom half to match the top half.

Fold the ends of the map in half from left to right.

Fold each of the open ends back into half again so that the map name and index to adjacent map sheet appears on the outside.

If the map is folded correctly, it should now open like an accordion in the shape of an M with the map name visible on top.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in folding a map will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. A map is usually drawn to scale. What does this mean?

Q2. What type of map should be used to travel from the Same City Museum to the Same City Zoo?

Q3. If the map is folded correctly, how should it now look?

ANTICIPATED ANSWERS

A1. A map is a proportionately smaller representation of the area depicted.

A2. A street map.

A3. The map should now open like an accordion in the shape of an M with the map name visible on top.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for cadets to understand the types of maps in order to choose the appropriate map.

INSTRUCTOR NOTES/REMARKS

The following types of maps are the minimum required to instruct this lesson:

- topographical,
- orienteering,
- street, and
- road.

REFERENCES

A2-036 A-CR-CCP-121/PT-001 Director Cadets 3. (2003). *Royal Canadian Army Cadet Reference Book*. Ottawa, ON: Department of National Defence.

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

C0-007 (ISBN 0-02-029265-1) Kjellstrom, B. (1994). *Be Expert With Map and Compass: The Complete Orienteering Handbook*. New York, NY: Hungry Minds, Inc.

C2-041 (ISBN 0-07-136110-3) Seidman, D., & Cleveland, P. (1995). *The Essential Wilderness Navigator*. Camden, ME: Ragged Mountain Press.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 7

EO C390.02 – INTERPRET CONTOUR LINES

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts located at Annexes F and H for each cadet.

Create slides of Annexes G and I.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to illustrate to the cadets how to interpret contour lines.

A practical activity was chosen for TP 2 as it is an interactive way to introduce cadets to interpreting contour lines in a safe, controlled environment. This activity contributes to the development of ground navigation skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have interpreted contour lines.

IMPORTANCE

It is important for cadets to be able to interpret contour lines in order for them to navigate through or around different elevations.

Teaching Point 1	**Explain How Contour Lines Are Interpreted to Indicate the Shape of the Ground**
Time: 15 min	Method: Interactive Lecture

HOW CONTOUR LINES ARE INTERPRETED TO INDICATE THE SHAPE OF THE GROUND

Through learning how to interpret contour lines, cadets will be better able to understand the relationship between contour lines on the map to the features on the ground.

Relief

Relief, or elevation, is the shape of the ground on a vertical plane. Relief on a map is the representation of the height and shape of the ground in intervals of metres or feet.

There are two distinct elements in the representation of relief, including:

- **Representation of Height.** This is a fact-based representation of the height of the land and of landforms. Differences in appearance on the map (as compared to the ground) will arise from the type, density and accuracy of the information provided.
- **Representation of Shape.** This may be largely artistic, and the methods used will vary between maps.

Contour Lines and Intervals

A contour line joins points of equal elevation in relationship to sea level, and is the standard method of showing relief on topographical maps.

Contour lines are shown at a regular vertical interval. This difference in height between contours lines is called contour interval. The contour interval is always stated in the margin of the map, normally near the graphic scales.

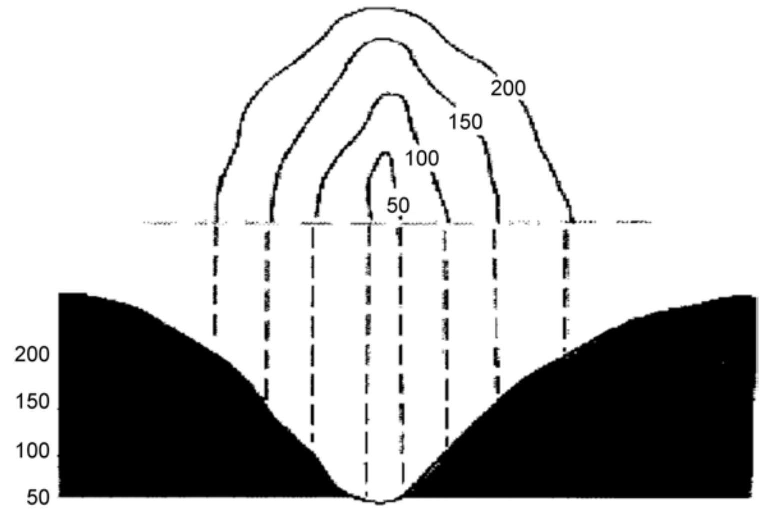
Contour lines are normally drawn as continuous brown lines. Every fourth or fifth contour line is called an “Index Contour” and is shown by a thicker brown line. This helps when reading and counting the contour lines to determine a height.

The Shape of the Ground

Interpreting contour lines provides a visualization of the shape of the ground, which is shown on the map by contour lines and contour intervals. Correct interpretation of the shape of the ground from interpreting contour lines requires practice. It is essential to study the various features, comparing the map to the ground in each case.

Types of Slopes

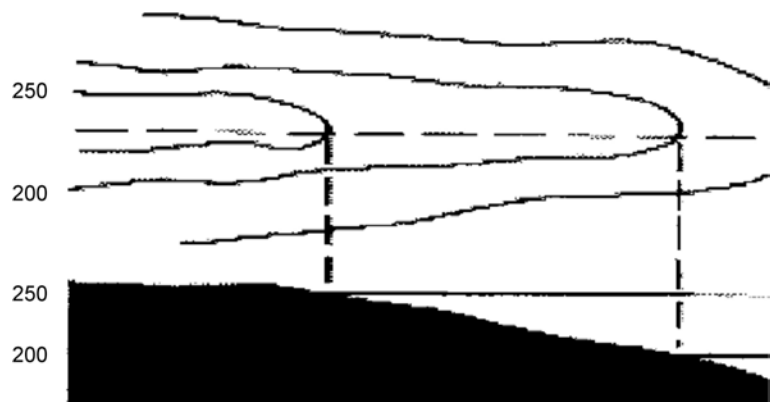
- **Steep.** Contour lines are close together. There is less distance to travel to gain or lose elevation.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 32)

Figure 18-7-1 Steep Slopes

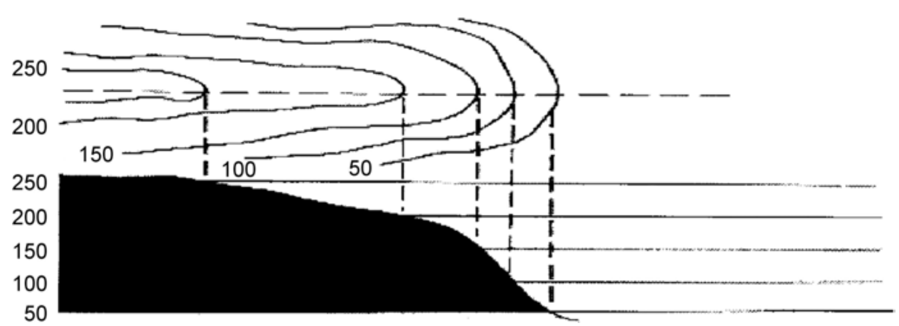
- **Gentle.** Contour lines are further apart. There is a greater distance to travel to gain or lose elevation.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 32)

Figure 18-7-2 Gentle Slope

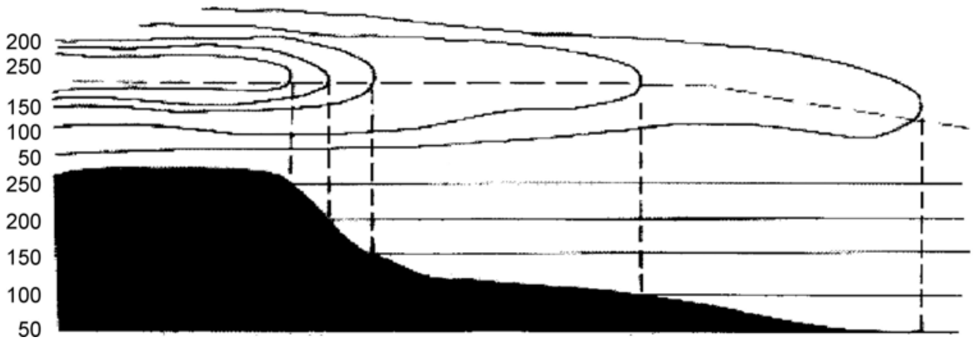
- **Uniform.** Contours are an equal distance apart. The slope remains constant in its rise/decline, whether the slope is steep or gentle.
- **Convex.** The spacing between contour lines moving down a slope decreases. The middle of the slope seems to bulge outward – appearing convex.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 32)

Figure 18-7-3 Convex Slope

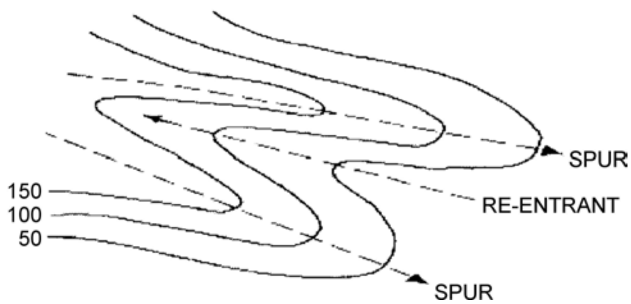
- **Concave.** The spacing of the contour lines increases towards the bottom of the slope. The middle of the slope seems to depress inward – appearing concave.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 32)

Figure 18-7-4 Concave Slope

- **Spurs.** A contour feature that extends out from a slope.
- **Re-Entrants.** A contour feature that cuts back into a slope.



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 32)

Figure 18-7-5 Spurs and Re-Entrant

Distribute Annex F to each cadet and have them complete the worksheet. Correct the answers using the answer key located at Annex G.

CONFIRMATION OF TEACHING POINT 1

The cadets' completion of the matching contour line worksheet will serve as the confirmation of this TP.

Teaching Point 2	**Have the Cadets Interpret Contour Lines**
Time: 10 min	Method: Practical Activity

Have cadets work independently (or in small groups if it suits the needs of the class).

The cadets will choose the easiest route, based on slope as indicated by the contour lines.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadet interpret contour lines on a map.

RESOURCES

- Contour line worksheet located at Annex H, and
- Relief version of map located at Annex I.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Hand out contour line worksheet.
2. Have cadets draw a route, based on the features (especially elevations), on their map.
3. Have cadets explain why they chose their route, emphasizing the contour lines that would be traversed.
4. When cadets have finished, display the slide of Annex I and discuss the terrain and its affects on possible routes.

Inform the cadets that there is no right answer. Routes chosen can be based on many factors, such as: differing hiking abilities, fitness levels, personal preferences, etc.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' completion of the two contour line worksheets will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for cadets to be able to interpret contour lines in order to navigate through or around differences of elevation. This skill will require practice.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 8

EO C390.03 – ORIENT A MAP BY INSPECTION

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy Annex J. Cut the first page along the dotted lines and post the three locations around the training area (eg, on walls, trees, etc). Ensure that the locations match the demonstration map.

Ensure sufficient topographical maps of the exercise area are available.

A recce of the exercise area should be made to determine a site where the topographical map of the exercise area may be oriented by inspection. The site chosen should have a minimum of three distinctive features to be used as prominent objects by the cadets in order to orient their maps.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to give the cadets an overview of the purpose of orienting a map.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate orienting a map by inspection while providing an opportunity for the cadets to practice the skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have oriented a map by inspection.

IMPORTANCE

It is important for cadets to be able to orient a map by inspection in order to match the symbols on the map with the terrain it represents. It also allows the cadet to confirm or discover their approximate location on the map.

Teaching Point 1	**Explain the Purpose of Orienting a Map**
Time: 5 min	Method: Interactive Lecture

PURPOSE OF ORIENTING A MAP

Orienting a map by inspection means to rotate the map so that the map directions and map detail correspond with those on the ground. This is a simple and quick way of orienting a map, if the person's approximate location is known. If the approximate location is unknown, orienting a map by inspection is much more difficult as similar features may confuse map readers and thereby they orient themselves incorrectly. If more unique features are visible and shown on the map, it will be easier to find one's approximate location.

Orienting the map does a number of things:

- it makes it easy to relate the map to the ground;
- it helps to confirm, or possibly find, a person's approximate location; and
- when moving over a complex route, or when travelling over long distances, it helps keep a hiker on the right track.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is physically done to the map when it is being oriented?

Q2. What key piece of information makes orienting a map by inspection simple and quick?

Q3. Orienting the map does a number of things. Describe one.

ANTICIPATED ANSWERS

A1. The map is rotated so that the map directions and map detail correspond with those on the ground.

A2. The person's approximate location.

A3. Three possible answers include:

- it makes it easy to relate the map to the ground;
- it helps to confirm, or possibly find, a person's approximate location; and
- when moving over a complex route, or when travelling over long distances, it helps keep a hiker on the right track.

Teaching Point 2 | **Explain and Demonstrate How to Orient a Map**

Time: 20 min | Method: Demonstration and Performance

After explaining each step, demonstrate using the training aids.

After the demonstration, have the cadets orient a topographical map of the exercise area using the prominent objects they observe.

To orient a map, complete the following steps:

Identify the approximate location on the map (the ‘You’).

Select three prominent objects around your current location and find them on the map (house, church and bridge).

Rotate the map until all identified objects on the map line up with the objects located on the ground.

Ensure that all features line up with the positions on the map.

Show page 18J-2.

ACTIVITY

Time: 15 min

OBJECTIVE

The objective of this activity is to have the cadets orient a map by inspection.

RESOURCES

- Topographical map of the exercise area, and
- The cadet’s location on the map.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have cadets confirm their location on the map.
2. Have cadets select three prominent objects around their current location and find them on the map.
3. Have cadets rotate the map until all identified objects on the map line up with the objects located on the ground.
4. Ensure all features line up with the positions on the map.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in orienting a map by inspection will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for cadets to be able to orient a map by inspection in order to match the symbols on the map with the terrain it represents. It also allows the cadet to confirm or discover their approximate location on the map.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 9

EO C390.04 – ORIENT A MAP USING A COMPASS

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Ensure sufficient topographical maps of the exercise area are available.

Photocopy Annex K. Cut the first page along the dotted lines and post the three locations around the training area (eg, on walls, trees, etc). Ensure that the locations match the demonstration map. Ensure that the north of the demonstration map corresponds to the north of the training area, which will allow the map to be oriented with a compass.

Calculate the magnetic declination for the topographical map of the exercise area.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to give the cadets an overview of the purpose of orienting a map.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate orienting a map using a compass while providing an opportunity for the cadets to practice the skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have oriented a map using a compass.

IMPORTANCE

It is important for cadets to orient a map using a compass in order to match the symbols on the map with the terrain it represents. It also allows the cadet to confirm or discover their approximate location on the map.

Teaching Point 1	**Explain the Purpose of Orienting a Map**
Time: 5 min	Method: Interactive Lecture

PURPOSE OF ORIENTING A MAP

Orienting a map using a compass means to rotate the map so that the north of the map matches the north of the ground. This is confirmed, visually, with the map directions and map detail corresponding with those on the ground. This is a simple and quick way of orienting a map if the person's approximate location is known. If the approximate location is unknown, orienting a map using a compass can still be done, but this does not determine the map reader's location. Similar features may confuse map readers and thereby they orient themselves incorrectly. If more unique features are visible and are shown on the map it will be easier to find one's approximate location.

Orienting the map does a number of things:

- it makes it easy to relate the map to the ground;
- it helps to confirm, or possibly find, a person's approximate location; and
- when moving over a complex route, or when travelling over long distances, it helps keep a hiker on the right track.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is physically done to the map when it is being oriented?

Q2. Can a map be oriented using a compass if the person's location is unknown?

Q3. Orienting the map does a number of things. Describe one.

ANTICIPATED ANSWERS

A1. The map is rotated so that the map directions and map detail correspond with those on the ground.

A2. Yes. Also, the oriented map may assist map readers in discovering their location.

A3. Three possible answers include:

- it makes it easy to relate the map to the ground;
- it helps to confirm, or possibly find, a person's approximate location; and
- when moving over a complex route, or when travelling over long distances, it helps keep a hiker on the right track.

Teaching Point 2 — **Explain, Demonstrate and Have the Cadets Practice Orienting a Map Using a Compass**

Time: 20 min — Method: Demonstration and Performance

After explaining each step, demonstrate using the training aids.

After the demonstration, the cadets will orient the topographical map of the training area.

To orient a map using a compass, complete the following steps:

1. Identify the cadet's approximate location on the map (the 'You').
2. Set the magnetic declination.
3. Set the compass dial to north.
4. Lay the compass flat on the map with the cover open.
5. Point the mirror to north (top of the map).
6. Align the compass meridian lines with the map easting lines (use the arrow beside the 'You' on the demonstration map).
7. Turn the map until the magnetic needle lines up with the orienting arrow.
8. Ensure that all features (the house, church and bridge) line up with their positions on the map.

Show page 18K-2.

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have the cadets orient a map using a compass.

RESOURCES

- Topographical map of the exercise area,
- Compass,
- Predetermined magnetic declination, and
- The cadet's location on the map.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have cadets confirm their location on the map.
2. Have cadets set the magnetic declination.
3. Have cadets set the compass dial to north.
4. Have cadets lay the compass flat on the map with the cover open.
5. Have cadets point the mirror to north (top of the map).
6. Have cadets align the compass meridian lines with the map easting lines.
7. Have cadets rotate the map until the magnetic needle lines up with the orienting arrow.
8. Have cadets ensure that all features line up with their positions on the map.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in orienting a map using a compass will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for cadets to orient a map using a compass in order to match the symbols on the map with the terrain it represents. It also allows the cadet to confirm or discover their approximate location on the map.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 10

EO C390.05 – CALCULATE MAGNETIC DECLINATION

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the handouts located at Annexes L and N for each cadet.

Create slides of Annex M.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to orient the cadet to calculating magnetic declination and present basic material.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate calculating magnetic declination while providing an opportunity for the cadets to practice calculating magnetic declination under supervision.

An in-class activity was chosen for TP 3 as it is an interactive way to reinforce calculating magnetic declination.

INTRODUCTION

REVIEW

N/A.

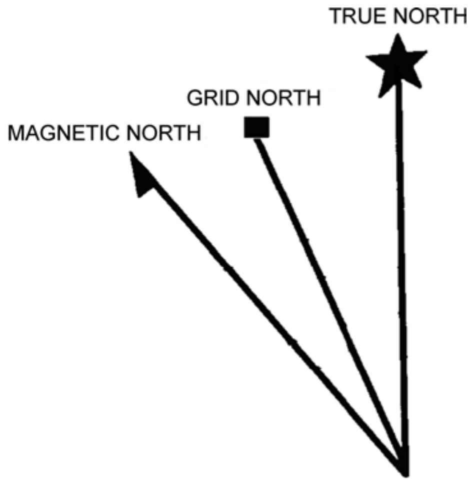
OBJECTIVES

By the end of this lesson the cadet shall have calculated magnetic declination.

IMPORTANCE

It is important for cadets to know how to calculate magnetic declination as it provides the cadet with confidence that they will arrive at their destination when navigating on a bearing. Not accounting for magnetic declination may affect navigation, as the cadet may travel off the intended route. For every one degree of magnetic declination not accounted for, a person would be approximately 17 m off for each kilometre travelled.

Teaching Point 1	**Discuss the Three Norths and Magnetic Declination**
Time: 5 min	Method: Interactive Lecture



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 18-10-1 The Three Norths

THE THREE NORTHS

The relationship between the three norths, especially grid and magnetic, is key to using a compass on both a map and on the ground.

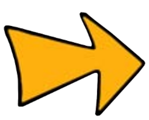
True North. True north is located at the top of the earth where the geographic North Pole is located and where all lines of longitude meet. In the declination diagram on the map, true north is represented by the symbol of a star, which represents the North Star, Polaris.

Grid North. Grid north is the north indicated by the grid lines (eastings) on a topographical map. The easting lines run parallel to each other and will never meet at the geographic North Pole; because of this, grid north points off slightly from true north. In the declination diagram on the map, grid north is represented by a square, which represents a map grid.

Magnetic North. Magnetic north is the location of the magnetic north pole, where the Earth's magnetic field bends back into the Earth toward the south magnetic pole. It is located in the Canadian arctic and is different from true north. It is the direction in which the compass needle points. In the declination diagram on the map, magnetic north is represented by a needle as on a compass.

MAGNETIC DECLINATION

The differences between the three norths affect navigation for the map and compass user, in the form of magnetic declination. Magnetic declination is the difference in bearing either between true north and magnetic north or between grid north and magnetic north.



The line of zero declination, as of 2008, runs through Baker Lake, Nunavut, Churchill, Man., and Sioux Lookout, Ont.

Cadets will normally use the magnetic declination value between grid north and magnetic north when navigating using a map and compass. By setting the magnetic declination on the compass, magnetic bearings are converted to grid bearings which allow bearings taken from the map to be used on the ground and vice versa.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Which north is represented by a star?

Q2. Which north does a compass needle point towards?

Q3. Which magnetic declination value is most important to topographical map users?

ANTICIPATED ANSWERS

A1. True north.

A2. Magnetic north.

A3. The magnetic declination value between grid north and magnetic north.

Teaching Point 2 — **Explain, Demonstrate and Have Cadets Calculate Magnetic Declination**

Time: 15 min — Method: Demonstration and Performance

Distribute Fact Sheet located at Annex L. When using the slides from Annex M, cover the right section (the equations) and reveal each step as required. Example 1 should be used as the demonstration and Example 2 to be performed step-by-step by the cadets. If more examples are required, use the questions from the worksheet. However, Question 9 should not be used as an example, only as a question for the cadets to calculate as it involves an east/west declination switch.

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor cadet performance.

LOCATING DECLINATION DIAGRAM

Calculating current declination uses the information provided by the declination diagram on a map and the information printed directly underneath. This diagram is most often found on the right side of the map in the marginal information.

IDENTIFING THE FORMULA USED TO CALCULATE MAGNETIC DECLINATION

Several mathematical principles are used in the formula to calculate magnetic declination. Understanding of the mathematical order of operations is essential.

Formula: Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination

Grid Magnetic Angle. The angle between grid north and magnetic north, found on the declination diagram. Written in degrees and minutes.

> 1 degree (°) = 60 minutes ('), similar to calculating time (eg, 1 hour = 60 minutes).
>
> This ratio is very important to remember when adjusting the grid magnetic angle to the current declination. This is where many errors occur.

Current Year. The current calendar year.

Year of Declination Information. Found below the declination diagram.

Annual Change. Found below the declination diagram and is written in minutes.

> It is important that the annual change be inserted into the formula correctly:
>
> - If annual change is **increasing**, insert into formula as a **positive** number.
> - If annual change is **decreasing**, insert into formula as a **negative** number.

Current Declination. This is the result of the formula. It is the magnetic declination to be set on the compass.

West Declination. When magnetic north is west (to the left) of grid north on the declination diagram.

East Declination. When magnetic north is east (to the right) of grid north on the declination diagram.

> If the current declination calculates to a negative number, an east declination changes to a west declination and vice versa.

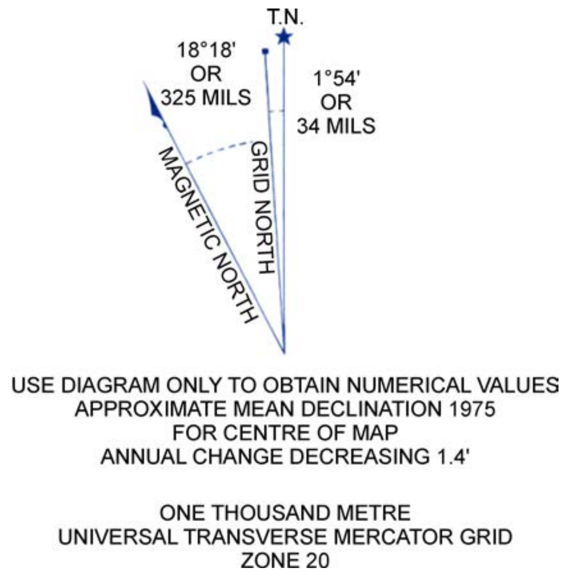
CALCULATING MAGNETIC DECLINATION

Steps to calculate magnetic declination:

1. Identify grid magnetic angle.
2. Identify current year.
3. Identify year of declination information.
4. Identify annual change.
5. Determine whether the annual change is positive or negative.
6. Input the information into the formula.
7. Solve for current declination.
8. Determine whether the magnetic declination is east or west.

Show slide of Example 1 of Calculating Magnetic Declination located at Annex M.

Example 1:



Natural Resources Canada, 2008, Topo Declination Diagram. Retrieved April 11, 2008, from http://gsc.nrcan.gc.ca/geomag/field/magdec_e.php?p=1

Figure 18-10-2 Declination Diagram

From Figure 18-10-2:

1. Grid Magnetic Angle: 18° 18'
2. Current Year: 2008 (used for this example)
3. Year of Declination Information: 1975
4. Annual Change: decreasing 1.4'
5. Decreasing means 1.4' becomes -1.4'
6. Input the information into the formula:
   18° 18' + [(2008 - 1975) x (-1.4')] = Current Declination
7. Solve for current declination.
   (a) 18° 18' + [(33) x (-1.4')] = Current Declination
   (b) 18° 18' + [-46.2'] = Current Declination
   (c) 18° 18' - 46.2' = Current Declination

Since 46.2' cannot be easily subtracted from 18° 18', 1° is converted into 60' (similar to time calculations), which converts 18° 18' to 17° 78'.

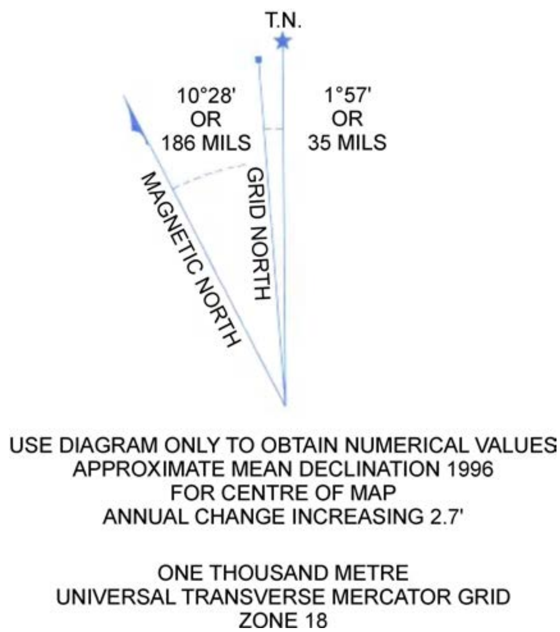
(d) 17° 78' - 46.2' = Current Declination

(e) 17° 31.8' = Current Declination

8. Since magnetic north is west of grid north and the result is positive, the magnetic declination for the topographical map in 2008 is 17° 31.8' west declination.

Show slide of Example 2 of Calculating Magnetic Declination located at Annex M.

Example 2:



Canada Centre for Mapping, Bancroft 31 F/4, Natural Resources Canada

Figure 18-10-3 Declination Diagram

From Figure 18-10-3:

1. Grid Magnetic Angle: 10° 28'

2. Current Year: 2008 (used for this example)

3. Year of Declination Information: 1996

4. Annual Change: increasing 2.7'

5. Increasing means 2.7' becomes +2.7'

6. Input the information into the formula:
10° 28' + [(2008 - 1996) x (+2.7')] = Current Declination

7. Solve for current declination.

(a) 10° 28' + [(12) x (+2.7')] = Current Declination

(b) 10° 28' + [+32.4'] = Current Declination

(c) 10° 28' + 32.4' = Current Declination

(d) 10° 60.4' = Current Declination

> Since 60.4' is greater than 1°, 60' is converted into 1° (similar to time calculations), which converts 10° 60.4' to 11° 0.4'.

(e) 11° 0.4' = Current Declination

8. Since magnetic north is west of grid north and the result is positive, the magnetic declination for the topographical map in 2008 is 11° 0.4' west declination.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 3 — **Have Cadets Calculate Magnetic Declination**

Time: 30 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets calculate magnetic declination.

RESOURCES

- Magnetic declination worksheet located at Annex N, and
- Pen/pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Distribute a worksheet to each cadet.
2. Have the cadets individually complete as many problems on the worksheet as possible in 20 minutes.
3. Correct the worksheet with the cadets using the answer key located at Annex O.
4. Answer any questions the cadets may have on calculating magnetic declination.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the in-class activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' calculation of magnetic declination will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing how to calculate magnetic declination provides the cadet with confidence that they will arrive at their destination when navigating on a bearing.

INSTRUCTOR NOTES/REMARKS

Cadets may use a calculator if they wish.

REFERENCES

A2-041 B-GL-382-005-PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 11

EO C390.06 – DETERMINE DIRECTION USING THE SUN

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for this lesson as it allows the instructor to explain and demonstrate determining direction using the sun while providing an opportunity for the cadets to practice the skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have determined direction using the sun.

IMPORTANCE

It is important for the cadets to be able to determine direction using the sun so in a survival situation they can navigate to and from their survival site without the aid of a compass or map.

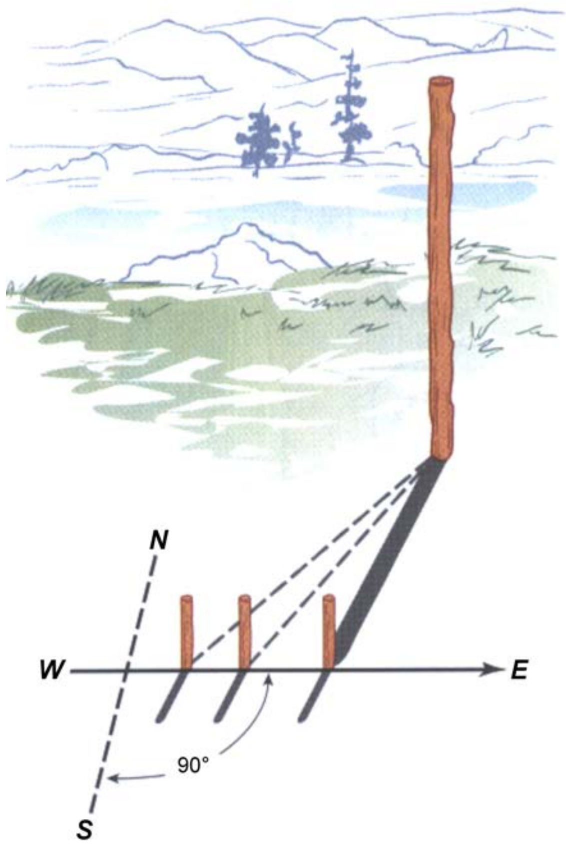
Teaching Point 1 | **Explain, Demonstrate and Have Cadets Determine Direction Using a Shadow Stick**

Time: 15 min | Method: Demonstration and Performance

DETERMINE DIRECTION USING A SHADOW STICK

In a survival situation, one may not have a map of the area, a compass or the use of a watch. On this occasion, it may be necessary to use natural guides, such as the sun to determine direction. The sun can be used to find north using a branch or stick to cast a shadow on the ground.

A shadow stick works because the sun always travels east to west, even though it may not rise at exactly 90 degrees or set at exactly 270 degrees. The tip of the shadow stick's shadow moves in the opposite direction, so the first shadow tip is always west of the second, anywhere on earth. Improvised methods are only general indicators of direction. The shadow stick is more accurate and easier to read when the stick is narrow.



National Association of Search and Rescue, Fundamentals of Search and Rescue, Jones and Bartlett Publishers, Inc. (p. 76)

Figure 18-11-1 Shadow Stick

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have the cadets construct a shadow stick and determine direction using the sun.

RESOURCES

Stick.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of three or four.
2. Have the cadets find a 45–60 cm straight stick.
3. Find a level vegetation-free spot. Push the 45–60 cm straight stick into the ground about 10 cm so it will remain upright, inclining it by 5–10 degrees to create a longer, bigger shadow.
4. Mark the tip of the shadow with a stone. Wait until the shadow tip moves several centimetres (10–15 minutes with a 45 cm stick).

> Use the time interval required for Step 4. to instruct TP 2.

5. Mark the position of the new shadow tip.
6. Draw a straight line from the first mark through the second mark and continue about 30 cm past it (as illustrated in Figure 18-11-1).
7. Have the instructor or a supervisor verify the bearings with a compass.

> The line drawn indicates the east–west line. The first mark made is west and the last mark made is east. A line perpendicular to the east–west line is a north–south line.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in this activity will serve as the confirmation of this TP.

Teaching Point 2 | **Explain, Demonstrate and Have Cadets Determine Direction Using an Analog Watch**

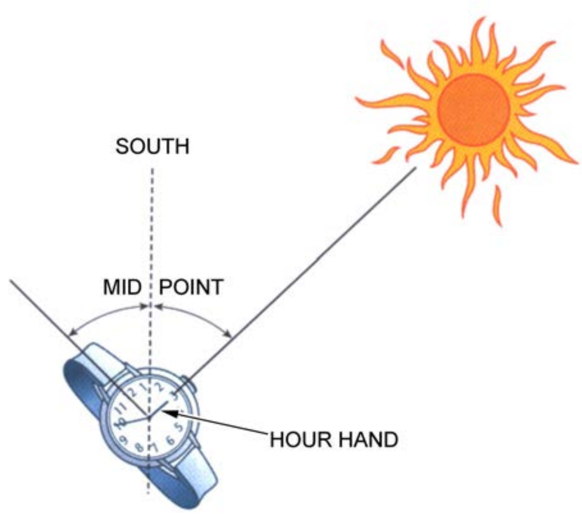
Time: 10 min | Method: Demonstration and Performance

Use an analog wall clock for demonstration purposes instead of an analog watch. Ask the cadets if any of them have an analog watch. Since digital watches are more common than analog watches, the cadets should understand that without one, they cannot use this method.

DETERMINE DIRECTION USING AN ANALOG WATCH

An analog watch can help establish direction using either standard or daylight savings time. The analog watch method is based on the principle that at noon (or 1 pm for daylight savings time) the sun is approximately due south in the northern hemisphere and approximately due north in the southern hemisphere. Using this principle, an analog watch's (with the correct time) hour hand, at noon, pointed at the sun, also points approximately due south/north. At times other than noon, bisecting the angle between the hour hand (pointing at the sun) and the 12 (or the 1 for daylight savings time) on the watch face, creates an imaginary line that points approximately due south/north.

This method becomes less accurate the closer a person is to the equator.



National Association of Search and Rescue, Fundamentals of Search and Rescue, Jones and Bartlett Publishers, Inc. (p. 76)

Figure 18-11-2 Analog Watch

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets determine direction using an analog watch.

RESOURCES

Analog watch (with the correct time).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Point the hour hand towards the sun.
2. Determine the halfway point between the hour hand and noon (or 1 pm for daylight savings time).
3. Create an imaginary line between the centre of the watch face and the halfway point (as illustrated in Figure 18-11-2).

> The imaginary line is a north–south line (points to the south in the northern hemisphere and to the north in the southern hemisphere).

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in this activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in constructing a shadow stick and determining direction using an analog watch will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to be able to determine direction using the sun so in a survival situation they can navigate to and from their survival site without the aid of a compass or map.

INSTRUCTOR NOTES/REMARKS

Sticks are to be collected by the cadets in the field.

REFERENCES

C3-002 (ISBN 0-00-653140-7) Wiseman, J. (1999). *The SAS Survival Handbook*. Hammersmith, London: HarperCollins Publishers.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 12

EO C390.07 – DETERMINE DIRECTION AT NIGHT

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Choose a suitable night to perform this activity by checking both a moon calendar and local weather conditions.

A sky map should be created for the date and location where the lesson will be taught. Annex P is an example created for reference of what a sky map looks like and how it is used to locate constellations. Photocopy the created sky map for each cadet.

Photocopy the handout located at Annex Q for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for this lesson as it allows the instructor to demonstrate determining direction at night while providing an opportunity for the cadet to practice the skill under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have determined direction at night.

IMPORTANCE

It is important for the cadets to be able to navigate at night so they will have the skills to find their way in the dark. In a survival situation, being able to determine direction in the dark is a skill that can assist in being rescued.

Teaching Point 1 | **Explain, Demonstrate and Have Cadets Determine Direction Using the Moon**

Time: 10 min | Method: Demonstration and Performance

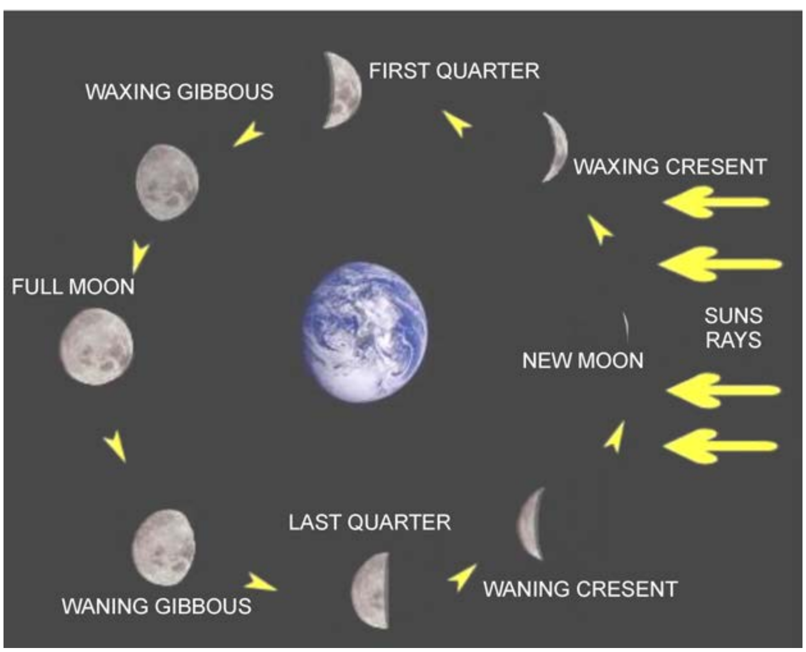
> This TP must be conducted during a clear night when the moon is in one of its crescent phases. Determine the phases of the moon on a moon calendar or through the internet.

IDENTIFYING THE PHASES OF THE MOON

The phases of the moon are caused by the relative positions of the earth, sun, and moon. The moon rotates around the earth, on average, once every 27 days, 7 hours and 43 minutes.

The sun always illuminates the half of the moon facing the sun (except during lunar eclipses). When the sun and moon are on opposite sides of the earth, the moon appears “full” like a bright, round disk. When the moon is between the earth and the sun, it appears dark, a “new” moon. In between these phases, the moon’s illuminated surface appears to grow (waxing) to full, and then shrink (waning) to the next new moon.

> The moon’s familiar crescent shape is formed by the shadow of the earth on the moon’s surface and always points relatively north and south in the sky.

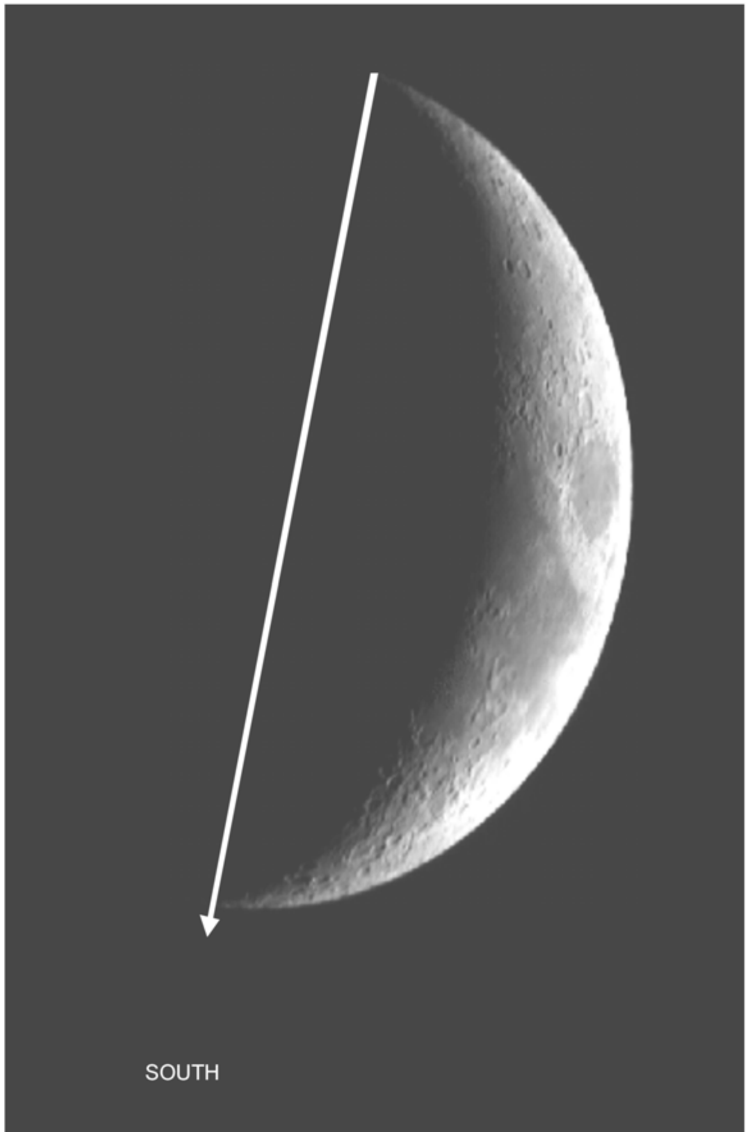


Afreshhorizon.co.uk, Copyright 2008 by A Fresh Horizon. Retrieved November 14, 2007, from http://www.afreshhorizon.co.uk/images/moon_phases.jpg

Figure 18-12-1 Moon Phases

DETERMINING SOUTH

Drop a line along the points of the crescent moon and project it to the horizon. This point on the horizon is in the general direction of south.



The Calvin College Observatory, 2001, The Crescent Moon, Copyright 2001 by The Calvin College Observatory. Retrieved November 14, 2007, from http://www.calvin.edu/academic/phys/observatory/images/moon/

Figure 18-12-2 Determining South by the Moon

This method will give a general direction of north and south.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets determine direction using the moon.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

Explain, demonstrate and have the cadets drop an imaginary line along the points of the crescent moon and project that line to the horizon (as illustrated in Figure 18-12-2). This point on the horizon is in the general direction of south.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

Teaching Point 2	**Explain, Demonstrate and Have Cadets Identify the Major Constellations Required to Find Polaris**
Time: 10 min	Method: Demonstration and Performance

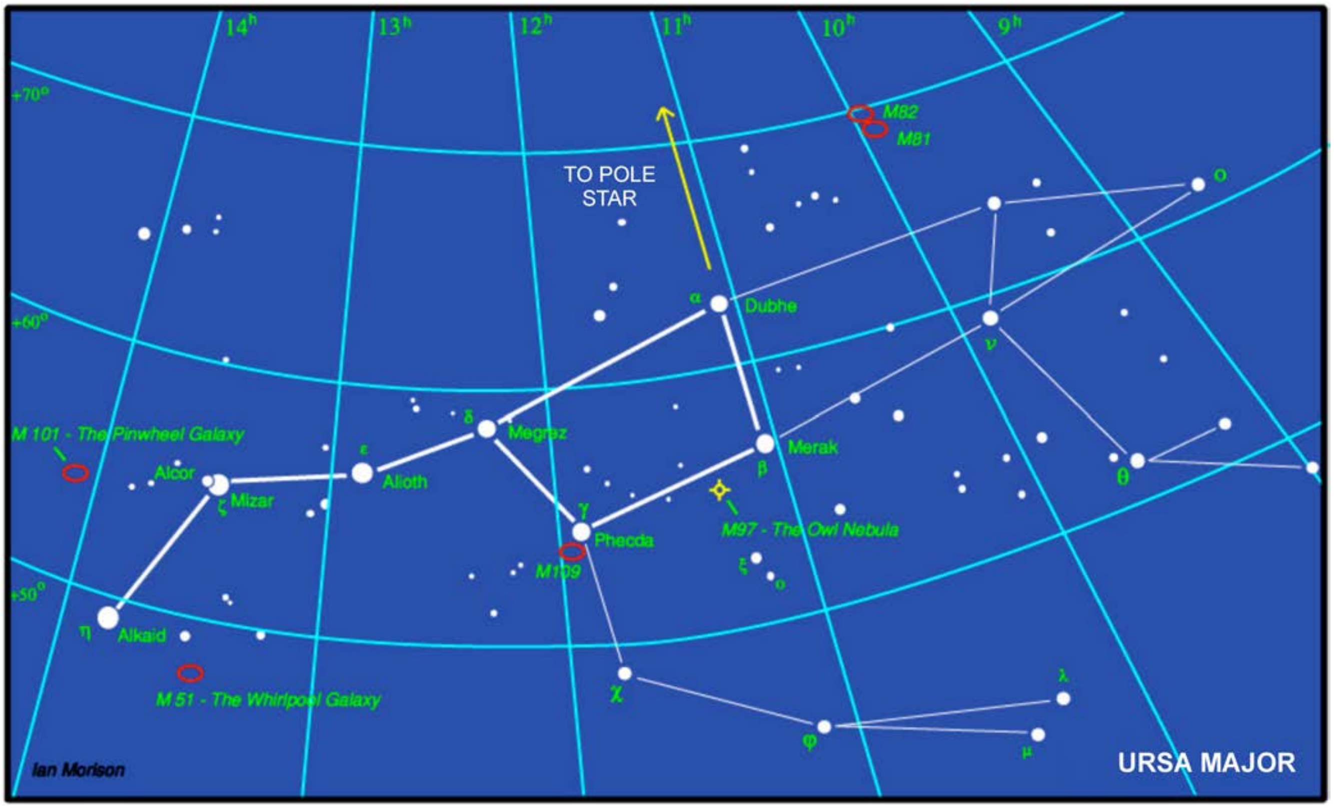
The best watching time for stars is between the moon's last quarter and the first, and three hours after sunset so the sky is dark enough to see the low intensity stars.

CONSTELLATIONS

Constellations are groupings of stars that have been given legendary or historical significance. These groups have been joined together with lines, outlining a figure or symbol, so that they may be found in the sky.

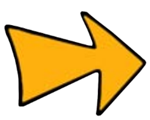
Ursa Major (Big Dipper)

Ursa Major is visible throughout most of the year in the northern hemisphere and is known as the "Great Bear" in Latin. The seven brightest stars are located in the bear's hindquarters and tail and form the well known asterism Big Dipper as it appears to form the shape of a ladle, or dipper shape. The stars Dubhe and Merak, located on the outside edge of the dipper, are also known as "The Pointer" since they point in the direction of Polaris.



Jobrell Bank Observatory, 2006, Ursa Major, Copyright 2006 by The University of Manchester. Retrieved November 14, 2007, from http://www.jb.man.ac.uk/public/Ursamjor.jpg

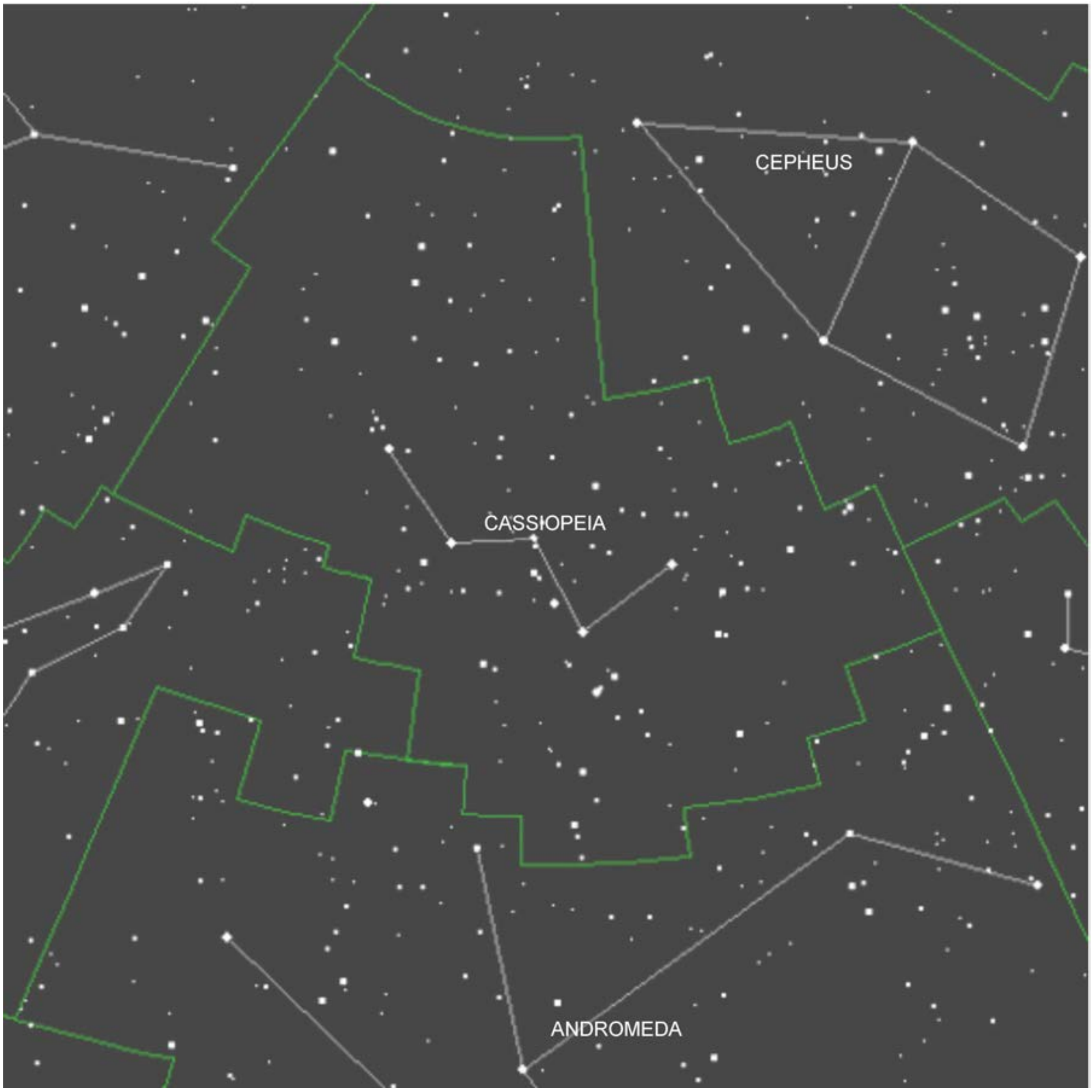
Figure 18-12-3 Ursa Major



The Big Dipper is not a constellation. It is part of Ursa Major, the Great Bear. The Big Dipper is an asterism – a recognized, but not official, grouping of stars. Some asterisms fall within a single constellation, others span across constellations.

Cassiopeia

Cassiopeia is a northern constellation which in Greek mythology represents a vain queen who boasted about her unrivalled beauty. It is made up of five stars that resemble a lopsided “M” or “W” depending on its position in the sky. Viewing the constellation as an “M”, connect the three bottom stars with an imaginary line. From the right-most star create an imaginary line straight down to find Polaris.

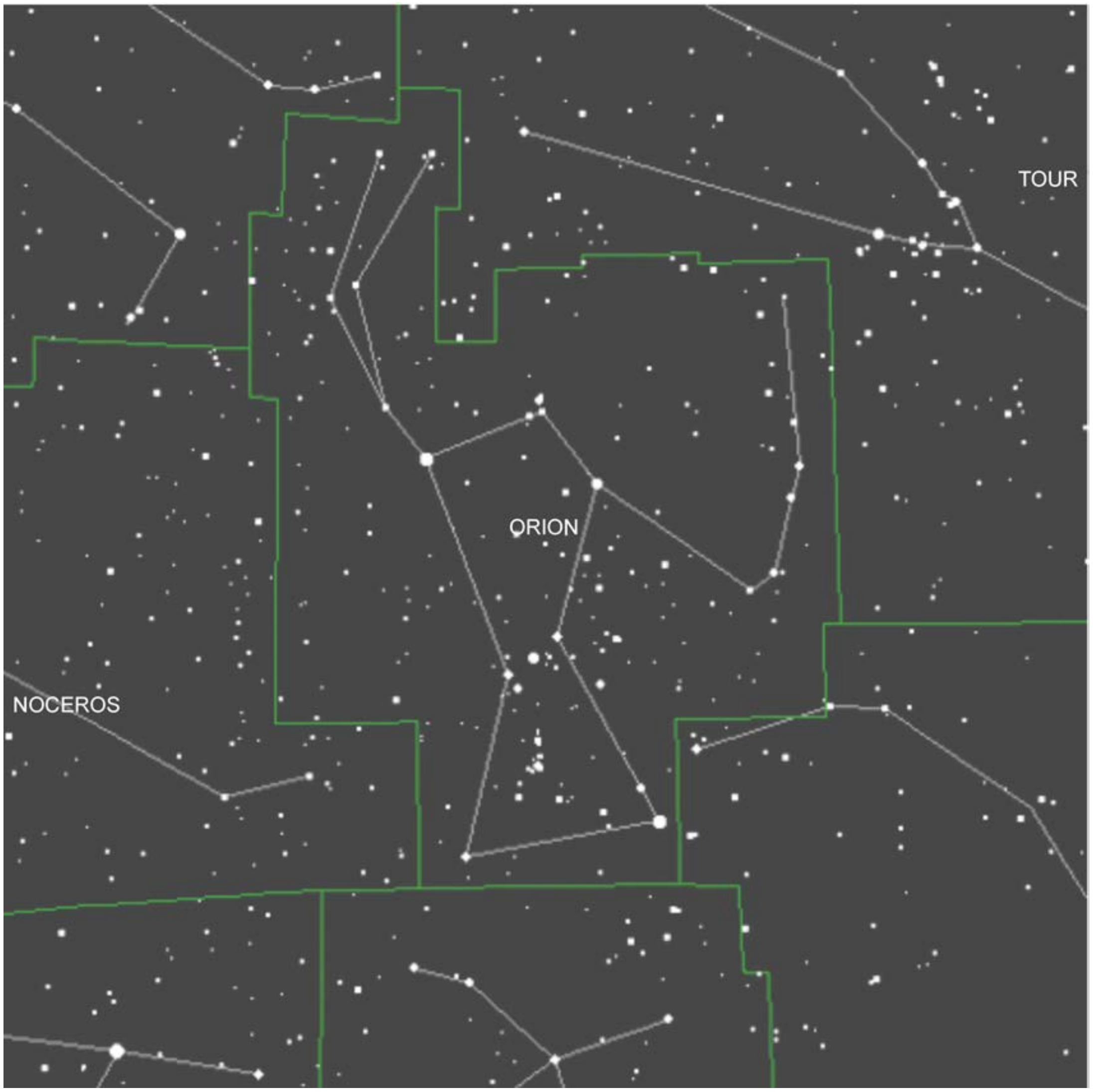


About.com, 2007, Cassiopeia, Copyright 2007 by About Inc. Retrieved November 14, 2007, from http://space.about.com/od/starsplanetsgalaxies/ig/Constellations-Pictures/cassiopeia.htm

Figure 18-12-4 Cassiopeia

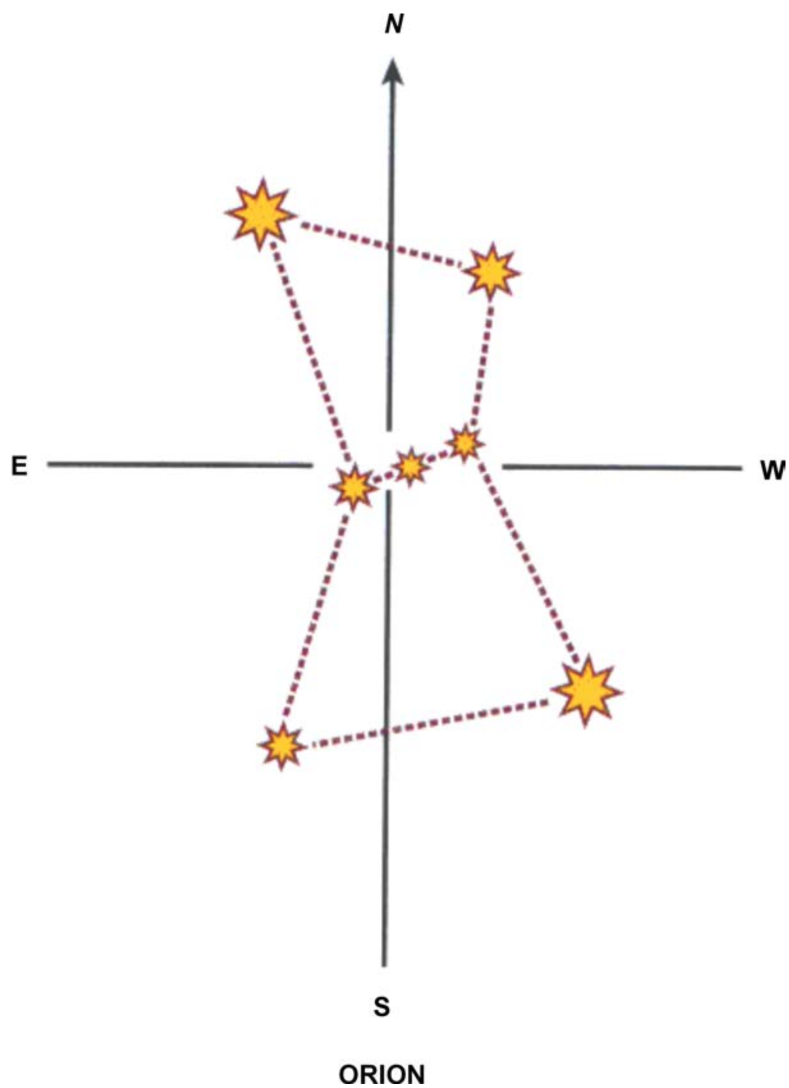
Orion

Orion is a constellation often referred to as The Hunter. It is one of the largest and most visible constellations in the sky. Its brilliant stars are found on the celestial equator and are visible throughout the world. From mid-northern latitudes, Orion is visible in the evening from November to early May and in the morning from late July to November. The constellation of Orion consists of seven stars. The three stars that are close together are the belt of the constellation. The Orion constellation, rises on the horizon due east and sets due west. At the equator it will pass directly overhead, and in the northern hemisphere it will pass south directly overhead. The top of Orion points in the direction of the Pole Star.



About.com, 2007, Orion, Copyright 2007 by About Inc. Retrieved November 14, 2007, from http://space.about.com/od/starsplanetsgalaxies/ig/Constellations-Pictures/orion.htm

Figure 18-12-5 Orion

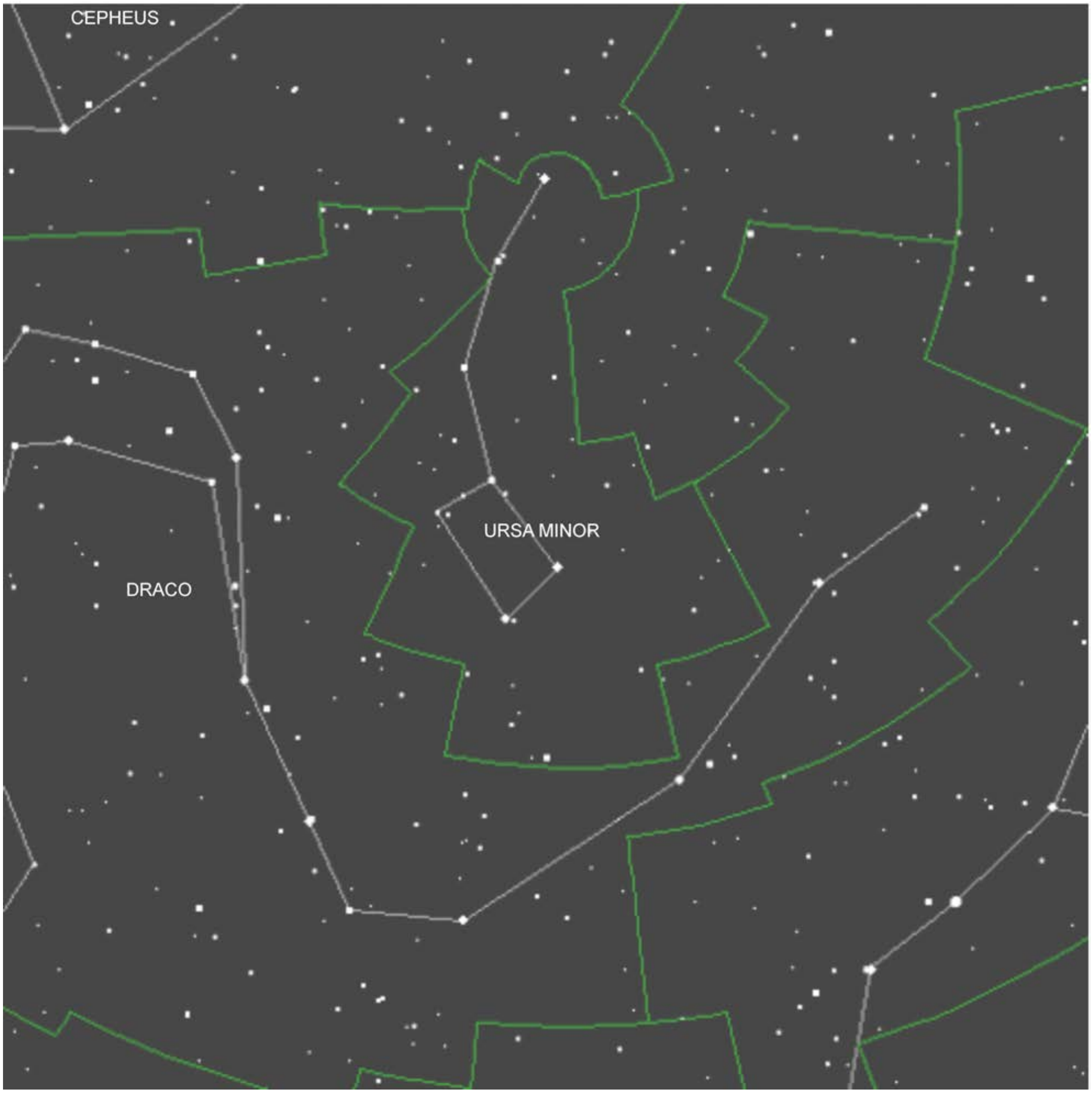


National Association of Search and Rescue, Fundamentals of Search and Rescue, Jones and Bartlett Publishers, Inc. (p. 78)

Figure 18-12-6 Orion and North

Ursa Minor (Little Dipper)

Ursa Major is a constellation in the northern hemisphere. Its name means “Little Bear” in Latin. Ursa Minor is known as Little Dipper because its seven brightest stars appear to form a ladle, or dipper shape. The star at the end of the dipper’s handle is Polaris, the North or Pole Star.



About.com, 2007, Ursa Minor, Copyright 2007 by About Inc. Retrieved November 14, 2007, from http://z.about.com/d/space/1/7/f/P/ursaminor.gif

Figure 18-12-7 Ursa Minor

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have cadets locate various constellations.

RESOURCES

- Sky map, and
- Red-filtered flashlight.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Indicate north to the cadets (use compass if necessary).
2. Hold the sky map upside-down (allowing the cadet to look at it) and overhead with the "N" on the map pointing north.

The east and west printed on the sky map are on the opposite side of the east and west of an earth map. The reason is that when the map is held above the head, the east and west markings will then be the same as on the ground. To better read a sky map in the dark, use a flashlight with a red filter so night vision is not affected.

3. With the aid of a local sky map, have the cadets locate:
   (a) Ursa Major,
   (b) Cassiopeia,
   (c) Orion, and
   (d) Ursa Minor.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the activity will serve as the confirmation of this TP.

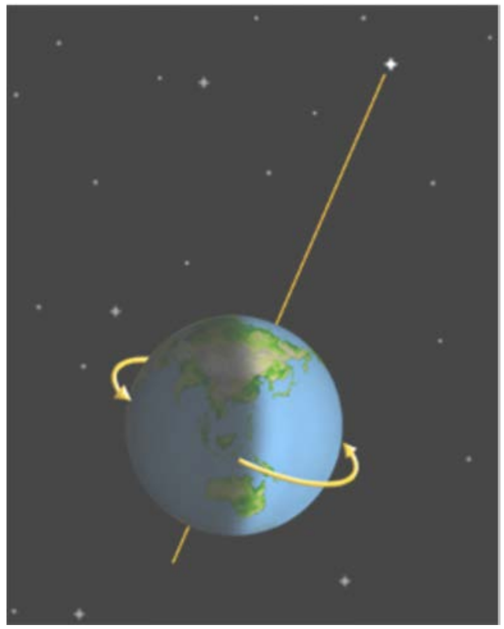
Teaching Point 3	**Explain, Demonstrate and Have Cadets Locate Polaris Using the Major Constellations Identified in TP2**
Time: 5 min	Method: Demonstration and Performance

POLARIS

Polaris is more commonly known as the North Star. It is the brightest star in the constellation Ursa Minor. It is very close to the celestial pole (0.7 degrees away from the pole rotation), making it the current Pole Star. The star lies in a direct axis above the North Pole and appears to stand almost motionless in the sky and the other stars seem to rotate around it. Polaris has been close to the actual position of north for the past 1000 years and during the course of the 21st century it will continue to close in on being in line with True North and will be closest on March 24, 2100 (almost 0.45 degrees away). After that date it will start to pull away and eventually another star will become the new Pole Star.

Locating the North Star

Polaris is located in the constellation Ursa Minor, which contains the group of stars that make up the Little Dipper (as illustrated in Figure 18-12-7). Polaris is the star in the end of the Little Dipper's handle. Often the Little Dipper is not very bright and can be challenging to find.



Lunar and Planetary Institute, 2007, Polaris, Copyright 2007 by Lunar and Planetary Institute. Retrieved November 14, 2007, from http://www.lpi.usra.edu/education/skytellers/polaris/about.shtml

Figure 18-12-8 Polaris

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets locate Polaris.

RESOURCES

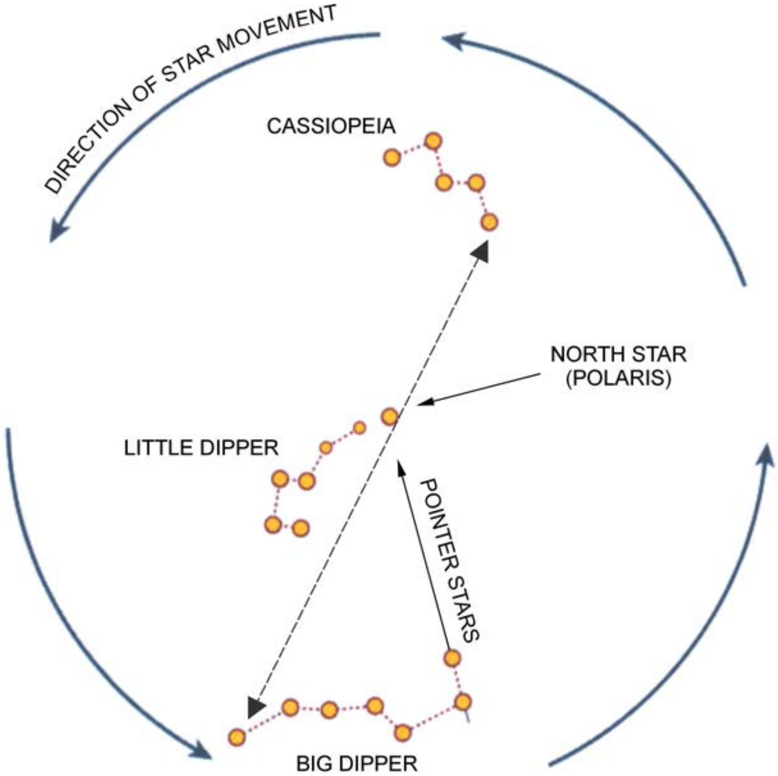
Handout located at Annex Q.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Hand out copies of Annex Q to each cadet.
2. Have the cadets find the constellation Ursa Major (Big Dipper).
3. Have the cadets draw an imaginary line between the two stars (the pointers Merak and Dubhe) at the end of the big dipper's bowl as they will point toward the Pole Star. The distance to the Pole Star is about five times the distance between the pointers.



National Association of Search and Rescue, Fundamentals of Search and Rescue, Jones and Bartlett Publishers, Inc. (p. 76)

Figure 18-12-9 Finding Polaris

4. Have the cadets locate the constellation Cassiopeia, which is directly across from Ursa Major.
5. Have the cadets draw an imaginary line between the star at the end of Cassiopeia and the last star in the handle of Ursa Major (as illustrated in Figure 18-12-9). Polaris is almost equidistant between Ursa Major and Cassiopeia.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in determining south by the phases of the moon, locating the various constellations and locating Polaris will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to be able to navigate at night so they can find their way in the dark. In a survival situation being able to determine direction in the dark is a skill that can assist in being rescued.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C0-111 (ISBN 978-0-9740820-2-8) Tawrell, P. (2006). *Camping and Wilderness Survival: The Ultimate Outdoors Book* (2nd ed.). Lebanon, NH: Leonard Paul Tawrell.

C3-002 (ISBN 0-00-653140-7) Wiseman, J. (1999). *The SAS Survival Handbook*. Hammersmith, London: HarperCollins Publishers.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 13

EO C390.08 – USE BLAZING TECHNIQUES

Total Time:	30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Blaze a route using grass and rocks for the demonstration in TP 2.

Prepare a route that is 100 m long for the cadets to use during the activity in TP 3.

Photocopy the handout located at Annex R for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to present basic material on blazing.

Demonstration was chosen for TP 2 as it allows the instructor to explain and demonstrate blazing techniques.

Performance was chosen for TP 3 as it provides an opportunity for the cadet to practice blazing techniques under supervision.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have used blazing techniques.

IMPORTANCE

It is important for the cadets to know how to use blazing techniques in a survival situation. Blazing techniques can be used when a cadet leaves a site to find water or build a signal fire and needs to find their way back. Blazing techniques may also help searchers find a survival site.

Teaching Point 1	Explain the Reasons for Blazing
Time: 5 min	Method: Interactive Lecture

REASONS FOR BLAZING

Leaving and Returning to the Site

When searching for water or finding higher ground to build a signal fire, the survivor may have to walk for a kilometre or more. Blazing will help to establish the route. If one loses their sense of direction they can follow it back to the survival site.

> Most trails are spotted (marked) coming and going so that they can be seen from both directions of travel.

Acting as a Guide to a Ground Search and Rescue (SAR) Party

Signs in the area will act as a clue to any presence or past presence and the direction markers will help rescuers follow someone’s trail.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why are trails spotted (marked) in two directions?

Q2. What does blazing help to establish?

Q3. What do signs in the area act as a clue to?

ANTICIPATED ANSWERS

A1. Most trails are spotted (marked) coming and going so that they can be seen from both directions of travel.

A2. Blazing will help to establish the route. If one loses their sense of direction they can follow it back to the survival site.

A3. Signs in the area will act as a clue to any presence or past presence and the direction markers will help rescuers follow someone’s trail.

Teaching Point 2 **Explain and Demonstrate Blazing Techniques**

Time: 10 min Method: Demonstration

BLAZING TECHNIQUES

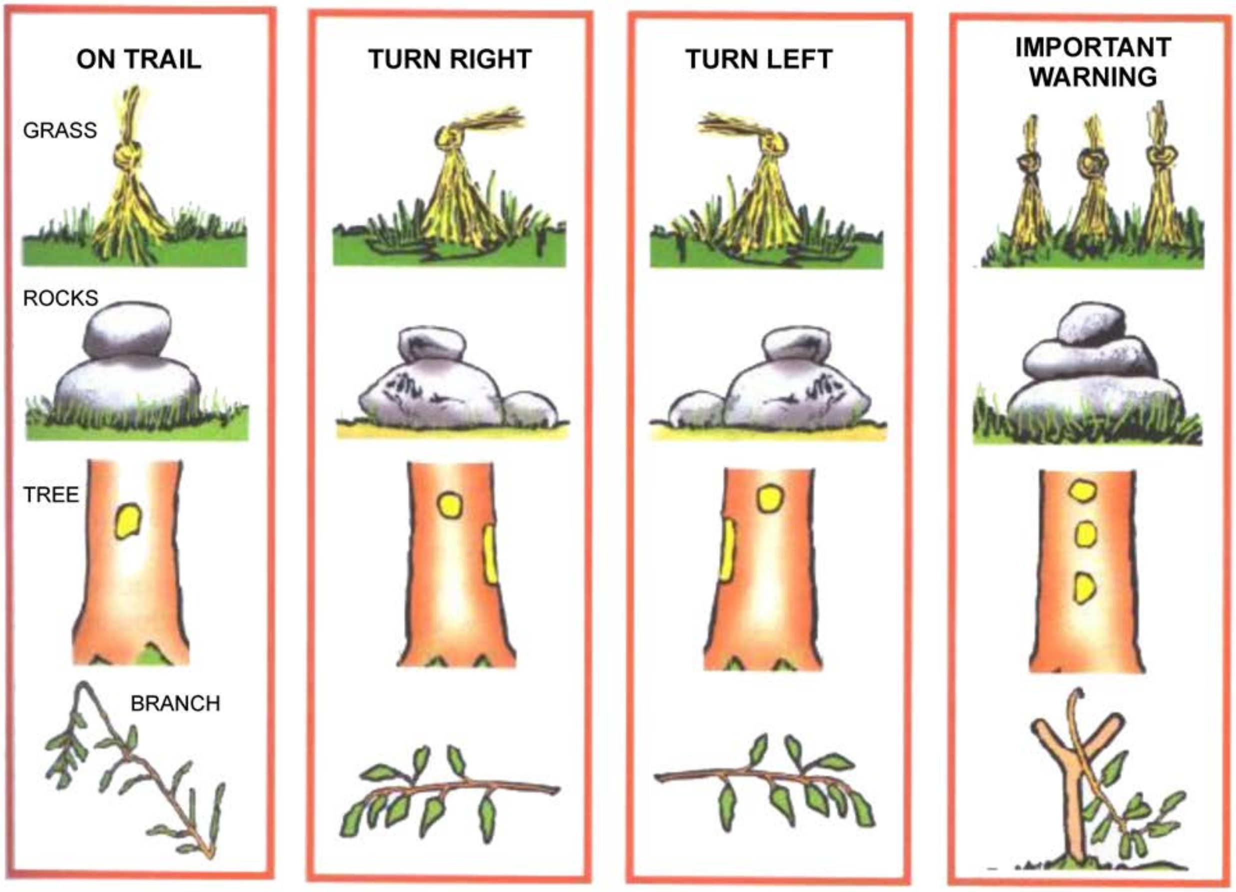
Blazing. Signals left behind if leaving the scene of a crash or moving to and from, or abandoning a survival site. These may include any of the following:

- A large arrow shape made to indicate the direction in which one is travelling. It will be visible from the air and other direction markers which can be interpreted at ground level. Direction markers could include:
  - rocks or debris placed in an arrow shape,
  - a stick left in a crooked support, with the top pointing in the direction taken,
  - grass tied in an overhand knot with the end hanging in the direction followed,
  - forked branches laid with the fork pointing in the direction followed,
  - arrowhead-shaped notches cut out of tree trunks indicating a turn,
  - small rocks set upon larger rocks, with small rocks beside, and
  - a cross of sticks or stones meaning "not this way".
- Trail-blazing signals, not only for people to follow but to establish a route to retrace and guide someone if they lose their sense of direction.
- In case rescuers find the survival site while the lost person is away, written messages left in containers with details of planned movements. Hang them from tripods or trees and draw attention to them with markers.

Show the cadets the previously blazed trail with grass and rocks.

Allow the cadets to ask questions.

EXAMPLES OF BLAZING



P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book, Paul Tawrell (p. 547)

Figure 18-13-1 Blazing Techniques

STEPS TO BLAZE A TRAIL

To blaze a trail with branches:

1. Find a route to follow for 100 m.
2. Gather branches which are already on the ground (deadfall or debris).
3. Create blazes by placing the branches along the route for 100 m.
4. At each created blaze, examine it from the point of view of returning along that trail. If necessary, create another blaze that will direct the person back along the trail.
5. Return the branches to the environment, when finished.

Demonstrate blazing with branches as the cadets observe.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What can direction markers include?

Q2. What is blazing?

Q3. What should be left at the survival site?

ANTICIPATED ANSWERS

A1. Direction markers may include:

- rocks or debris placed in an arrow shape,
- a stick left in a crooked support, with the top pointing in the direction taken,
- grass tied in an overhand knot with the end hanging in the direction followed,
- forked branches laid with the fork pointing in the direction followed,
- arrowhead-shaped notches cut out of tree trunks indicating a turn,
- small rocks set upon larger rocks, with small rocks beside, and
- a cross of sticks or stones meaning "not this way".

A2. Signals left behind if you leave the scene of a crash or abandon a survival site.

A3. In case rescuers find the survival site while the lost person is away, written messages should be left in containers with details of planned movements.

Teaching Point 3 | **Have Cadets Blaze a Trail**

Time: 10 min | Method: Performance

Have cadets blaze a trail using branches.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets blaze a trail using branches.

RESOURCES

Handout of blazing techniques located at Annex R.

ACTIVITY LAYOUT

A route that is 100 m long.

ACTIVITY INSTRUCTIONS

1. Distribute the handout located at Annex R to each cadet.
2. Have the cadets:
   (a) gather branches which are already on the ground (deadfall or debris);
   (b) place the branches along the route for 100 m;
   (c) turn the branches around when returning to the starting point; and
   (d) return the branches to the environment when the activity is complete.

SAFETY

Ensure the cadets stay in the designated area during this TP.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in blazing a trail will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to know how to use blazing techniques in a survival situation. Blazing techniques can be used when the survivor leaves their site to find water or build a signal fire and needs to find their way back. Blazing techniques also help searchers find a survival site.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-016 B-GG-217-001/PT-001 Director Air Operations and Training. (1983). *Down But Not Out*. Ottawa, ON: Department of National Defence.

C0-111 (ISBN 978-0-9740820-2-8) Tawrell, P. (2006). *Camping and Wilderness Survival: The Ultimate Outdoors Book* (2nd ed.). Lebanon, NH: Leonard Paul Tawrell.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 14

EO C390.09 – IDENTIFY ELEMENTS OF THE NIGHT SKY

Total Time:	120 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

If there are insufficient quantities of planispheres and red-filtered flashlights, divide the cadets into groups based on the quantities available.

Planispheres may be created from Figures 15U-4 and 15U-5.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 in order to orient the cadets to the conditions required to observe the elements of the night sky.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate how to use a planisphere star chart while providing an opportunity for the cadets to practice the skill under supervision.

A practical activity was chosen for TP 3 as it is an interactive way to introduce the cadets to elements of the night sky. This activity contributes to the development of astronomy skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified elements of the night sky.

IMPORTANCE

It is important for cadets to be able to identify the elements of the night sky so they can apply the knowledge acquired in a practical setting. Observing the night sky will allow the cadets to observe the moon, planets, stars and constellations. This may also assist in overcoming the sixth and seventh enemies of survival: boredom and loneliness.

Teaching Point 1	**Describe Conditions Required to View the Elements of the Night Sky**
Time: 5 min	Method: Interactive Lecture

CLOUDS

The presence of clouds will inhibit observations of the elements of the night sky. Even partial cloud cover will make it more difficult to identify specific constellations by hiding parts of the constellation or obscuring elements used to find the constellation. It is best to observe the night sky on a cloudless night.

MOON

The moon is the brightest object in the night sky. The moon itself does not shine, it reflects sunlight. When the moon is full, its light overpowers the light of the dim stars near it. For example, looking at a small flashlight that is next to a million candlepower flashlight, the light of the smaller flashlight is not any less, but its light is overpowered by the brighter flashlight.

> The best time to look for stars is between the moon's last quarter and the first quarter, three hours after sunset so the sky is dark enough to see the low intensity stars.

The moon is second only to the sun as the largest source of natural light pollution.

LIGHT POLLUTION

T. Dickinson, NightWatch: A Practical Guide to Viewing the Universe, Firefly Books Ltd. (p. 48)

Figure 18-14-1 Light Pollution's Effects

The sun and moon are the main sources of light pollution. However, artificial light pollution exists near built-up areas and makes the sky appear yellowish-gray as opposed to black. This happens because outdoor lighting illuminates the air as well as the ground. To clearly see stars at night, find a location that is free from lights. This includes individual lights, like street lights, as well as the glow that appears from built-up areas (eg, towns and cities). Figure 18-14-1 illustrates the effect of light pollution by contrasting the same section of sky with and without light pollution.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Which natural phenomenon may inhibit the view of part or all of the night sky?

Q2. What is the second brightest object that may be seen from Earth?

Q3. What are examples of artificial light pollution?

ANTICIPATED ANSWERS

A1. Clouds.

A2. The moon.

A3. This includes individual lights, like street lights, as well as the glow that appears from built-up areas (eg, towns and cities).

Teaching Point 2	**Explain, Demonstrate and Have the Cadets Use a Planisphere Star Chart**
Time: 10 min	Method: Demonstration and Performance

Instruct the cadets on the use of the specific planisphere star chart according to directions provided with the planisphere.

Note: Directions, for the *Firefly Planisphere: Latitude 42 deg N*, are included and may serve as an example of directions for the type of planisphere used.

Distribute one each, planisphere and red-filtered flashlight, per group of cadets and have the cadets orient their planisphere.

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

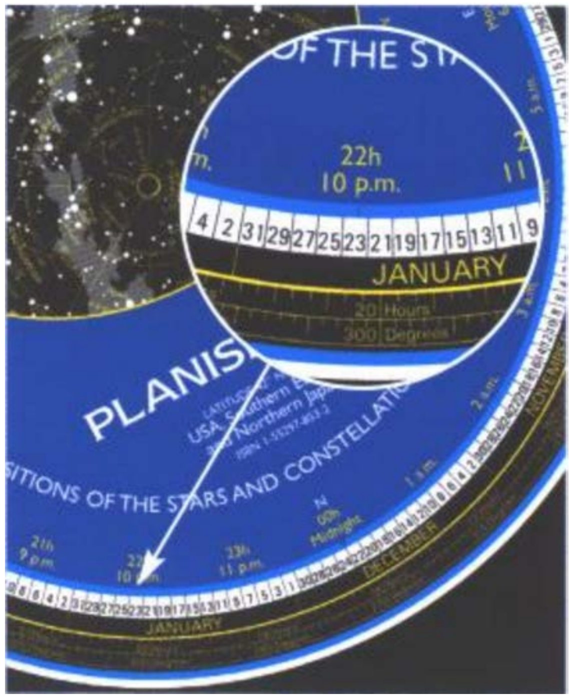
Note: Assistant instructors may be employed to monitor cadet performance.

Elements of the night sky can be identified with the naked eye, star charts, a planisphere star chart, binoculars or a telescope.

Planisphere Star Chart. An analog computer for calculating the position of stars. It has this name because the celestial sphere is represented on a flat plane, such as paper. Since the Earth is constantly in motion, the time of day, time of year and location influence the appearance of the sky. An individual star chart cannot accurately represent all of these combinations. This would take many different star charts. A preferable method is to use a planisphere star chart which allows the user to twist a dial to show the true position of the stars.

Steps to use the *Firefly Planisphere: Latitude 42 deg N*:

1. Find the date around the outer edge of the disk, and the time of night on the inner, movable wheel. (As illustrated in Figure 18-14-2, the planisphere is set for 10 p.m. (22h) on the evening of January 23.)



R. Scagell, Firefly Planisphere: Latitude 42 deg N, Firefly Books Ltd.

Figure 18-14-2 Step 1

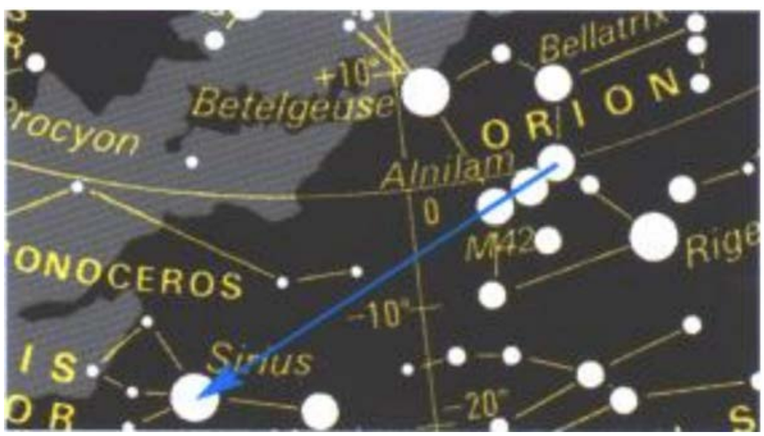
> Remember to allow for Daylight Savings Time (mid-spring to mid-fall) if it is in effect. This means subtracting one hour from the current time.

2. Hold the planisphere over your head. The oval map shows the entire sky, with the horizon around the edges of the map and the overhead point in the middle (as illustrated in Figure 18-14-3). Rotate the planisphere so that the eastern horizon, western horizon and the ‘N’ by the Midnight marker correspond with the ground.

R. Scagell, Firefly Planisphere: Latitude 42 deg N, Firefly Books Ltd.

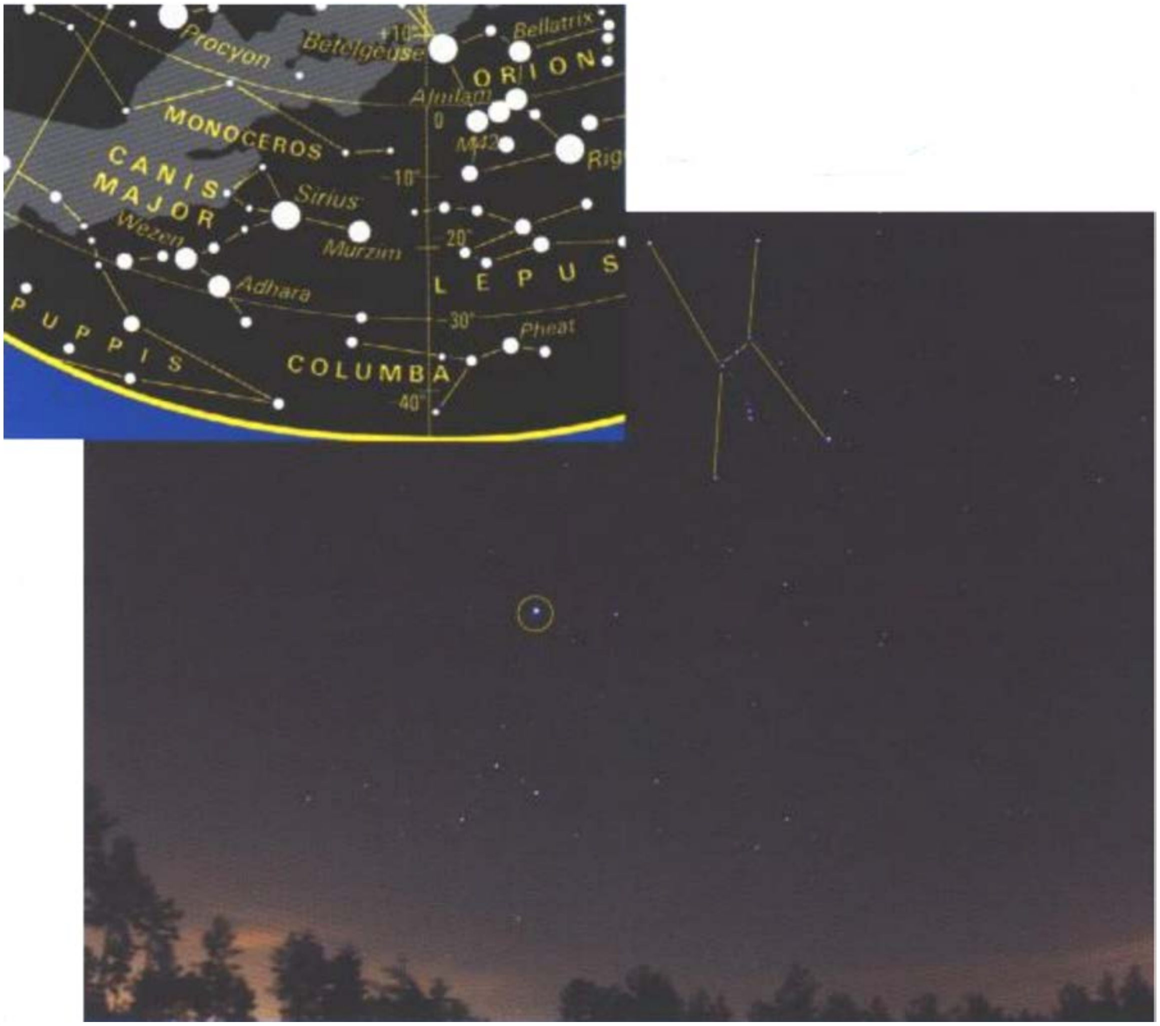
Figure 18-14-3 Step 2

3. Pick out a major constellation by its shape. Remember that the map shows the whole sky, so what looks like a small pattern on the map may cover a large area of the sky. Once one constellation is found, it is used as a guide to locate other constellations. (as illustrated in Figure 18-14-4, the three central stars of Orion, known as Orion's Belt, will be used as a pointer to Sirius in Canis Major. Figure 18-14-5 illustrates a section of the planisphere and a section of night sky with Orion marked and Sirius circled.)



R. Scagell, Firefly Planisphere: Latitude 42 deg N, Firefly Books Ltd.

Figure 18-14-4 Step 3 Locating Sirius Using Orion's Belt



R. Scagell, Firefly Planisphere: Latitude 42 deg N, Firefly Books Ltd.

Figure 18-14-5 Step 3 Sirius Located

> The above example used Orion as a guide; however, Orion is visible in Canada only from approximately November to April. If Orion is not visible, choose another constellation.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in using a planisphere will serve as the confirmation of this TP.

Teaching Point 3	Describe and Have the Cadets Identify Elements of the Night Sky
Time: 95 min	Method: Practical Activity

Depending on viewing opportunities, handouts may be created for the moon and Venus located at Annexes S and T.

MOON

The moon is the brightest object in the night sky. If the moon dominates the night sky making observing other elements of the night sky difficult, the opportunity should be used to observe the moon itself. While it may be a source of light pollution, when the Moon is at least half full, many features may be observed on its surface (see Annex S).

VENUS

The planet Venus and the Moon are the only natural objects that can be seen while the Sun is in the sky. Venus is normally seen either around dawn or dusk depending on where it is relative to Earth in its orbit (see Annex T).

POLARIS

Polaris is more commonly known as the North Star. It is the brightest star in the constellation Ursa Minor. It is very close to the celestial pole (0.7 degrees away from the pole rotation), making it the current North Star. The star lies in a direct axis above the North Pole and appears to stand almost motionless in the sky. Other stars seem to rotate around it. Polaris has been close to the actual position of north for the past 1000 years and during the course of the 21st century it will continue to close in on being in line with True North and will be closest on March 24, 2100 (approximately 0.45 degrees away). After that date it will start to pull away and eventually another star will become the new North Star.

CONSTELLATIONS

Throughout history humanity has gazed upon the stars and created patterns called constellations. These celestial groups are steeped in mythology and, in the case of the signs of the zodiac, embellished with the symbolism of astrology. One of the best known (in Canada) group of stars is known as the Big Dipper, however, it is not a constellation.

The Big Dipper is not a constellation. It is part of Ursa Major, the Great Bear. The Big Dipper is an asterism, a recognized, but not official, grouping of stars. Some asterisms fall within a single constellation; others cross constellations.

Ursa Major

Ursa Major means "Great Bear" in Latin. The seven brightest stars are located in the bear's hindquarters and tail and form the well known asterism, the Big Dipper, as it appears to form the shape of a ladle, or dipper shape. The stars Dubhe and Merak, located on the outside edge of the dipper, are also known as "The Pointer" since they point in the direction of Polaris. Most of Ursa Major is visible year-round in Canada.

Ursa Minor

Ursa Minor means “Little Bear” in Latin. Ursa Minor is known as Little Dipper because its seven brightest stars appear to form a ladle, or dipper shape. The star at the end of the dipper’s handle is Polaris, the North or Pole Star. Ursa Minor is visible year-round in Canada.

Cassiopeia

Cassiopeia is a northern constellation which in Greek mythology represented a vain queen who boasted about her unrivalled beauty. It is made up of five stars that resemble a lopsided “M” or “W” depending on its position in the sky. It is visible year-round in Canada.

Orion

Orion is a constellation often referred to as The Hunter. It is one of the largest and most visible constellations in the sky. The constellation consists of seven stars. The three stars that are close together at the centre of the constellation are known as Orion’s Belt. Orion is visible in Canada from approximately November to April.

The Signs of the Zodiac

All of the signs of the zodiac will not be visible at the same time. This is due to the location of the signs around the celestial sphere, which means that several signs will be below the horizon at any one time.

The twelve signs of the zodiac are Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces.

See Annex U for more details of the 16 constellations. Use this information to answer questions the cadets may have about these constellations.

ACTIVITY

Time: 85 min

OBJECTIVE

The objective of this activity is to have the cadets identify elements of the night sky.

RESOURCES

- Planisphere star chart, and
- Red-filtered flashlight.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Have the cadets locate the Moon (if visible).
2. Have the cadets locate Venus (if visible, see Annex T).
3. Have the cadets locate Polaris (always visible).

4. Have the cadets locate Ursa Major (always visible).
5. Have the cadets locate Ursa Minor (always visible).
6. Have the cadets locate Orion (if visible).
7. Have the cadets locate Cassiopeia (always visible).
8. Have the cadets, using a planisphere, locate signs of the zodiac.

SAFETY

The site chosen for observing the night sky should be flat as the cadets will be concentrating on the sky and not where they are stepping.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' identification of elements of the night sky will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Observing the night sky will allow the cadets to observe the moon, planet, star and constellations. This may assist in overcoming the sixth and seventh enemies of survival: boredom and loneliness.

INSTRUCTOR NOTES/REMARKS

It is recommended this lesson be conducted after EO C340.04 (Describe Elements of the Night Sky, Chapter 15, Section 6).

REFERENCES

C3-179 (ISBN 1-55209-302-6) Dickenson, T. (2006). *Night Watch: A Practical Guide to Viewing the Universe*. Richmond Hill, ON: Firefly Books Ltd.

C3-180 (ISBN 1-55297-853-2) Scagell, R. (2004). *Firefly Planisphere: Latitude 42 Deg N*. Toronto, ON: Firefly Books Ltd.

C3-221 National Research Council of Canada. (2007). *Explore the Night Sky*. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/eng/education/astronomy/constellations/html.html.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 15

EO C390.10 – IDENTIFY METHODS OF PREPARING AND COOKING A SMALL ANIMAL OR FISH

Total Time:	60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and practice skinning a small animal or preparing a fish and cooking a small animal or fish with the equipment provided prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration was chosen for this lesson as it allows the instructor to explain and demonstrate skinning a small animal, preparing a fish and cooking a small animal or fish.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified methods of preparing and cooking a small animal or fish.

IMPORTANCE

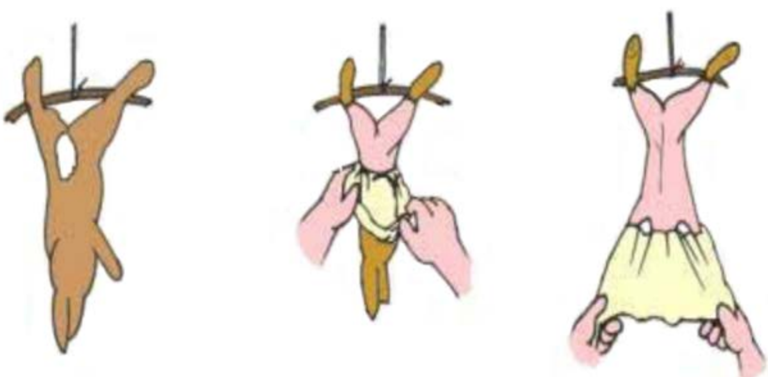
It is important for the cadets to identify the methods of preparing and cooking a small animal or fish that can be used in a survival situation. While food is the last component of the survival pattern (a person can live for weeks without eating), if it is readily available, the efforts made in catching, preparing and cooking a small animal or a fish are worthwhile. Proper preparation and cooking minimizes the chances of getting sick and helps to preserve the food.

Teaching Point 1	**Explain and Demonstrate Skinning a Small Animal**
Time: 15 min	Method: Demonstration

SKINNING A SMALL ANIMAL

For best results, the steps for skinning a small animal should be done in the sequence outlined below.

1. Remove urine by holding the animal's forelegs and gradually squeeze down on the body from the chest to the bowels.
2. Cut a hole in the belly area.
3. Pull the skin apart at the hole exposing the guts. Remove the guts.
4. Cut the skin around the front and hind paws and between the hind legs.
5. Hang the small animal and pull off the skin by pulling it down and over the head.
6. Cut the head off the small animal.



Note. From "Dressing", Simple Survival. Retrieved March 15, 2007, from http://www.simplesurvival.net/dressing.htm

Figure 18-15-1 Skinning a Small Animal

The guts (innards or entrails) can be used as bait or buried as the odour will attract insects and scavengers.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How do you remove urine from the animal's body?

Q2. What area of the animal's body is first cut?

Q3. What is the last step in skinning an animal?

ANTICIPATED ANSWERS

A1. Remove the urine by holding the animal's forelegs and gradually squeeze down on the body from the chest to the bowels.

A2. The first cut is made in the belly area.

A3. Cutting the head off the small animal.

Teaching Point 2 | **Explain and Demonstrate Preparing a Fish**

Time: 15 min | Method: Demonstration

PREPARING A FISH

To prevent spoilage, prepare the fish as soon as possible. The innards (guts or entrails) can be used as bait or buried as the odour will attract insects and scavengers. Keep the fish cool and cook as soon as possible.

1. **Bleeding.** As soon as a fish is caught, cut its throat and allow it to bleed. Wipe the slime off the fish to make it less slippery. Do not let any slime get into your eyes as it may cause Fisherman's Conjunctivitis (pink eye). Cut out the gills (these are the flaps on both sides and just behind the fish's head) as they will quickly spoil.

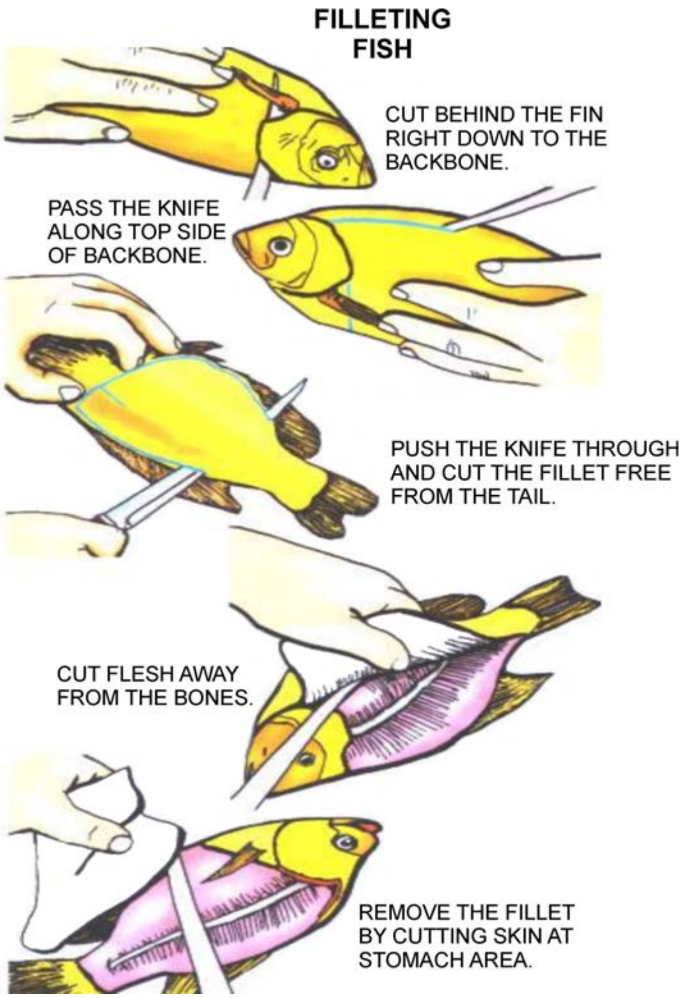
2. **Gutting.** Make an incision from the anal orifice to where the throat was cut. Remove the entrails – you can use them for bait. Keep the roe, which runs down the side of the fish. It is hard in females and soft in males; it is very nutritious.

The roe of a fish are within the sexual organs (hard roe are eggs, soft roe is sperm). It is recommended that this is not explained to the cadets.

3. **Scaling.** Scaling is not necessary and fish can be cooked with scales on, but if there is time, scrape them off. Remove scales by holding the tail and pushing a dull knife across the skin at a forty-five degree angle. Draw the knife from tail to head.

Catfish have skin, not scales and should be skinned like a small animal.

4. **Filleting.** Pass the knife along the top side of the backbone. Cut behind the fin down to the backbone. Push the knife through and cut the fillet free from the tail. Cut the flesh away from the bones. Remove the fillet by cutting the skin at the stomach area.



P. Tawrell, Camping and Wilderness Survival, Paul Tawrell (p. 144)

Figure 18-15-2 Filleting a Fish

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is done as soon as a fish is caught?

Q2. What should you do with the entrails?

Q3. What is the process for filleting?

ANTICIPATED ANSWERS

A1. As soon as a fish is caught, its throat is cut and allowed to bleed.

A2. Remove the entrails – you can use them for bait.

A3. Filleting:

(1) Pass the knife along the top side of the backbone.

(2) Cut behind the fin down to the backbone.

(3) Push the knife through and cut the fillet free from the tail.

(4) Cut the flesh away from the bones.

(5) Remove the fillet by cutting the skin at the stomach area.

Teaching Point 3 — **Explain Methods of Cooking a Small Animal or Fish and Demonstrate One of the Methods**

Time: 20 min — Method: Demonstration

While only one method will be demonstrated, all three are explained.

COOKING A SMALL ANIMAL OR FISH

In addition to killing parasites and bacteria, cooking food can make it more palatable. The methods chosen for cooking a small animal or fish are based on the items one may have in a survival situation.

Practice cooking a small animal or fish before demonstrating one of the following procedures to the cadets. Prepare all materials before the start of the class. The small animals and fish prepared during the instructor's practice should be cooked using all three methods and used as examples of the finished (fully cooked) products.

GRILLING

The following are some considerations for grilling food:

- Grilling is a quick way of cooking large amounts of food but it requires a support – such as wire mesh or a grid of green sticks – rested on rocks over the embers of the fire.
- It should only be used when food is plentiful since it wastes most of the fat from the meat.
- Hot rocks beside the fire can be used as grilling surfaces.

Grilling:

1. Place the large rocks on either side of the fire for the wire mesh/green sticks to rest on.
2. Place the wire mesh/green sticks (in grid formation) on the rocks above the fire.
3. Place food on the wire mesh/green sticks and cook until the meat is no longer pink. Fresh water fish are normally germ free and may be eaten raw, however it is more palatable when cooked.

J. Wiseman, The SAS Survival Handbook, HarperCollins Publishers (p. 284)

Figure 18-15-3 Grilling

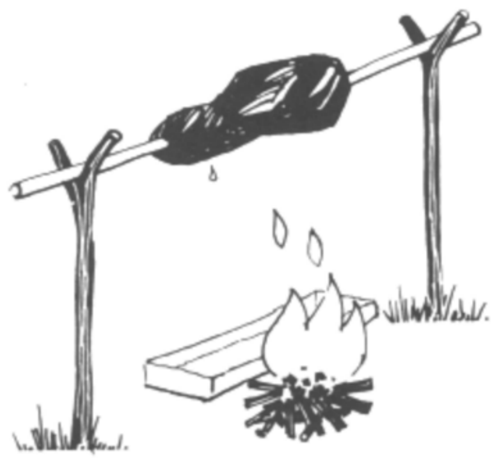
ROASTING

The following are some considerations for roasting food:

- Roasted meat cooks in its own fat.
- Continually turning the meat keeps the fat moving over the surface.
- The easiest method is to skewer the meat on a spit and turn it over the hot embers of a fire or beside a blazing fire where it is hot enough to cook.
- Roasting makes a very tasty dish but has two disadvantages:
  - Valuable fat is lost unless a drip tray is placed beneath the spit. Regularly baste the meat with fat from the tray.
  - Roasting by a fierce fire can cook and seal the outside, leaving the inner meat uncooked and harmful bacteria alive. A slow roast is preferable, and the inner meat can continue cooking after the outer meat has been cut off.

Roasting:

1. Build a spit with two Y shaped sticks and a green stick as the centrepiece.
2. Place the spit over the fire.
3. Skewer the meat and place it on the spit. Turn it over the hot embers of the fire or place the spit beside a blazing fire where it is hot enough to cook. If possible, place a drip pan under the meat to catch the fat.
4. Continue turning the meat so the fat moves over the surface.



J. Wiseman, The SAS Survival Handbook, HarperCollins Publishers (p. 284)

Figure 18-15-4 Roasting

FRYING

The following are some considerations for frying:

- Frying is an excellent way of adding variety to your diet if fat is available and you have a container in which to fry food.
- Any sheet of metal that you can fashion into a curve or give a slight lip can serve as a pan.
- In some areas, you may find a large leaf which contains enough oil that will not dry out before the cooking is done. Before you risk valuable food on them, try the leaves first. See if the leaves burn when placed over the embers. If you use a large leaf, fry only over embers, not over flames.

Frying

1. Place a flat rock, large leaf, or sheet of metal on or next to the fire. (Avoid rocks with high moisture content, they may explode when heated).
2. Let the rock or metal heat up and cook on it as you would a frying pan.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What are three types of cooking methods?

Q2. Which type of cooking should only be used when food is plentiful?

Q3. What material can serve as a pan?

ANTICIPATED ANSWERS

A1. Grilling, roasting and frying.

A2. Grilling should only be used when food is plentiful since it wastes most of the fat from the meat.

A3. Any sheet of metal that you can fashion into a curve or give a slight lip can serve as a pan.

END OF LESSON CONFIRMATION

The cadets' participation in identifying methods of preparing and cooking a small animal or fish will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to identify the methods of preparing and cooking a small animal or fish in a survival situation because before you can eat what you have caught you have to prepare and cook it. Proper preparation and cooking minimizes the chances of getting sick and helps to preserve the food.

INSTRUCTOR NOTES/REMARKS

Cadets who feel uncomfortable with skinning a small animal do not have to participate in that portion of the class but should be present for the TP on preparing a small animal or fish.

If a rabbit or squirrel cannot be caught in a snare, it may be bought at a farmers' market or a similar venue.

If a fish cannot be caught, it may be bought at a farmers' market or a similar venue.

REFERENCES

C0-111 (ISBN 978-0-9740820-2-8) Tawrell, P. (2006). *Camping and Wilderness Survival: The Ultimate Outdoors Book* (2nd ed.). Lebanon, NH: Leonard Paul Tawrell.

C3-002 (ISBN 0-00-653140-7) Wiseman, J. (1999). *The SAS Survival Handbook*. Hammersmith, London: HarperCollins Publishers.

C3-003 (ISBN 1-896713-00-9) Tawrell, P. (1996). *Camping and Wilderness Survival: The Ultimate Outdoors Book*. Green Valley, ON: Paul Tawrell.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 16

EO C390.11 – CONSTRUCT CAMP CRAFTS

Total Time:	120 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Prepare three camp crafts for demonstration purposes.

Photocopy the diagrams detailing camp craft construction for the selected camp crafts located at Annexes V to AJ for each pair of cadets.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow the cadets to practice constructing camp crafts in a safe, controlled environment.

INTRODUCTION

REVIEW

EO C190.03 (Tie Knots and Lashings, A-CR-CCP-801/PF-001, Chapter 15, Section 9) may serve as the review for this lesson.

OBJECTIVES

By the end of this lesson the cadet shall have constructed two camp crafts.

IMPORTANCE

It is important for the cadets to be able to construct camp crafts in a survival situation so they will be able to combat both the elements and psychological factors (eg, boredom and loneliness). It is important to construct camp crafts that serve a purpose in a survival situation (eg, a fishing pole does not have a purpose if there is no water present). The amount of energy put into constructing a camp craft should be relative to its usefulness.

Teaching Point 1 | **Have the Cadets, in Pairs, Construct Two Camp Crafts**

Time: 110 min | Method: Practical Activity

For this skill lesson, it is recommended that the instruction take the following format:

1. Explain how the camp crafts that were prepared prior to the lesson were constructed.
2. Divide the cadets into pairs and distribute the handouts.
3. Have groups choose two camp crafts to construct.
4. Supervise the cadets as they construct camp crafts.

Cadets will choose the camp crafts they want to construct. If time allows, have each group construct a third camp craft.

CAMP CRAFTS

Two camp crafts will be chosen from the following:

- a ladder bed,
- a pack frame,
- a shower,
- a washstand,
- a drying rack,
- a tool rack,
- a camp craft for cooking, including:
    - a pot rod,
    - a swinging pot holder, or
    - a Chippewa kitchen;
- a wheelbarrow,
- a coat hanger,
- a simple bench,
- a bench with back rest,
- a camp table, or
- a friction-lock table.

ACTIVITY

Time: 100 min

OBJECTIVE

The objective of this activity is to have the cadets, in pairs, construct two camp crafts.

RESOURCES

- Knife,
- Cord,
- Axe,
- Bow saw,
- Other resources based on camp craft chosen, and
- Diagrams detailing camp craft construction (located at Annexes V to AJ).

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs and hand out diagrams detailing camp craft construction.
2. Have the cadets construct two camp crafts.
3. When camp crafts are completed, have the groups view all of the constructed crafts.
4. Do not leave camp crafts behind. Have the cadets redistribute all natural material used into the bush at the end of the lesson or exercise.

SAFETY

Tools shall be handled in a safe manner.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in constructing camp crafts will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to be able to construct camp crafts in a survival situation so they will be able to combat both the elements and psychological factors (eg, boredom and loneliness). It is important to construct camp crafts that serve a purpose for each survival situation (eg, a fishing pole does not have a purpose if there is no water present). The amount of energy put into constructing a camp craft should be relative to its usefulness.

INSTRUCTOR NOTES/REMARKS

Natural resources found in the field, such as fallen or dead wood, are to be used for construction.

The directives found in CATO 11-08, *Environmental Protection and Stewardship*, are to be followed during this lesson.

The more difficult camp crafts should be constructed in advance for demonstration purposes.

REFERENCES

A0-039 CATO 11-08 Director Cadets 3. (1997). *Environmental Protection and Stewardship*. Ottawa, ON: Department of National Defence.

C2-046 PioneeringProjects.org. (2004). *PioneeringProjects.org*. Retrieved February 20, 2007, from http://www.pioneeringprojects.org/projects/index.htm.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 17

EO C390.12 – PERFORM MINOR FIRST AID IN A FIELD SETTING

Total Time:	120 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

There is no requirement for a qualified first aid instructor to teach the material contained in this lesson, as the cadets are not required to qualify in first aid; however, the instructor should be a qualified first-aider.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for TPs 1–3 and 5 as it allows the instructor to explain and demonstrate minor first aid while providing an opportunity for the cadet to practice and develop these skills under supervision.

An interactive lecture was chosen for TP 4 to introduce the cadets to the treatment of minor wounds and burns.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have performed minor first aid in a field setting.

IMPORTANCE

It is important for the cadets to be able to perform the selected minor first aid skills as injuries are a common occurrence in field settings. Having a basic understanding of minor first aid will allow the cadets to take action in an emergency situation.

Teaching Point 1	Demonstrate and Have the Cadets Perform Minor First Aid
Time: 25 min	Method: Demonstration and Performance

When performing first aid in the field there are certain considerations regardless of what the injury or illness is. The following are the first to be addressed:

- breathing problems,
- exposure,
- shock, and
- dehydration.

BREATHING PROBLEMS

Many people have died in the wilderness because they were left on their back while someone went to seek assistance. In most cases the person became unconscious and their relaxed tongue fell to the back of their throat blocking the air passage. In some cases the wounded individual vomited and it entered the lungs. In other cases blood from the nose or mouth collected in the airway and caused asphyxiation.

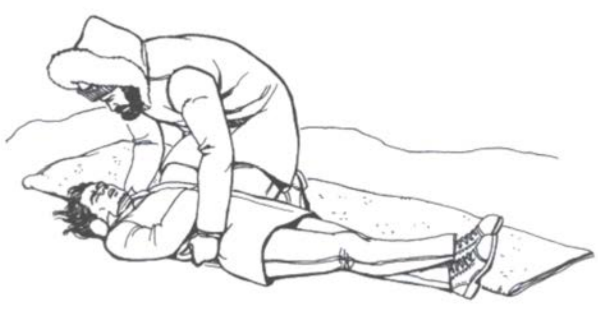
Placing a casualty in the recovery position is one of the basics of first aid. The recovery position protects an unconscious or injured casualty against fluid entering the lungs. If the casualty is on the snow or damp ground, a blanket or pad should be placed underneath to protect the face and reduce heat loss.

Have two assistants demonstrate each step as it is described.

The Recovery Position

The recovery position is adopted as follows:

1. Cross the casualty’s legs at the ankles, with the leg further from you on top.
2. Place the arm that is closer to you along their side and the arm further from you across their chest (as illustrated in Figure 18-17-1).



W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 3)

Figure 18-17-1 Preparing the Roll

3. Support their head with one hand and grip their clothing at the waist on the far side.

4. Roll the person gently toward you, protecting their head and neck, and rest them against your knees (as illustrated in Figure 18-17-2).

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 3)

Figure 18-17-2 Making the Roll

5. Bend their upper knee toward you to form a support (as illustrated in Figure 18-17-3).

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 3)

Figure 18-17-3 Leg Position

6. Position their head with the chin slightly extended to keep their airway open.

7. Place the upper arm above the head to keep the casualty from rolling onto their face (as illustrated in Figure 18-17-4).

8. Place the lower arm along their back so they cannot roll onto their back.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 3)

Figure 18-17-4 Final Position

If the individual is conscious and having breathing problems it is best to place them in a seated position. Causalities have died because they cannot get enough air into their lungs. A person lying down cannot breathe as well as someone who is sitting up.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 4)

Figure 18-17-5 Semi-Sitting Position

EXPOSURE

Exposure is a common hazard in a survival situation. It occurs when a person is exposed to the elements (eg, rain, snow, wind, immersed in water) and the body starts losing heat faster than it produces it. Hypothermia occurs when the body's core temperature falls below 33.7 degrees Celsius. If a person is wet, even in a mild wind, hypothermia may occur in temperatures as high as 15 degrees Celsius.

Anyone who is sick or injured is in more danger from exposure than a healthy person. They may get hypothermia or frostbite, because their bodies are unable to produce sufficient heat. A first-aider must protect a casualty from exposure even in a warm environment.

Protecting a casualty from exposure is as simple as covering them with a sleeping bag, blanket or extra clothing. It is also necessary to place something underneath the casualty as body heat is easily lost into the ground. Keep the casualty warm and dry as an injured person is extremely sensitive to changes in temperature.

SHOCK

Shock may be present with many injuries or illnesses and is usually present in serious injuries. Shock occurs when there is inadequate organ perfusion (decreased blood flow through the organs).

The Circulatory System

The heart is a pump. The arteries and veins work like flexible hoses: carrying blood to and from every part of the body, bringing oxygen and food, and removing carbon dioxide and waste products. The food and oxygen are “burned”, keeping the body healthy and producing heat. When organs are not getting enough oxygen to work properly the signs of shock will begin to show.

Causes of Shock

Shock is caused by a drop in blood pressure. This pressure is provided by the heart and maintained by a system of veins and arteries. Several things may cause this pressure to drop; medications, prolonged rest, a variety of illnesses, and if there is a “leak” in the system from a bad cut or injury. With such a “leak”, blood flows out of the system and the pressure drops.

Signs and Symptoms of Shock

Signs and symptoms of shock include:

- pale, cool clammy skin,
- rapid pulse rate,
- rapid breathing,
- thirst,
- gasping for air,
- anxiety,
- nervousness,
- confusion, and
- decreased amounts of urine.

Shock Prevention and Treatment

> Fainting is not the same as shock. It is caused by a shortage of blood flow to the brain.

Once shock begins, it may be difficult to stop. Always expect shock in any severe injury or illness and prevent/treat it by:

- ensuring a good airway;
- controlling bleeding;
- lying the casualty down on their back, with their feet raised 20–30 cm (8–12 inches) (do not tilt the entire body if there is difficulty breathing);
- keeping the casualty warm and comfortable;
- avoiding rough handling;

- reducing pain as much as possible (eg, by splinting fractures); and
- reassuring the casualty.

DEHYDRATION

> Dehydration is not usually a factor in urban first aid. In the wilderness, however, it often affects a person more than is realized.

Dehydration occurs when the body loses more water than it takes in. Dehydration is usually caused by:

- not drinking enough water;
- losing too much water through the skin by perspiration;
- losing too much water through the lungs by evaporation;
- losing water through vomiting or diarrhea; and
- frequently urinating.

A person who is working hard outdoors in a survival situation for several days with little opportunity to drink may become severely dehydrated and may show signs similar to shock. With the cold, very dry air in more northern regions, dehydration occurs more rapidly.

Signs and Symptoms of Dehydration

Signs and symptoms of dehydration include:

- thirst,
- dry tongue,
- discomfort,
- tiredness,
- nausea,
- sleepiness,
- pale, cool and clammy skin,
- faster pulse,
- pinched skin on back of hand is slow to flatten out, and
- little urine, dark in colour.

A person who drinks an adequate amount of fluids and is healthy will produce at least 1 000 ml of urine per day.

Prevention of Dehydration

Drink more water during outdoor activities. Try to drink even if there is no feeling of thirst. Remember that drinks containing caffeine are diuretics and will make one urinate more often. Although one can reduce thirst for a short time by nibbling on snow, remember that melting any amount of snow in the mouth takes an enormous amount of heat from the body and produces little water. Any water one can get, no matter how cold, will use up less body heat than eating snow.

There are stories of people who have survived for long periods of time by drinking their own urine, but it is more likely that they survived in spite of drinking urine since urine and sea water contain large amounts of salt which draw water away from the tissues, having an overall negative effect on hydration.

ACTIVITY

Time: 10 min

OBJECTIVE

The objective of this activity is to have the cadets practice putting a casualty in the recovery position.

RESOURCES

N/A.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets in groups of three or four.
2. Have one cadet act as the casualty, one act as the first-aider and one or two observe and assist.
3. The first-aider will put the casualty in the recovery position by:
   (a) crossing the casualty's legs at the ankles, with the leg furthest from the first-aider on top;
   (b) placing the arm closest to the first-aider along their side, the arm furthest from the first-aider across their chest;
   (c) supporting their head with one hand and grip their clothing at the waist on the far side with the other hand;
   (d) rolling the person gently toward the first-aider, protecting their head and neck, and resting them against the first-aider's knees;
   (e) bending their upper knee toward the first-aider to form a support;
   (f) positioning their head with the chin slightly extended to keep their airway open;
   (g) placing their upper arm to keep the casualty from rolling onto their face; and
   (h) placing the lower arm along their back so they cannot roll onto their back.
4. Have the cadets rotate through positions.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in putting a casualty into the recovery position will serve as the confirmation of this TP.

Teaching Point 2 | **Demonstrate and Have the Cadets Practice Actions to be Taken at an Emergency Scene**

Time: 30 min | Method: Demonstration and Performance

For this skill lesson, it is recommended that the instructor take the following format:

1. Explain and demonstrate the steps in the Priority Action Approach while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor the cadets' performance.

ENSURE PERSONAL SAFETY

With serious injuries it is often difficult to know how to assist. Most people react well to less serious problems. When a person gets a cut or scrape or breaks an arm, it is easy to see and understand what is wrong and handle it without emotion or confusion.

In every first aid situation, before doing anything else, a person must make sure there is no further hazard threatening oneself or the casualty. Take care of the hazard first or get the casualty away from it.

Rescuer panic usually happens when the casualty is unconscious or dazed, when there is a lot of blood or disfigurement, or when we do not know what is exactly wrong with the casualty but suspect it is quite serious. Rescuers who are panicked need to regain control of themselves before performing first aid.

FOLLOW THE STEPS IN A PRIORITY ACTION APPROACH

First aid employs the Priority Action Approach to identify and treat the most life threatening items first. Then the less critical areas are taken care of next. If the exact cause of the injury is known, either directly witnessed or the casualty is conscious and can describe the accident, there is no need to go through all the steps of the Priority Action Approach. However, if the cause is unknown it is necessary to follow a checklist of tasks.

The most common approach uses the first four letters of the alphabet as clues:

A = Airway and cervical spine

B = Breathing

C = Circulation

D = Deadly bleeds

Also, include "S" for shock, because it may be present in any serious injury or illness.

Check the level of consciousness (LOC), by talking to the casualty in a loud voice. If the casualty is unresponsive, immediately begin the Priority Action Approach.

(A) Airway and Cervical Spine. Check the airway. Is it open? Is there anything blocking the airway (eg, packed snow or blood)? Clear it. Is the tongue falling back blocking the airway? To open the airway, move the lower jaw upward without moving the neck.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 15)

Figure 18-17-6 Chin Lift

If there is a possibility of neck injury, immobilize the neck with a cervical or improvised collar. Ensure airway is open.

(B) Breathing. Be sure the casualty is breathing. Remember, they can only live for minutes without air. Press an ear next to their lips. Listen for breathing, feel for their breath on the ear or cheek and watch for the chest to rise and fall. If the casualty is not breathing, start rescue breathing immediately.

Rescue Breathing

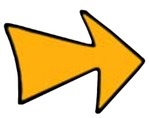
With the chin lifted, as illustrated in Figure 18-17-6, place the mouth over the casualty's mouth and establish a seal. Close the nostrils and breathe into the casualty's mouth. Then lift the mouth away, permitting the casualty to exhale. The rescuer breathes 12 times each minute (15 times for a child and 20 for an infant) into the casualty's mouth.

Rescue breathing and cardiopulmonary resuscitation (CPR) are very different in purpose. Rescue breathing only addresses the casualty's breathing problems. CPR addresses both breathing and circulatory problems. CPR requires extensive practice and will not be covered in this lesson.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 15)

Figure 18-17-7 Breathing

(C) Circulation. Check the circulation. Is there a pulse? The pulse in the neck (carotid pulse) is the easiest to check, because it is strongest. Fingers can be slipped onto the neck without removing clothing and risking frostbite. If there is no pulse and the first-aider has CPR training, start CPR.

	Breathing and circulation go hand in hand and a casualty cannot survive without either. If there is no pulse, chances are unlikely that the casualty will be breathing. They can still have a heartbeat and not be breathing if the injuries are recent. Start rescue breathing in this situation.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 16)

Figure 18-17-8 Pulse

(D) Deadly Bleeds. Make sure that the casualty is not bleeding severely from somewhere unseen. While wearing latex or surgical gloves, slide a hand gently beneath the casualty then remove and look for blood on the gloves. If the casualty is bleeding severely, try to stop it. Next, feel carefully underneath the casualty for any obvious bumps, irregularities or tenderness in the spine indicating damage.

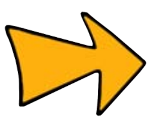
W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 16)

Figure 18-17-9 Bleeding

(S) Shock. Shock is a life-threatening disability. If the casualty shows or is likely to show the signs of shock, begin treatment immediately.

Shock is covered in TP 1.

Completing the Priority Action Approach should only take a couple of minutes.



First-aiders should wear latex gloves whenever they may be exposed to bodily fluids because of the increasing danger of HIV (the AIDS virus), hepatitis (A, B, C, D, and E) and other diseases. Every first aid kit should include one or more pairs of gloves. They can be obtained at a drug store, nursing station or hospital. After use, the contaminated gloves should be carefully removed and burned. Any blood that accidentally spatters onto skin must be washed off immediately with soap and water.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in completing the Priority Action Approach will serve as the confirmation of this TP.

Teaching Point 3 | **Demonstrate and Have the Cadets Move a Casualty to Shelter**

Time: 30 min | Method: Demonstration and Performance

For this skill lesson, it is recommended that the instructor take the following format:

1. Explain and demonstrate each carry while the cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor the cadets as they imitate each step in groups of two or three.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to assist with carries and monitor the cadets' performance.

MOVING AND CARRYING OVER SHORT DISTANCES

Many wilderness emergencies require moving or carrying a casualty a short distance, with usually only one or two rescuers. It is difficult to carry an adult for any distance and it is easy to injure them further while carrying.

Drags

A casualty should be dragged only if they must be moved quickly out of danger, severe cold, strong winds, blowing snow or water. It is important to assess the casualty before attempting a drag because some injuries, if not yet stabilized, may be aggravated by premature movement. If there is only one rescuer, dragging may be the only means of moving a casualty.

When dragging a casualty, observe the following rules:

- Drag a casualty headfirst. This allows the head and neck to be supported and keeps the body straight.
- Keep the body in-line. The casualty's body must not twist or bend. Avoid major bumps.
- The neck should not bend sharply, nor should the head fall forward or to the side.

Steps to drag a person:

1. If possible, secure the casualty's hands before beginning the drag.
2. Reach under the casualty's body and grip their clothing just below their shoulder on either side while supporting the head and neck using the forearms.
3. Crouch or kneel and walk backwards (as illustrated in Figure 18-17-10).
4. Stop when the casualty is out of danger.

This drag is hard on the rescuer's back, so be careful.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 21)

Figure 18-17-10 Drag

5. If the casualty's clothing pulls up too much or tears, place a shirt or jacket over their chest and bring the sleeves under their back to provide a firm grip (as illustrated in Figure 18-17-11).

> The first-aider can use cuff buttons or Velcro, mitten ties or a piece of cord to assist in this drag.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 21)

Figure 18-17-11 Modified Drag

Tarp Drag Method

> Rarely should lifts or carries be done on snow because of the possibility of the rescuer slipping; it is safer and easier to drag a casualty on a tarp or sled.

The tarp drag method works well on snow. A rescuer may make a ramp of snow and slide a casualty onto a sled. This drag is also a good way to move a casualty onto insulating material to protect them from the cold ground or snow.

One may wish to leave the tarp under the casualty to aid in another lift. Always put the casualty into a basket stretcher with a backboard, blanket or tarp under them, as it is otherwise difficult to remove them without excessive movement.

> Be careful when using the tarp drag method on sloping snow as control may be lost on a downhill slope.

Dragging a casualty on a tarp, blanket, sail, tent or large hide can be accomplished by following these steps:

1. Place the tarp next to the casualty.
2. Fold the tarp into accordion folds of about 1 m (3 feet) wide.
3. Log-roll the casualty toward the first-aider and brace them there with your knees while the first-aider use one hand to slide the folds close against their back.
4. Roll the casualty gently back onto the accordion folds.
5. Reach under the casualty and pull the folds out straight.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 21)

Figure 18-17-12 Rolling Onto a Tarp

6. Grip the tarp and hold the casualty's head and shoulders off the ground and drag carefully.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 21)

Figure 18-17-13 Tarp Drag

Single-Rescue Carries

Most single-rescue carries are for short distances and cannot be used to transport a casualty with major injuries. All are extremely strenuous. They are often used to transport casualties with injuries of the lower extremities but care must be taken as it is easy to cause further injuries.

Packstrap Carry

This is a quick, easy carry for very short distances. The casualty must be able to stand to get into position with their arms across the shoulders like packstraps. Bring the casualties arms across the shoulders, crossing their wrists in front. Hold their wrists while bending forward and lift the casualty's feet off the ground. Be sure their arms are bent at the elbow.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 23)

Figure 18-17-14 Packstrap Carry

Pickaback Carry

This familiar carry is good for short-distance transport of conscious casualties with minor injuries and may be used to carry children for long distances.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 23)

Figure 18-17-15 Pickaback Carry

Carrying Seat

A quick and easy backpack seat to assist the pickaback system may be made with a simple loop of wide strap. It may be necessary to adjust the length once or twice for maximum comfort. This seat is best used if the casualty is lighter than the rescuer, otherwise it may put pressure on the rescuer's neck and shoulders.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 23)

Figure 18-17-16 Carrying Seat With Wide Strap

CARRYING OVER LONG DISTANCES USING TWO-PERSON CARRIES

Lifting is half as strenuous if there are two rescuers; however carrying for any distance is usually not easier because two carriers must compensate for each other's movements to keep balanced. The chance of error is multiplied with each added person in a lifting team and injury to the casualty often occurs if lifts are poor. Whenever more than one person lifts, observe the following rules:

- One person must be clearly designated as the leader and be responsible for giving all of the commands.
- The partner(s) must be told exactly what is to be done and what the commands will be.
- The lift should first be practiced without the casualty or on an uninjured person.
- Rescuers should maintain eye contact while lifting.

The Fore-and-Aft Lift and Carry

This should be used only if the casualty has minor injuries. On uneven terrain, it may be the easiest method of lifting a casualty onto a stretcher or another means of transport. As it produces some pressure against the chest, it will restrict the casualty's air flow. Follow these steps:

1. If the casualty is conscious, help them sit up. If the casualty is unconscious, have a partner take the casualty's hands and pull them into the sitting position.
2. Cross the casualty's arms on their chest.
3. Crouch behind them, reach under their arms and grasp the opposite wrists.
4. Have your partner crouch between the casualty's knees, facing the casualty's feet and take a leg under each arm.
5. At the leader's signal, rise, keeping your back straight.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 26)

Figure 18-17-17 Fore-and-Aft Lift and Carry

Two-Hand Seat

This two-person lift and carry is good for casualties who cannot hold onto the rescuer's shoulders for support, or who are not fully alert.

1. Rescuers crouch on either side of the casualty.
2. Each rescuer will slide one hand under the casualty's thighs and lock fingers over a pad or while wearing mittens or gloves so that fingernails do not dig into each other (as illustrated in Figure 18-17-18).

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 26)

Figure 18-17-18 Hand Grip

3. Reach across the casualty's back and grip their belt and pants at the opposite hip; the rescuers' arms are crossed (as illustrated in Figure 18-17-19).
4. Rise on command and step off with the inside foot. This supports the casualty's back; however, the fingers of the gripping hands will tire quickly.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 26)

Figure 18-17-19 Two-Person Lift

For longer carries, try gripping your partner's wrists rather than their fingers. If wearing mittens, gripping the wrist will be more secure than gripping the hand. If the casualty is unconscious, they may be lifted easily to a sitting position. One rescuer pulls on the casualty's hands while the other lifts and supports their head; then the rescuers move into position while supporting the casualty's head and back.

W. Merry, St. John Ambulance: The Official First Aid Guide, McClelland & Stewart Inc. (p. 26)

Figure 18-17-20 Two-Person Carry

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in completing all the carries will serve as the confirmation of this TP.

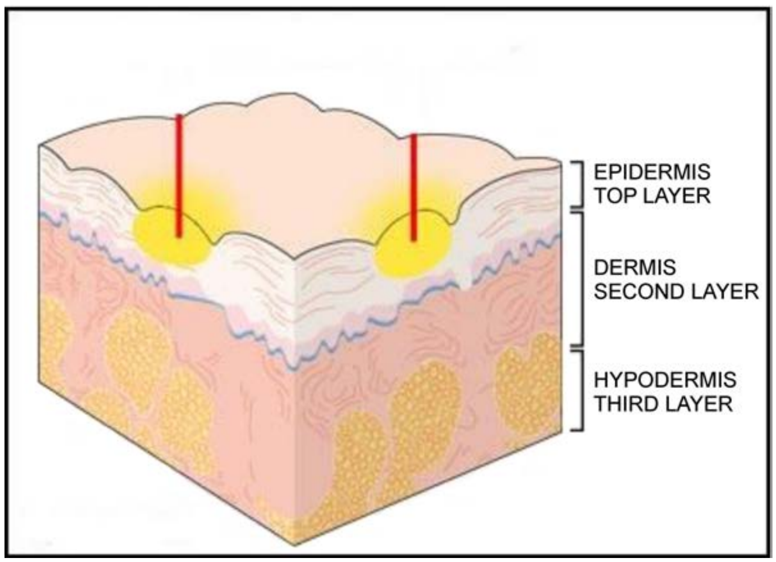
Teaching Point 4	Have the Cadets Identify Minor Wounds and Types of Burns
Time: 10 min	Method: Interactive Lecture

MINOR WOUNDS

Minor wounds are those that do not have severe bleeding; bleeding wounds can be internal (inside the body) or external (outside the body). Common external bleeding wounds are:

- abrasions and scrapes, and
- nicks and cuts.

There is always a risk of infection when the skin's top layer is broken. Knowing how to identify and treat minor wounds can reduce the risk of infection or aggravation.



Irishhealth.com, Copyright 2007 by Irishhealth.com. Retrieved March 17, 2007, from http://irishhealth.com/index.html?level=4&con=467

Figure 18-17-21 Layers of Skin

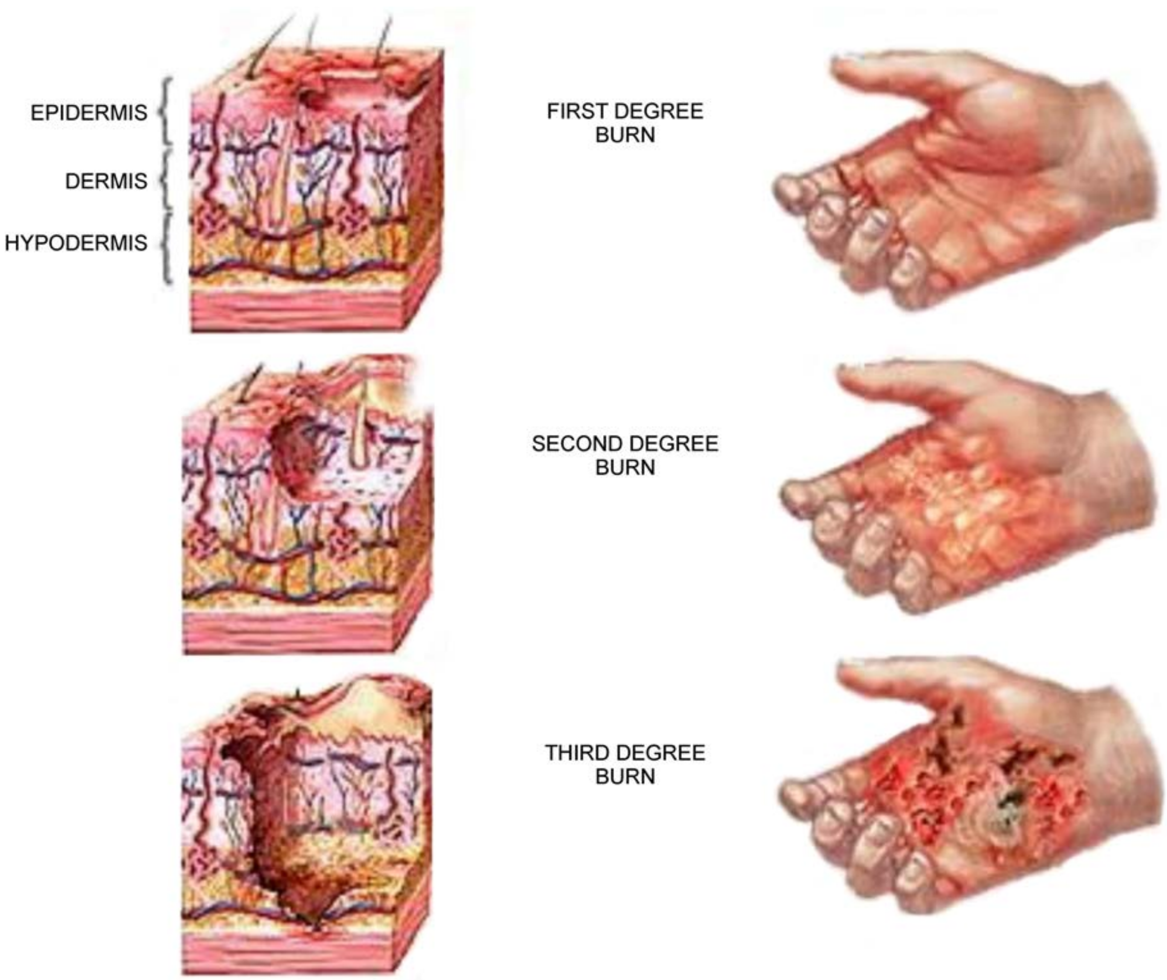
Abrasions and Scrapes. These occur on the top layer of the skin, when the skin is scraped or rubbed away. They are often painful and may bleed in small amounts.

Nicks and Cuts. Cuts are breaks in the top or second layer of the skin; there is often minor bleeding involved.

TheFatManWalking.com, Copyright 2006 by FatManWalking.com. Retrieved March 6, 2007, from http://www.thefatmanwalking.com/page/65492/;jsessionid=mni5xlvqdm9

Figure 18-17-22 Leg Scrape

TYPES OF BURNS



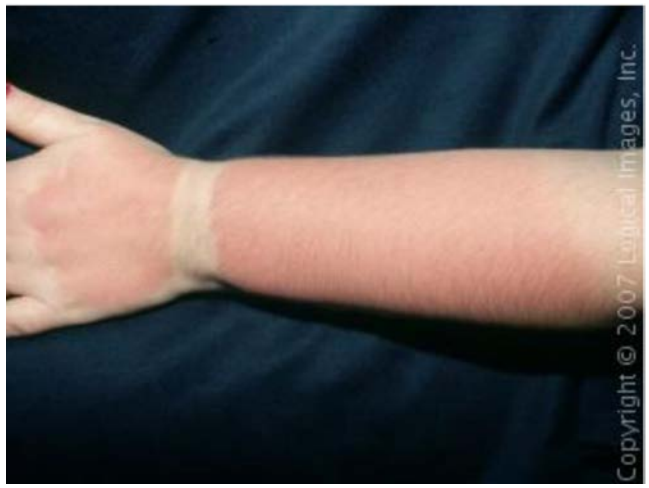
Medline Plus, Medical Encyclopedia, Copyright 2007 by US National Library of Medicine. Retrieved March 19, 2007, from http://www.nlm.nih.gov/medecineplus/ency/presentations/100208_4.htm

Figure 18-17-23 Types of Burns

First-Degree Burns. Called superficial burns and only affect the top layer of skin. Hot liquids, heat, and the sun are the main causes of these burns.

Signs and symptoms of a first-degree burn include:

- pinkish-reddish skin,
- slight swelling of the area,
- mild to moderate pain in the area, and
- sore, dry skin.



VisualDxHealth, 2006-2008, Sunburn, Copyright 2007 by Logical Images, Inc. Retrieved March 17, 2008, from http://www.visualdxhealth.com/images/dx/webChild/sunburn_43305_lg.jpg

Figure 18-17-24 First-Degree Burn

Sunburns are first-degree burns.

Second-Degree Burns. Affect the second layer of skin. Hot liquids, the sun, chemicals, and fire are the main causes of these burns.

Signs and symptoms of a second-degree burn include:

- raw-looking, moist skin,
- skin colouring that may range from white to cherry red,
- blisters containing clear fluid, and
- extreme pain in the area.

Sickkids.ca. Copyright 1999 by The Hospital for Sick Children. Retrieved March 6, 2007, from http:// www.sickkids.ca/plasticsurgery/section.asp?s=Burns&s ID=4489&ss=About+Burns&ssID=4496

Figure 18-17-25 Second-Degree Burn

Third-Degree Burns. Affect the third layer of skin and can extend into the muscle. Contact with extreme heat sources (eg, hot liquids and solids, direct flame, chemicals) and electricity are the main causes of these burns.

Signs and symptoms of a third-degree burn include:

- dry, leathery skin,
- pearly white, tan, grey, or charred black skin,
- blood vessels or bone may be visible,
- little or no pain (nerves are destroyed),
- breathing problems, and
- shock.

Sickkids.ca. Copyright 1999 by The Hospital for Sick Children. Retrieved March 6, 2007, from http://www.sickkids.ca/plasticsurgery/section.asp?s=Burns&s ID=4489&ss=About+Burns&ssID=4496

Figure 18-17-26 Third-Degree Burn

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. Where do abrasions and scrapes occur?

Q2. What layer of the skin does first-degree burn affect and what are the main causes?

Q3. What are the main causes of third-degree burns?

ANTICIPATED ANSWERS

A1. They occur on the top layer of the skin, when the skin is scraped or rubbed away. They are often painful and may bleed in small amounts.

A2. Called superficial burns and only affect the top layer of skin. Hot liquids, heat and the sun are the main causes of these burns.

A3. Contact with extreme heat sources (eg, hot liquids and solids, direct flame, chemicals) and electricity are the main causes of these burns.

Teaching Point 5 — **Demonstrate and Have the Cadets Treat Minor Wounds and First-Degree Burns**

Time: 150 min — Method: Demonstration and Performance

For this skill lesson, it is recommended that the instructor take the following format:

1. Explain and demonstrate treating minor wounds and first-degree burns while the cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor the cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to assist with carries and to monitor the cadets' performance.

TREATMENT FOR MINOR WOUNDS

There are three basic objectives when treating abrasions, scrapes, nicks and cuts:

- to control bleeding;
- to prevent further injury; and
- to reduce the risk of infection.

Have cadets, in pairs, practice the principles of cleaning and treating a wound, using the following resources:

- gauze,
- gloves,
- scissors,
- sterile dressing, and
- tape.

Principles of cleaning and treating a minor wound to avoid infection:

1. Wash hands with soap and water and put gloves on. Do not cough or breathe directly over the wound.
2. Fully expose the wound, without touching it.
3. Gently wash loose material from the surface of the wound. Wash and dry the surrounding skin with clean dressings, cleaning the wound with clean gauze wiping from the centre of the wound to the edge of the wound (an antibiotic cream can be used on surface wounds and abrasions).
4. Cover the wound promptly with a sterile dressing.

Medline Plus, Medical Encyclopedia, Copyright 2007 by US National Library of Medicine. Retrieved March 19, 2007, from http://www.nlm.nih.gov/medecineplus/ency/presentations/100208_4.htm

Figure 18-17-27 Washing the Wound

5. Tape the dressing in place.

6. Remove and dispose of the gloves and wash your hands and any other skin area that may have been in contact with the casualty's blood.

Medline Plus, Medical Encyclopedia, Copyright 2007 by US National Library of Medicine. Retrieved March 19, 2007, from http://www.nlm.nih.gov/medecineplus/ency/presentations/100208_4.htm

Figure 18-17-28 Dressing and Taping the Wound

TREATMENT FOR FIRST-DEGREE BURNS

Have cadets, in pairs, practice the principles of cleaning and treating heat and radiation burns, using the following resources:

- gauze,
- gloves,
- scissors,
- sterile dressing, and
- tape.

Heat Burns. The most common types of burns; caused by sources of heat such as flames from stoves, lanterns, and fires. A scald is a heat burn caused by hot liquid or steam.

To treat a heat burn:

1. Immerse the burn in cool water until the pain is reduced. If it is not possible to immerse the burn in cool water, flush the burn with cool water and cover it with a clean, wet cloth.

Medline Plus, Medical Encyclopedia, Copyright 2007 by US National Library of Medicine. Retrieved March 19, 2007, from http://www.nlm.nih.gov/medecineplus/ency/presentations/100213_1.htm

Figure 18-17-29 Cooling the Burn

2. Cover the burn with a clean, lint-free dressing.
3. Seek further medical attention, if necessary.

Medline Plus, Medical Encyclopedia, Copyright 2007 by US National Library of Medicine. Retrieved March 19, 2007, from http://www.nlm.nih.gov/medecineplus/ency/presentations/100213_1.htm

Figure 18-17-30 Dressing the Burn

Radiation Burns (Sunburns). These are caused by over-exposure to sunlight and can be prevented by wearing sunscreen of a high sun protection factor (SPF), long sleeves, and wide-brimmed hats. Sunburns range from mild to serious.

SPF indicates the time a person using sunscreen can be exposed to sunlight before getting sunburn. For example, a person who would normally burn after 12 minutes in the sun would expect to burn after 120 minutes if protected by a sunscreen with SPF 10. The higher the SPF, the more protection sunscreen offers against ultraviolet radiation (UV).

To treat radiation burns:

1. Seek shade.
2. Gently sponge the area with cool water.
3. Cover the area with a cool wet towel.
4. Repeat as needed to relieve pain.
5. Pat the skin dry.
6. Apply medicated sunburn lotion (ointment).
7. Seek medical attention, if necessary.

Blisters caused by sunburns should not be broken. Fevers and vomiting indicate a serious sunburn and medical attention should be sought immediately.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in treating minor wounds and first-degree burns will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in placing a casualty in the recovery position, practicing the Priority Action Approach, moving a casualty to shelter and treating minor wounds and first-degree burns will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

It is important for the cadets to be able to perform the selected minor first aid skills as injuries are a common occurrence in field settings. Having a basic understanding of minor first aid will allow the cadets to take action in an emergency situation.

INSTRUCTOR NOTES/REMARKS

There is no requirement for a qualified first aid instructor to teach the material contained in this lesson, as the cadets are not required to qualify in first aid; however, the instructor should be a qualified first-aider.

REFERENCES

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C2-030 (ISBN 0-7710-8250-9) Merry, W. (1994). *St. John Ambulance: The Official Wilderness First Aid Guide*. Toronto, ON: McClelland & Stewart Inc.

ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 18

EO C390.13 – ACT AS A MEMBER OF A GROUND SEARCH AND RESCUE (SAR) PARTY

Total Time:	120 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-803/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Examples of confinement methods and clues are to be created prior to the lesson.

The lost person's survival site is to be created prior to the lesson.

The briefing to be presented in TP 4 should be created based on the details of the lost person that will be found at the scenario's survival site. A sample briefing is located at Annex AK.

Additional staff will be required during TP 4 for supervision and assistance in the search.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to present the categories of lost persons and other general information to the cadets.

Demonstration was chosen for TPs 2 and 3 as it allows the instructor to explain and demonstrate limiting the search area and clue orientation which the cadet is expected to learn.

A practical activity was chosen for TP 4 as it is an interactive way to experience being a member of a search and rescue party. This activity contributes to the development of search and rescue skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet, in pairs, shall have acted as a member of a ground SAR party.

IMPORTANCE

It is important for the cadets to know how a ground SAR party operates so they know what to look for when searching for a lost person. It is easier for them to plan their rescue in a survival situation.

Teaching Point 1	**Explain Lost Person Behaviour and General Information**
Time: 10 min	Method: Interactive Lecture

LOST PERSON BEHAVIOUR

Profiling. Recording and analyzing a person's psychological and behavioural characteristics, to assess or predict their capabilities or to assist in identifying a particular subgroup of people.

People that become lost exhibit specific traits that have been profiled from SAR statistics. These traits, if known to the SAR party, will greatly help in the search effort. While there will always be exceptions, lost persons will generally react to their situation based on these specific traits.

Children (1–3 Years)

Children will rarely be far from the point they were last seen, unless some mode of transportation is available (eg, a river, boat, vehicle). In general, children in this age group exhibit the following traits:

- unaware of the concept of being lost;
- navigation skills and sense of direction are practically non-existent;
- tend to wander aimlessly with no specific objective; and
- will seek out the most convenient location to lie down and go to sleep, for example:
  - inside a hollow log,
  - under a thick bush,
  - under an overhanging rock, or
  - under a picnic table.

Children (3–6 Years)

Children will rarely be far from the point they were last seen, unless some mode of transportation is available (eg, a river, boat, vehicle, bicycle). In general, children in this age group exhibit the following traits:

- more mobile and capable of walking further than children aged 1–3 years;
- have a concept of being lost and will generally try to return home or go back to a place they are familiar with;
- have definite interests and may be drawn away by animals, older children or just exploring;
- when tired, generally try to find a spot to sleep; and
- some have been instructed to stay away from strangers and as a result will not answer or talk to searchers when called by name.

Children (6–12 Years)

This group is much more complex than the previous groups in that they may intentionally be running away. They may also seek out some mode of transportation (eg, boat, vehicle, bicycle). In general, members of this group exhibit the following traits:

- navigational and directional skills are much more developed;
- generally oriented to their normal, familiar surroundings and become confused in a strange environment;
- may intentionally run away to avoid punishment, gain attention, or sulk;
- often will not answer when called;
- darkness usually brings on a willingness to accept help and be found;
- suffer from the same fears and problems an adult would, but with a greater sense of helplessness; and
- the circumstances of becoming lost often reflect they are being taken to an unknown environment or surroundings by parents or other adults they know.

Older Persons

Older persons have a wide variety of capabilities, but the many physical and mental conditions of this group define their behavioural characteristics. In general, members of this group exhibit the following traits:

- may be suffering from senility or Alzheimer’s disease;
- may be easily attracted by something that catches their attention;
- their orientation may be to previously known environments rather than the present;
- some may have conditions that require the same type of supervision that children do;
- more lucid older persons may be more likely to over-extend and exhaust themselves rapidly, which can result in a heart attack or other fatal complications; and
- they may be hard-of-hearing or deaf which presents problems with detection.

People With Intellectual Disabilities (All Ages)

This group is very difficult to categorize due to the wide variety of disabilities; however some general behavioural characteristics are:

- they act and react in much the same way as children from the age of 6–12;
- they generally will not respond to their spoken name;
- they most often will be hidden from view as a result of fright or seeking shelter from the elements;
- many times they will stay in one place for days; and
- they usually have no physical impairments but may do nothing to help themselves.

Hikers

Hikers are one of the groups more likely to become lost and their behavioural characteristics include:

- they usually rely on trails with a set destination in mind;
- problems or complications may arise with navigation when trail conditions change or become obscure, for example:
    - a slide over the trail,

  - the trail is not maintained,
  - the trail is covered intermittently with snow in the spring, or
  - poorly defined trail junctions;
- often hiking party members may be mismatched in abilities and one person falls behind, becomes disoriented and ultimately lost;
- cutting switchbacks (a type of road/trail used to ascend/descend a slope by using almost 180 degree turns to follow the slope at a gentler angle for ease of driving/walking) will many times lead to disorientation or going down the wrong hill or drainage; and
- they may be dependent on travel aids and trails for navigation.

GENERAL INFORMATION

Most adults and older youth do not have specific traits that may be used to predict their behaviour. The most important clue to predicting their behaviour is the reason (eg, hiking) they were in the wilderness in the first place. The following general information is relevant (to all groups) and may be used when trying to predict the behaviour of a lost person, their movements and whereabouts.

Category and Circumstances

Can a lost person be categorized? Children are different from hikers, who are different from the elderly, etc. By categorizing a lost person, the search effort may be orientated to the most likely area. The circumstances surrounding the person before they become lost contribute greatly to predicting their behaviour. Effort must be made to discover these circumstances.

Terrain

The terrain affects travel. The area should be examined for barriers, escape routes, drainages, ridges, etc. Flat terrain generally yields different travel distances (farther) than mountainous.

Weather

Weather may restrict the lost person’s movement. It is also a principle contributor to hypothermia, which may affect movement and decision making. Poor weather increases the importance of the length of time a person has been lost (eg, increased risk of hypothermia) and may require increased SAR efforts.

Personality

It has a substantial effect on the lost person’s ability to survive. Consider the aggressive personality versus the ponderer or pessimist.

Physical Conditions

Are the lost person’s physical capabilities limited in any way? A poor physical condition means an increased susceptibility to hypothermia. It also has a direct bearing on the distance a lost person will travel.

Medical Problems

Is there any condition that could possibly precipitate abnormal behaviour? This could have a direct bearing on the distance a lost person will travel. Examples of medical problems that may affect a person’s behaviour:

- weak heart,
- diabetes,
- allergies, and
- not having taken medication when needed (they do not have their prescription with them).

Through determining if the lost person is affected by any of the discussed conditions, logical assumptions may be made on their possible behaviour in order to determine the most likely area to focus the search effort.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Where are the most likely places to find a lost child between the ages of 1–3?

Q2. Where would a hiker most likely be found?

Q3. How does weather affect the behaviour of a lost person and the need to find them?

ANTICIPATED ANSWERS

A1. Lying down/asleep inside a hollow log, under a thick bush, under an overhanging rock, or under a picnic table.

A2. On or near a trail.

A3. Weather restricts the lost person's movement and is a principle contributor to hypothermia. Poor weather increases the importance of the length of time a person has been lost (eg, increased risk of hypothermia) and may require increased SAR efforts.

Teaching Point 2 — **Explain and Demonstrate Limiting the Search Area**

Time: 20 min — Method: Demonstration

Demonstrate examples of limiting techniques, based on the types (eg, road block, track trap, string line) created (based on terrain) for the lesson, when it is being discussed.

LIMITING THE SEARCH AREA

Why Limit the Search Area?

The search area should be limited as the smaller the area, the less time that will be required to effectively cover it. In addition, fewer searchers are required, or smaller spacing can exist between party members.

Confinement. An effort made to establish a search perimeter which encompasses the lost person and beyond which the person is unlikely to pass without being detected.

Confinement Methods

Confinement methods are used to establish a perimeter around the area being searched and to detect a lost person that may wander out of the search area. Types of confinement methods include:

- **Road Block/Trail Block/Patrols.** Blocks and patrols are designed to cover the parts of the perimeter made up of roads and trails. Blocks serve to confine the search area and also inform through traffic of a search in progress. Patrols serve to cover stretches of roads and trails between the blocks.

- **Lookouts.** While aerial search has replaced the need for most fixed lookout towers, stationing lookouts on high ground is also a viable method of establishing a perimeter.
- **Track Traps.** Sections of trail or a road edge that has been brushed clear of all traces of use. Patrols would, on a regular basis, examine track traps for footprints for an indication that the lost person may have left the confinement area.
- **String Lines.** A method of confinement where a large spool of string is mounted in a backpack. As a SAR member walks through an area, the string unrolls, which is then tied by another SAR member approximately one metre (three feet) above the ground leaving a very visible perimeter. Arrows could also be placed on the string directing the lost person that comes across the string line to the closest SAR group, usually located at a road or trail block.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Why limit the search area?

Q2. Define confinement.

Q3. What is a string line?

ANTICIPATED ANSWERS

A1. The search area should be limited as the smaller the area, the less time that will be required to effectively cover it. In addition, fewer searchers are required, or smaller spacing can exist between party members.

A2. Confinement is an effort made to establish a search perimeter which encompasses the lost person and beyond which the person is unlikely to pass without being detected.

A3. A string line is a method of confinement where a string is tied approximately one metre (three feet) above the ground leaving a very visible perimeter for the lost person.

Teaching Point 3	**Explain and Demonstrate Clue Orientation**
Time: 10 min	Method: Demonstration

Demonstrate examples of clues, based on the types (eg, footprint, food wrapper, trip plan, an eyewitness account, light flashing in the distance) created for the lesson, when it is being discussed.

CLUE ORIENTATION

Searching for clues helps discover the characteristics and possible behaviour of the lost person that are key to limiting the search area.

General Principles

The general principles of clue orientation are as follows:

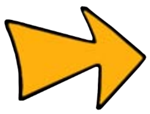
- Clue seeking is a learned skill and must be practiced to develop a sense of what is the minimum information needed to decide on how to categorize a lost person. Clues found and deciphered allow the SAR leader to orientate the search effort to the most likely area.

- Avoid forming opinions and then gathering information to support that opinion. It may limit the searcher to only accepting clues that support their opinion.
- A SAR leader gathers information from everyone, as no one person can know all the facts.
- Assemble a complete profile of the missing person and their situation and let it offer direction.

Searching for Clues

Types of clues that SAR leaders search for:

- **Physical.** Examples include footprints, food wrappers and dropped/lost items.
- **Recorded.** Examples include a trail register, summit logs and a trip plan.
- **People.** These are eyewitness accounts, the point last seen, family and friends.
- **Event.** Examples include a flashing light, a campfire or a ground-to-air signal.



The cadets should evaluate any physical clues they find for relevance. For example, a fresh candy wrapper possibly dropped by the lost person versus one that has been there for some time (dirty and weathered).

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Why is searching for clues important?

Q2. Why should a searcher avoid making an opinion and then search for clues?

Q3. Name the four types of clues.

ANTICIPATED ANSWERS

A1. Searching for clues helps discover the characteristics and possible behaviour of the lost person that are key to limiting the search area.

A2. It may limit the searcher to only accepting clues that support their opinion.

A3. The four types are: physical, recorded, people and an event.

Teaching Point 4	**Cadets, in Pairs, Will Participate in a Ground SAR Exercise**
Time: 70 min	Method: Practical Activity

Planning and preparation are key to the running of this activity. Ensure the lost person is in position before beginning the search.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets, in pairs, act as a member of a SAR party.

RESOURCES

- Prepared briefing,
- Compasses (one per pair),
- Two first aid kits (to be given to the anchor [end] pairs),
- Hand-held radios (one per pair),
- Spare batteries, and
- Whistle (one per cadet).

ACTIVITY LAYOUT

A large confined outdoor area.

ACTIVITY INSTRUCTIONS

1. Issue equipment, to include:
   (a) compass,
   (b) first aid kit,
   (c) hand-held radio,
   (d) spare batteries, and
   (e) whistle.
2. Give a briefing, to include:
   (a) situation,
   (b) details of the confinement area,
   (c) formation: creeping line (as when cadets do a garbage sweep),
   (d) distance between pairs: 10–20 m (30–60 ft) based on the terrain,
   (e) call signs and radio frequency to be used,
   (f) magnetic bearing (search direction),
   (g) safety bearing (if lost or disoriented), and
   (h) actions to take if the cadets discover a clue/lost person: radio in, wait for instructions.
3. Have the cadets deploy to the search start line.
4. Have the cadets respond to a radio check.
5. Begin the search.

6. Have the cadets radio in if they find a clue.
7. Have the cadets radio in if they find the lost person.
8. Have first-aid trained cadets perform first aid on simulated minor injuries of the lost person (only if designed into the scenario).
9. Have the cadets examine the (mock) survival site.
10. Have the SAR leader conduct a debriefing of the activity.
11. Have the cadets return equipment.

SAFETY

- A safety bearing shall be given to the cadets.
- Staff should be placed in the centre and at the ends of the search formation.

CONFIRMATION OF TEACHING POINT 4

The cadets' participation in the activity will serve as confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the SAR activity will serve as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Understanding how a SAR party operates, a person in a survival situation will have a better idea of knowing what is being looked for and where. If you know how to search, you should know how to be found. This information should allow the cadets to better plan for being rescued through selecting their site location, signal placement and clues known and also found.

INSTRUCTOR NOTES/REMARKS

A briefing will be conducted before the practical activity, to inlcude the scenario (eg, downed pilot, lost hiker), the confinement area, search bearing, and call signs.

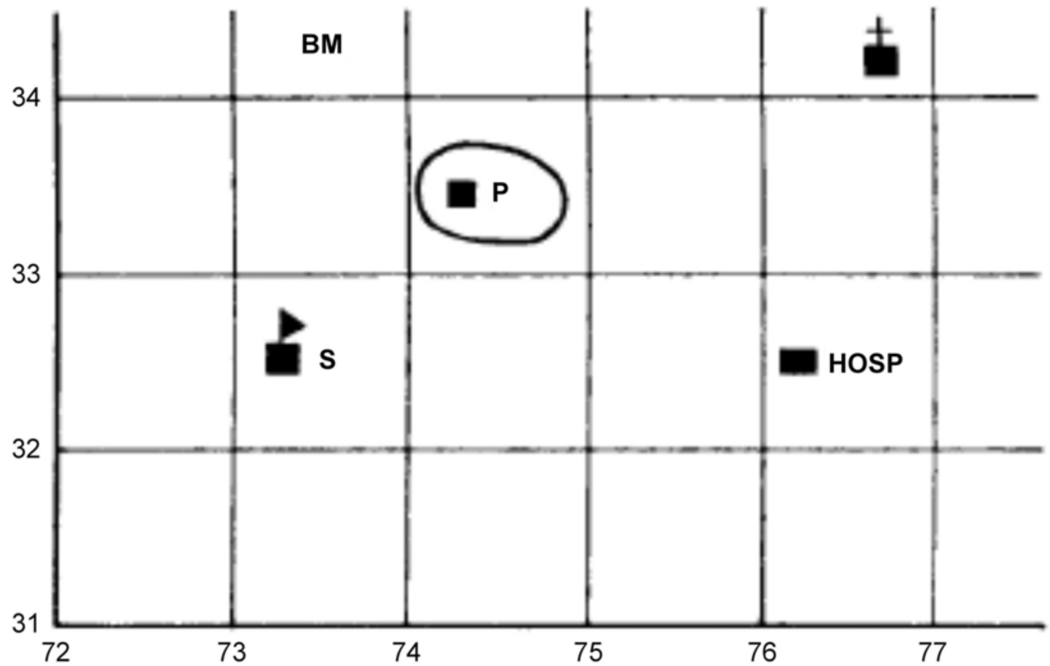
The scenario's survival site should be set up prior to the activity.

REFERENCES

A3-052 (ISBN 0-913724-30-0) LaValla, P. (1999). *Search is an Emergency*. Olympia, WA: ERI International Inc.

C3-208 (ISBN 0-7637-4807-2) National Association for Search and Rescue. (2005). *Fundamentals of Search and Rescue*. Mississauga, ON: Jones and Bartlett Publishers Canada.

WORKSHEET FOR FOUR-FIGURE GRID REFERENCES



Determine the four-figure grid references for the following:

Post Office: ____________

Hospital: ____________

Christian Church: ____________

Bench Mark: ____________

School: ____________

Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-18)

Figure 18A-1 Four-Figure Grid Reference Worksheet

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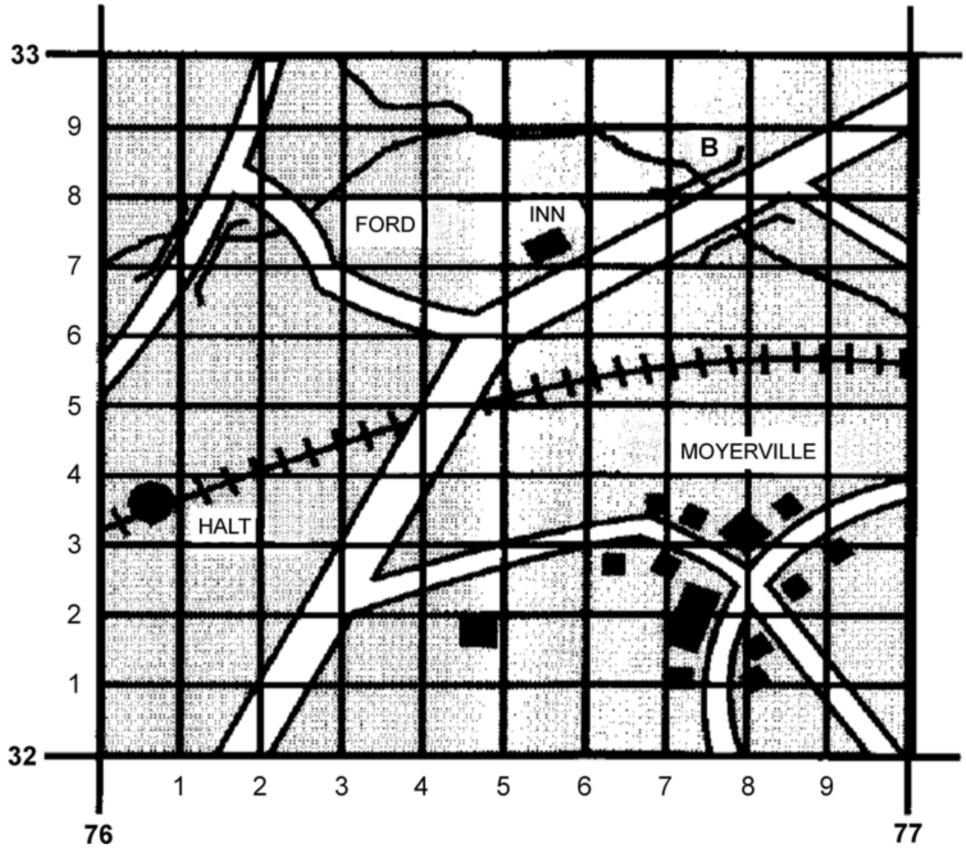
SIX-FIGURE GRID REFERENCES



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 38)

Figure 18B-1 Six-Figure Grid References

Steps to Determine a Six-Figure GR:

1. Identify the object within the grid square. Note the four-figure GR.
2. Using the imaginary grid within the square, determine the three-digit easting by using the two digits of the easting combined with the number of tenths, measured from the left, to the line before the object.
3. Using the imaginary grid within the square, determine the three-digit northing by using the two digits of the northing combined with the number of tenths, measured from the bottom, to the line before the object.
4. Combine the two sets of numbers to create the six-figure GR.

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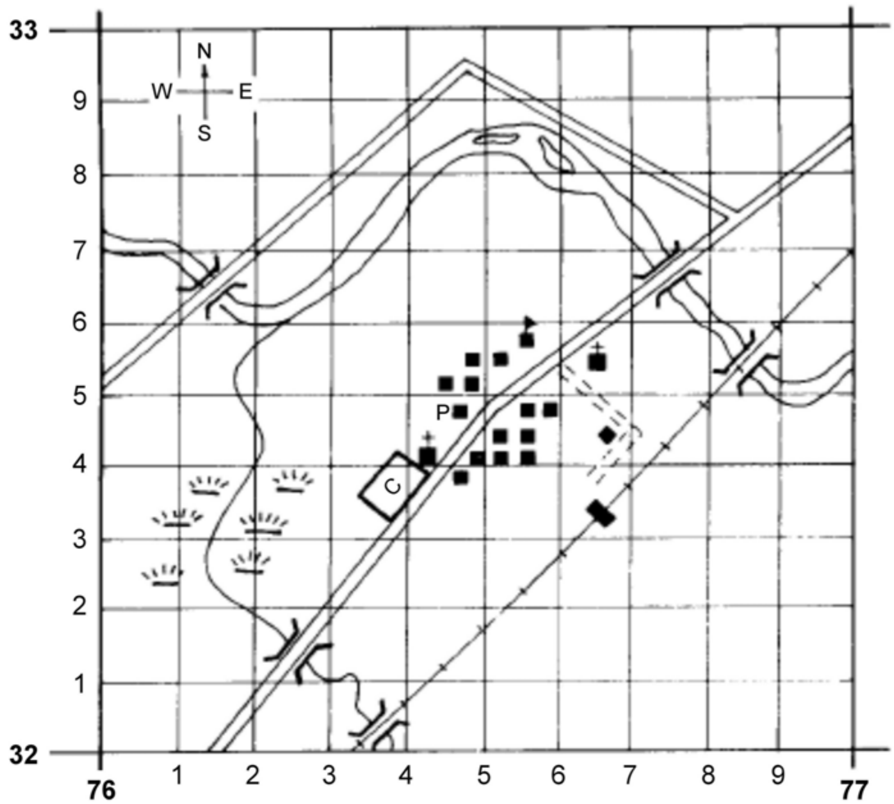
WORKSHEET FOR SIX-FIGURE GRID REFERENCES



Determine the six-figure grid references for the five bridges:

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Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-18)

Figure 18C-1 Six-Figure Grid Reference Worksheet

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ANSWER KEY FOR WORKSHEETS AT ANNEXES A AND C

Answer Key for Worksheet for Four-Figure Grid References

Post Office:	GR 7433
Hospital:	GR 7632
Christian Church:	GR 7634
Bench Mark:	GR 7334
School:	GR 7332

Answer Key for Worksheet for Six-Figure Grid References

GR 761326

GR 762321

GR 763320

GR 767326

GR 768325

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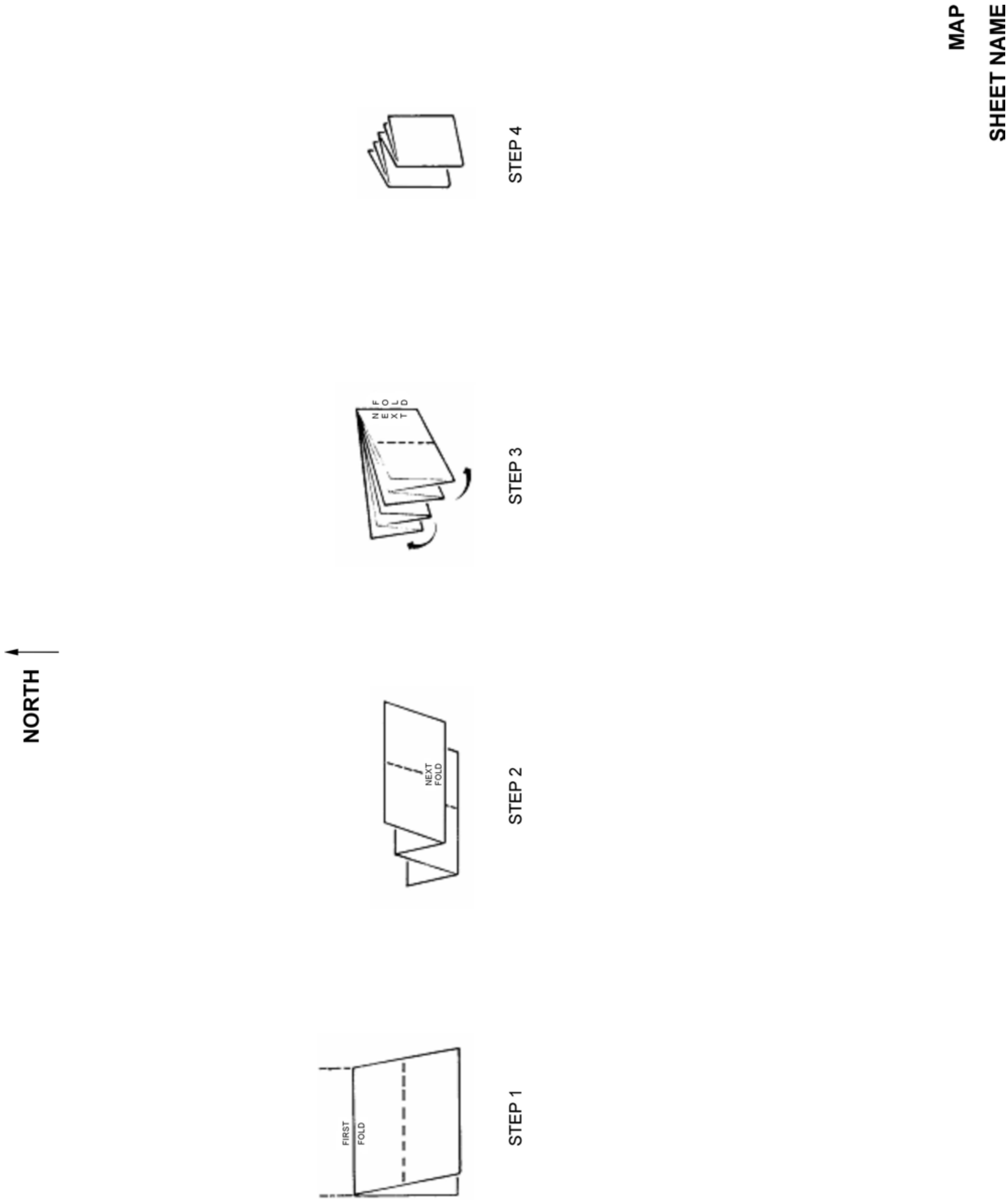
STEPS TO FOLD A MAP



Director Cadets 3, Royal Canadian Army Cadet Reference Book, Department of National Defence (p. 5-5)

Figure 18E-1 Steps to Fold a Map

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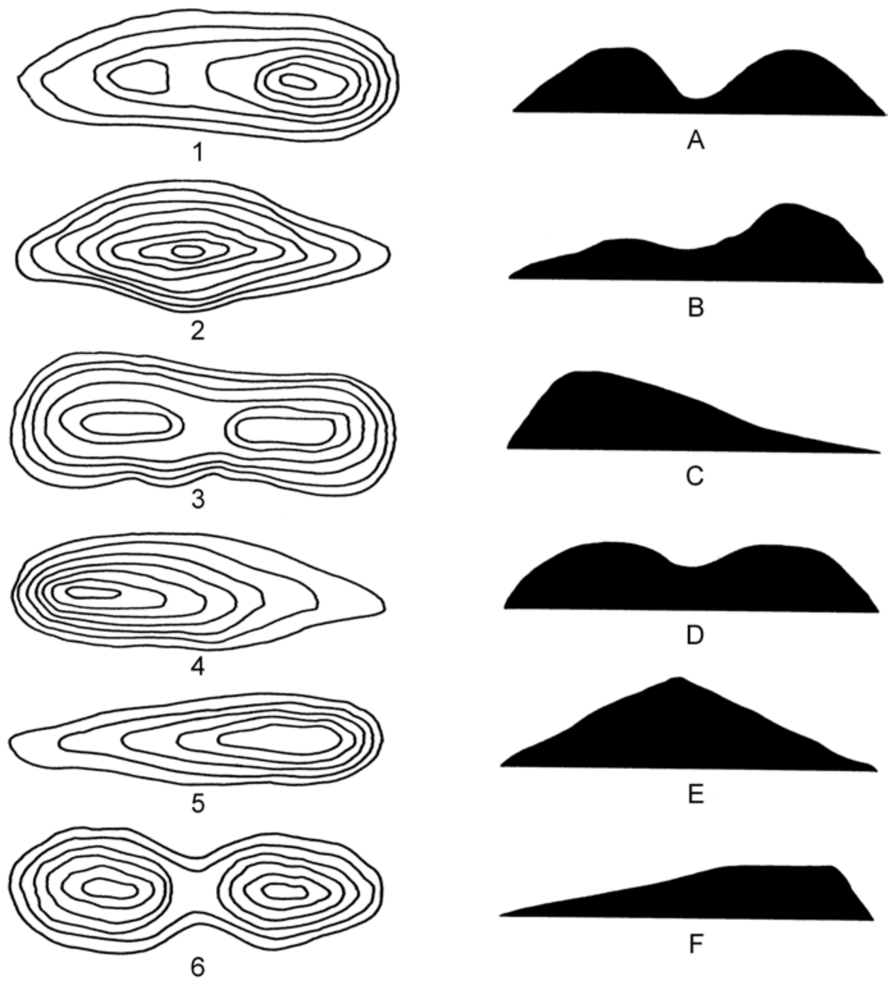
MATCH THE CONTOUR DIAGRAM ON THE LEFT TO THE APPLICABLE DEPICTION OF A LANDFORM ON THE RIGHT



1. ___
2. ___
3. ___
4. ___
5. ___
6. ___

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 18F-1 Contour Lines Matching Sheet

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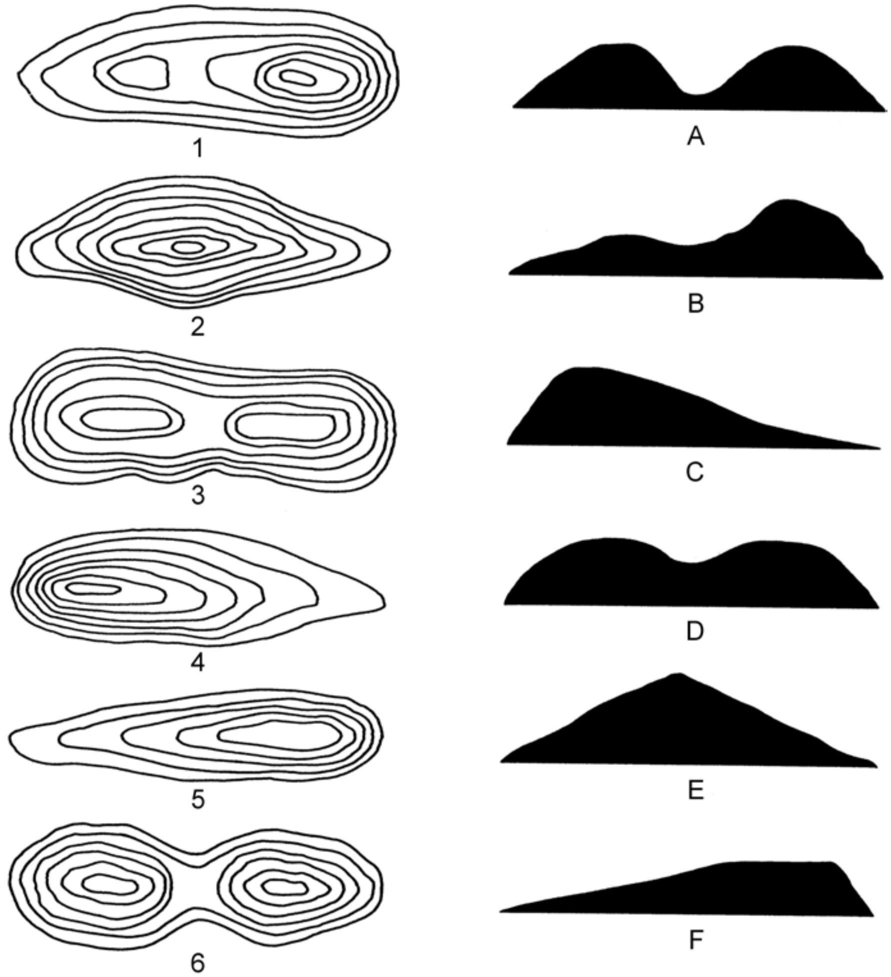
MATCH THE CONTOUR DIAGRAM ON THE LEFT TO THE APPLICABLE DEPICTION OF A LANDFORM ON THE RIGHT



1.	B	4.	C
2.	E	5.	F
3.	D	6.	A

Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 18G-1 Contour Line Matching Answer Key

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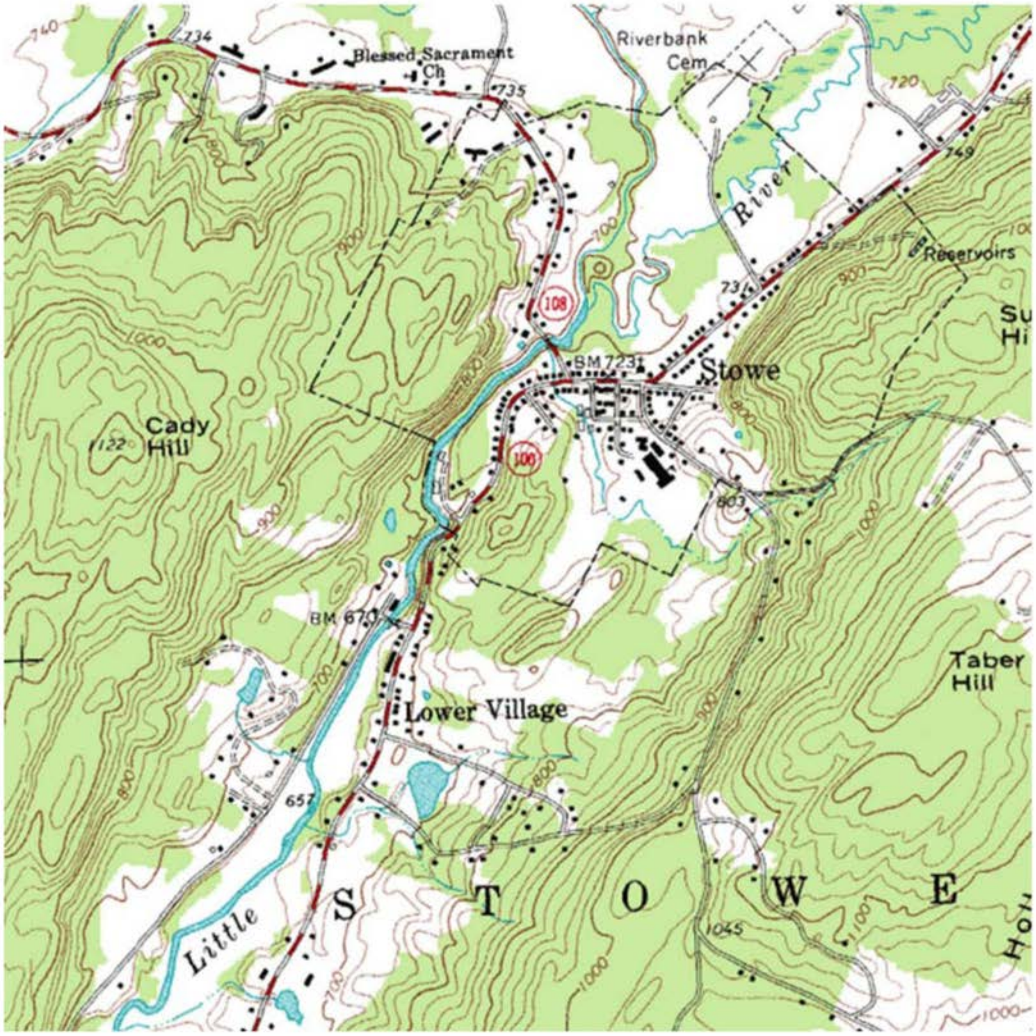
TOPOGRAPHICAL MAP EXAMPLE

Instructions: Draw a line to represent a route you would take to travel from your house on Taber Hill to the peak of Cady Hill.



Explain why you picked your route, emphasizing the contour lines you crossed over.

____

____

____

____

Wikimedia.org, 2006, Topographic Map Example. Retrieved March 26, 2008, from http://upload.wikimedia.org/wikipedia/commons/7/79/Topographic_map_example.png

Figure 18H-1 Topographical Map Example

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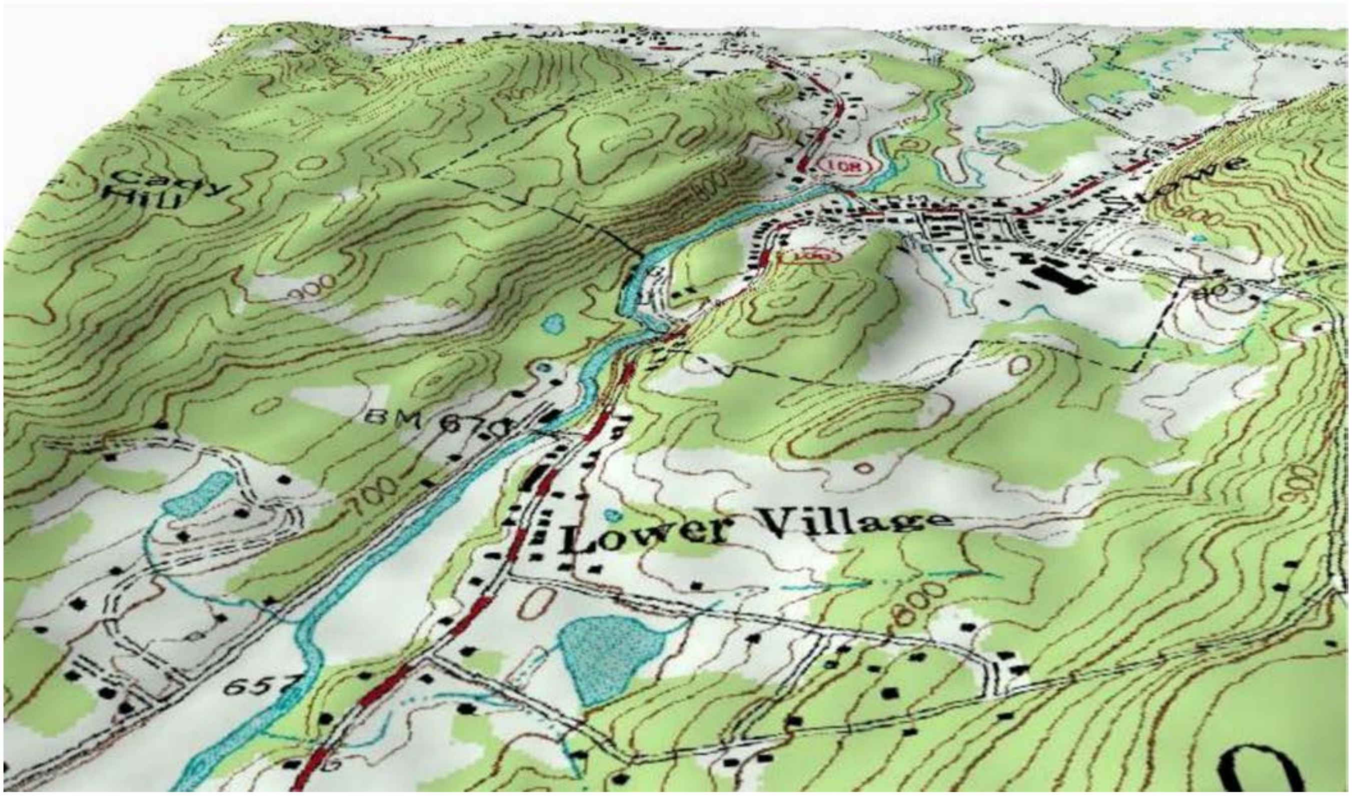
TOPOGRAPHICAL MAP EXAMPLE

Relief Version of Map at Figure 18H-1



Wikimedia.org, 2007, Topographic Relief Perspective Sample. Retrieved March 26, 2008 from http://upload.wikimedia.org/wikipedia/en/4/4c/Topographic-Relief-perspective-sample.jpg

Figure 18I-1 Topographical Relief Perspective Sample

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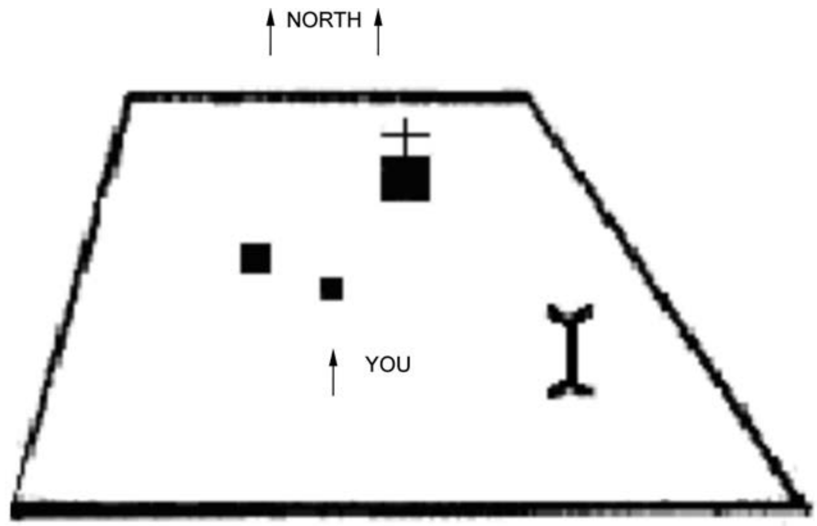
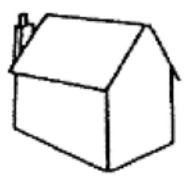
ORIENTING A MAP BY INSPECTION

MAP



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 79)

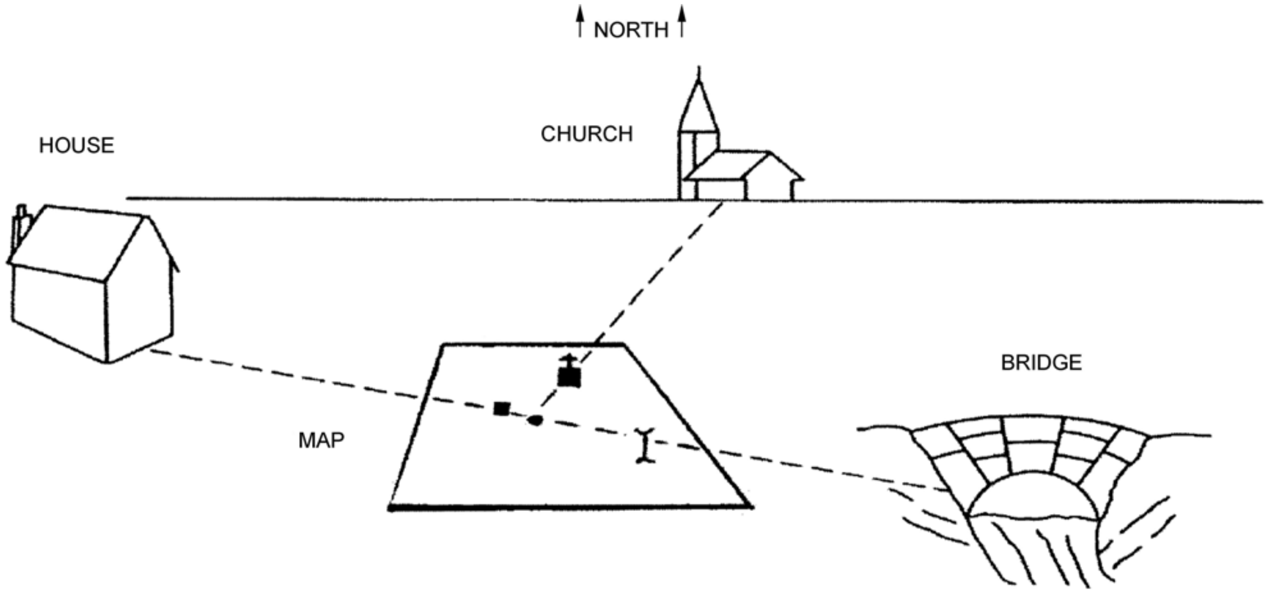
Figure 18J-1 Demonstration Map



House

Church

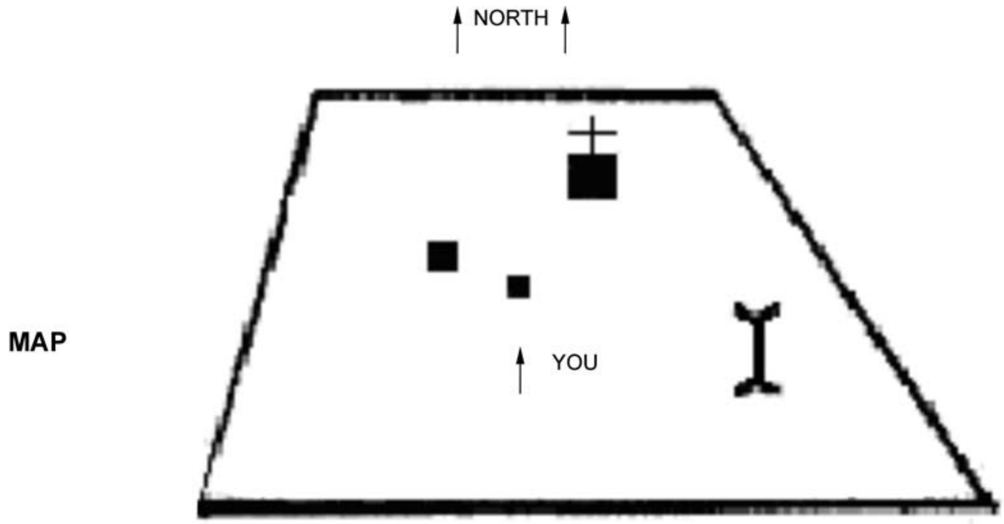
Bridge



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 79)

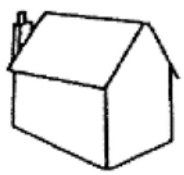
Figure 18J-2 Orienting a Map by Inspection

ORIENTING A MAP USING A COMPASS



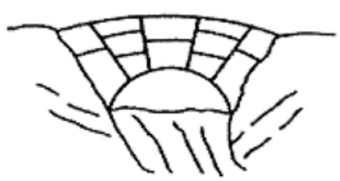
Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 79)

Figure 18K-1 Demonstration Map

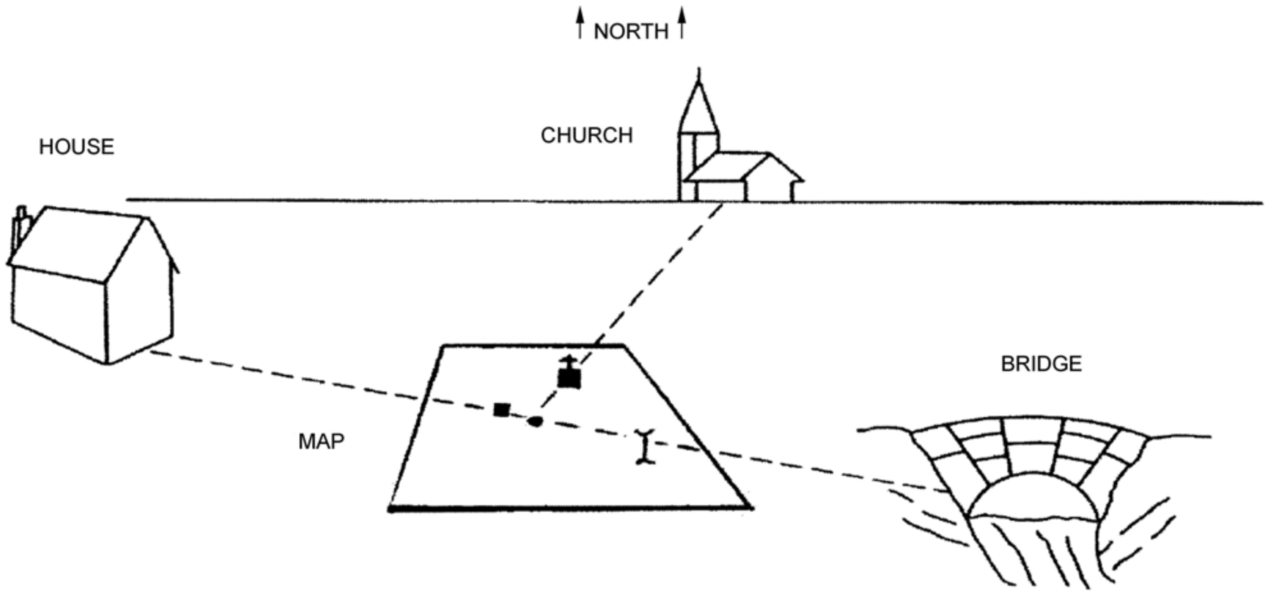


House

Church



Bridge



Canadian Forces, Maps, Field Sketching, Compasses and the Global Positioning System, Department of National Defence (p. 79)

Figure 18K-2 Orienting a Map Using a Compass

FACT SHEET: CALCULATING MAGNETIC DECLINATION

Formula: Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination

Grid Magnetic Angle. The angle between grid north and magnetic north, found on the declination diagram. Written in degrees and minutes.

> 1 degree (°) = 60 minutes ('), similar to calculating time (eg, 1 hour = 60 minutes).
>
> This ratio is very important to remember when adjusting the grid magnetic angle to the current declination. This is where most errors occur.

Current Year. The current calendar year.

Year of Declination Information. Found below the declination diagram.

Annual Change. Found below the declination diagram and is written in minutes.

> It is important that the annual change be inserted into the formula correctly:
>
> - If annual change is **increasing**, insert into formula as a **positive** number.
> - If annual change is **decreasing**, insert into formula as a **negative** number.

Current Declination. This is the result of the formula. It is the magnetic declination to be set on the compass.

East Declination. When magnetic north is east (to the left) of grid north on the declination diagram.

West Declination. When magnetic north is west (to the right) of grid north on the declination diagram.

> If the current declination calculates to a negative number, an east declination changes to a west declination and vice versa.

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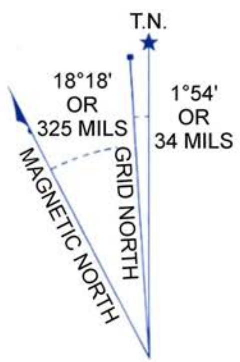
DECLINATION DIAGRAMS

EXAMPLE 1: CALCULATING MAGNETIC DECLINATION



USE DIAGRAM ONLY TO OBTAIN NUMERICAL VALUES
APPROXIMATE MEAN DECLINATION 1975
FOR CENTRE OF MAP
ANNUAL CHANGE DECREASING 1.4'

ONE THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 20

Grid Magnetic Angle: 18° 18'

Current Year: 2008 (used for this example)

Year of Declination Information: 1975

Annual Change: decreasing 1.4' (decreasing means 1.4' becomes -1.4')

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination

Inputting the information into the formula:

18° 18' + [(2008 - 1975) x (-1.4')] = Current Declination

Solving for current declination.

18° 18' + [(33) x (-1.4')] = Current Declination

18° 18' + [-46.2'] = Current Declination

18° 18' - 46.2' = Current Declination

Note: Since 46.2' cannot be easily subtracted from 18° 18', 1° is converted into 60' (similar to time calculations), which converts 18° 18' to 17° 78'.

17° 78' - 46.2' = Current Declination

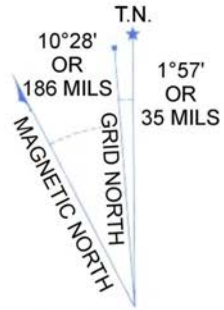
17° 31.8' = Current Declination

Since magnetic north is west of grid north and the result is positive, the magnetic declination for the topographical map in 2008 is 17° 31.8' west declination.

Natural Resources Canada, 2008, Topo Declination Diagram. Retrieved April 11, 2008, from http://gsc.nrcan.gc.ca/geomag/field/magdec_e.php?p=1

Figure 18M-1 Declination Diagram

EXAMPLE 2: CALCULATING MAGNETIC DECLINATION



USE DIAGRAM ONLY TO OBTAIN NUMERICAL VALUES
APPROXIMATE MEAN DECLINATION 1996
FOR CENTRE OF MAP
ANNUAL CHANGE DECREASING 2.7'

ONE THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 18

Grid Magnetic Angle: 10° 28'

Current Year: 2008 (used for this example)

Year of Declination Information: 1996

Annual Change: increasing 2.7'

Increasing means 2.7' becomes +2.7'

Inputting the information into the formula:

10° 28' + [(2008 - 1996) x (+2.7')] = Current Declination

Solving for current declination.

10° 28' + [(12) x (+2.7')] = Current Declination

10° 28' + [+32.4'] = Current Declination

10° 28' + 32.4' = Current Declination

10° 60.4' = Current Declination

Note: Since 60.4' is greater than 1°, 60' is converted into 1° (similar to time calculations), which converts 10° 60.4' to 11° 0.4'.

11° 0.4' = Current Declination

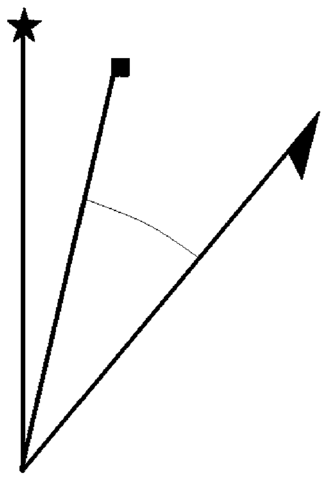
Since magnetic north is west of grid north and the result is positive, the magnetic declination for the topographical map in 2008 is 11° 0.4' west declination.

Canada Centre for Mapping, Bancroft 31 F/4, Natural Resources Canada

Figure 18M-2 Declination Diagram

MAGNETIC DECLINATION WORKSHEET

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination



Question 1:

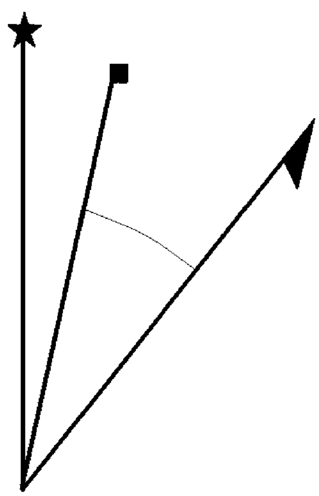
Grid Magnetic Angle: 10° 46'

Current Year: 2011

Year of Declination Information: 1988

Annual Change: decreasing 5.2'

Answer: ____________ E/W declination (circle correct one)



Question 2:

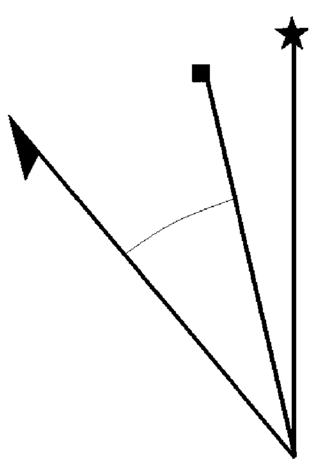
Grid Magnetic Angle: 11° 2'

Current Year: 2014

Year of Declination Information: 1995

Annual Change: increasing 3.8'

Answer: ____________ E/W declination (circle correct one)



Question 3:

Grid Magnetic Angle: 18° 43'

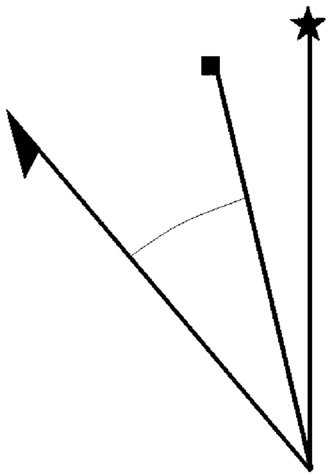
Current Year: 2013

Year of Declination Information: 1986

Annual Change: decreasing 6.5'

Answer: ____________ E/W declination (circle correct one)

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination



Question 4:

Grid Magnetic Angle: 9° 14'

Current Year: 2018

Year of Declination Information: 1999

Annual Change: increasing 4.1'

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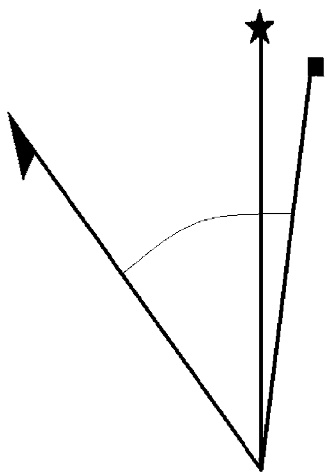
Answer: ____________ E/W declination (circle correct one)



Question 5:

Grid Magnetic Angle: 19° 35'

Current Year: 2016

Year of Declination Information: 1981

Annual Change: decreasing 5.4'

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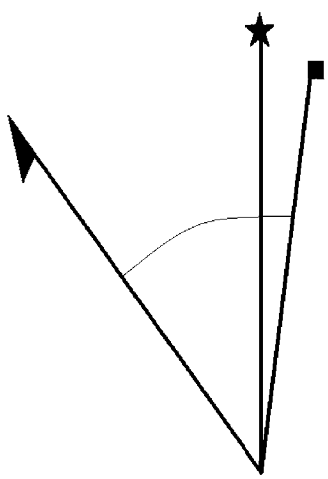
Answer: ____________ E/W declination (circle correct one)



Question 6:

Grid Magnetic Angle: 18° 22'

Current Year: 2010

Year of Declination Information: 1976

Annual Change: increasing 4.7'

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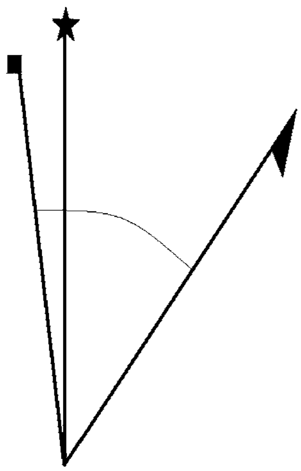
Answer: ____________ E/W declination (circle correct one)

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination



Question 7:

Grid Magnetic Angle:	12° 34'
Current Year:	2020
Year of Declination Information:	1991
Annual Change:	increasing 1.2'

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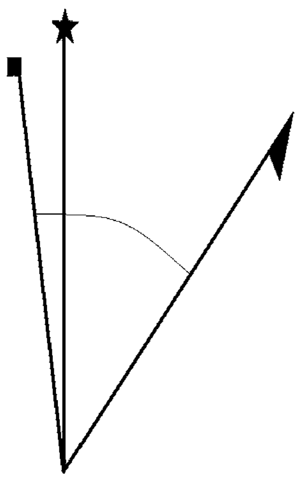
Answer: ____________ E/W declination (circle correct one)



Question 8:

Grid Magnetic Angle:	13° 21'
Current Year:	2017
Year of Declination Information:	1994
Annual Change:	decreasing 2.9'

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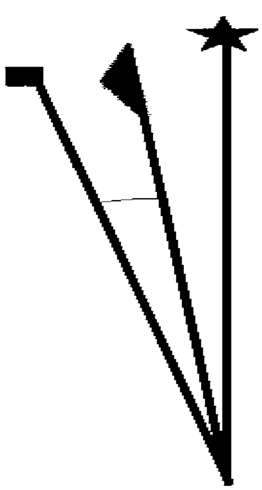
Answer: ____________ E/W declination (circle correct one)



Question 9:

Grid Magnetic Angle:	3° 16'
Current Year:	2012
Year of Declination Information:	1980
Annual Change:	decreasing 6.2'

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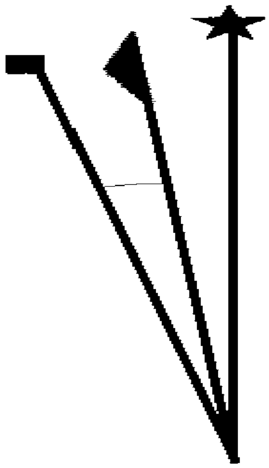
____

Answer: ____________ E/W declination (circle correct one)

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination



Question 10:

Grid Magnetic Angle: 4° 27'

Current Year: 2019

Year of Declination Information: 1977

Annual Change: increasing 2.2'

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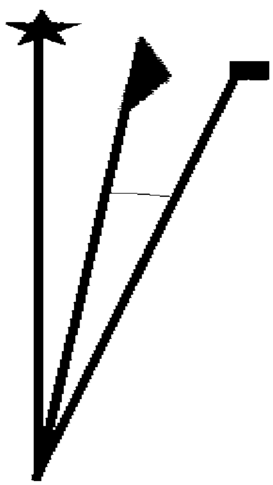
Answer: ____________ E/W declination (circle correct one)



Question 11:

Grid Magnetic Angle: 7° 7'

Current Year: 2021

Year of Declination Information: 1992

Annual Change: increasing 5.5'

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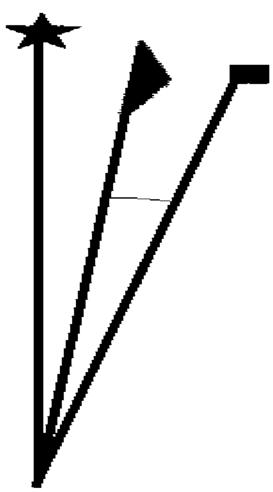
Answer: ____________ E/W declination (circle correct one)



Question 12:

Grid Magnetic Angle: 9° 36'

Current Year: 2015

Year of Declination Information: 1983

Annual Change: decreasing 3.3'

____

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____

Answer: ____________ E/W declination (circle correct one)

MAGNETIC DECLINATION WORKSHEET: ANSWER KEY

Grid Magnetic Angle + [(Current Year - Year of Declination Information) × (Annual Change)] = Current Declination

Question 1:

Grid Magnetic Angle:	10° 46'
Current Year	2011
Year of Declination Information:	1988
Annual Change:	decreasing 5.2'

10° 46' + [(2011 - 1988) × (-5.2')] = Current Declination

10° 46' + [(23) × (-5.2')] = Current Declination

10° 46' + [-119.6'] = Current Declination

10° 46' - 119.6' = Current Declination

9° 106' - 119.6' = Current Declination

8° 166' - 119.6' = Current Declination

8° 46.4' = Current Declination

Magnetic declination is 8° 46.4' east.

Question 2:

Grid Magnetic Angle:	11° 2'
Current Year:	2014
Year of Declination Information:	1995
Annual Change:	increasing 3.8'

11° 2' + [(2014 - 1995) × (+3.8')] = Current Declination

11° 2' + [(19) × (+3.8')] = Current Declination

11° 2' + [+72.2'] = Current Declination

11° 2' + 72.2' = Current Declination

11° 74.2' = Current Declination

12° 14.2' = Current Declination

Magnetic declination is 12° 14.2' east.

Question 3:

Grid Magnetic Angle:	18° 43'
Current Year:	2013
Year of Declination Information:	1986
Annual Change:	decreasing 6.5'

18° 43' + [(2013 - 1986) × (-6.5')] = Current Declination

18° 43' + [(27) × (-6.5')] = Current Declination

18° 43' + [-175.5'] = Current Declination

18° 43' - 175.5' = Current Declination

17° 103' - 175.5' = Current Declination

16° 163' - 175.5' = Current Declination

15° 223' - 175.5' = Current Declination

15° 47.5' = Current Declination

Magnetic declination is 15° 47.5' west.

Question 4:

Grid Magnetic Angle:	9° 14'
Current Year:	2018
Year of Declination Information:	1999
Annual Change:	increasing 4.1'

9° 14' + [(2018 - 1999) × (+4.1')] = Current Declination

9° 14' + [(19) × (+4.1')] = Current Declination

9° 14' + [+77.6'] = Current Declination

9° 14' + 77.6' = Current Declination

9° 91.9' = Current Declination

10° 31.9' = Current Declination

Magnetic declination is 10° 31.9' west.

Question 5:

Grid Magnetic Angle:	19° 35'
Current Year:	2016
Year of Declination Information:	1981
Annual Change:	decreasing 5.4'

19° 35' + [(2016 - 1981) × (-5.4')] = Current Declination

19° 35' + [(35) × (-5.4')] = Current Declination

19° 35' + [-189'] = Current Declination

19° 35' - 189' = Current Declination

18° 95' - 189' = Current Declination

17° 155' - 189' = Current Declination

16° 215' - 189' = Current Declination

16° 26' = Current Declination

Magnetic declination is 16° 26' west.

Question 6:

Grid Magnetic Angle:	18° 22'
Current Year:	2010
Year of Declination Information:	1976
Annual Change:	increasing 4.7'

18° 22' + [(2010 - 1976) × (+4.7')] = Current Declination

18° 22' + [(34) × (+4.7')] = Current Declination

18° 22' + [+159.8] = Current Declination

18° 22' + 159.8' = Current Declination

18° 181.8' = Current Declination

19° 121.8' = Current Declination

20° 61.8' = Current Declination

21° 1.8' = Current Declination

Magnetic declination is 21° 1.8' west.

Question 7:

Grid Magnetic Angle:	12° 34'
Current Year:	2020
Year of Declination Information:	1991
Annual Change:	increasing 1.2'

12° 34' + [(2020 - 1991) × (+1.2')] = Current Declination

12° 34' + [(29) × (+1.2')] = Current Declination

12° 34' + [+34.8'] = Current Declination

12° 34' + 34.8' = Current Declination

12° 68.8' = Current Declination

13° 8.8' = Current Declination

Magnetic declination is 13° 8.8' east.

Question 8:

Grid Magnetic Angle:	13° 21'
Current Year:	2017
Year of Declination Information:	1994
Annual Change:	decreasing 2.9'

13° 21' + [(2017 - 1994) × (-2.9')] = Current Declination

13° 21' + [(23) × (-2.9')] = Current Declination

13° 21' + [-66.7'] = Current Declination

13° 21' - 66.7' = Current Declination

12° 81' - 66.7' = Current Declination

12° 14.3' = Current Declination

Magnetic declination is 12° 14.3' east.

Question 9:

Grid Magnetic Angle:	3° 16'
Current Year:	2012
Year of Declination Information:	1980
Annual Change:	decreasing 6.2'

3° 16' + [(2012 - 1980) × (-6.2')] = Current Declination

3° 16' + [(32) × (-6.2')] = Current Declination

3° 16' + [-198.4'] = Current Declination

3° 16' - 198.4' = Current Declination

2° 76' - 198.4' = Current Declination

1° 136' - 198.4' = Current Declination

196' - 198.4' = Current Declination

-2.4' = Current Declination

Since the current declination calculated has a negative value, the east declination, as shown on the declination diagram, becomes a west declination.

Magnetic declination is 2.4' west.

Question 10:

Grid Magnetic Angle:	4° 27'
Current Year:	2019
Year of Declination Information:	1977
Annual Change:	increasing 2.2'

4° 27' + [(2019 - 1977) × (+2.2')] = Current Declination

4° 27' + [(42) × (+2.2')] = Current Declination

4° 27' + [+92.4'] = Current Declination

4° 27' + 92.4' = Current Declination

4° 119.4' = Current Declination

5° 59.4' = Current Declination

Magnetic declination is 5° 59.4' east.

Question 11:

Grid Magnetic Angle:	7° 7'
Current Year:	2021
Year of Declination Information:	1992
Annual Change:	increasing 5.5'

7° 7' + [(2021 - 1992) × (+5.5')] = Current Declination

7° 7' + [(29) × (+5.5')] = Current Declination

7° 7' + [+159.5'] = Current Declination

7° 7' + 159.5' = Current Declination

7° 166.5' = Current Declination

8° 106.5' = Current Declination

9° 46.5' = Current Declination

Magnetic declination is 9° 46.5' west.

Question 12:

Grid Magnetic Angle:	9° 36'
Current Year:	2015
Year of Declination Information:	1983
Annual Change:	decreasing 3.3'

9° 36' + [(2015 - 1983) × (-3.3')] = Current Declination

9° 36' + [(32) × (-3.3')] = Current Declination

9° 36' + [-105.6'] = Current Declination

9° 36' - 105.6' = Current Declination

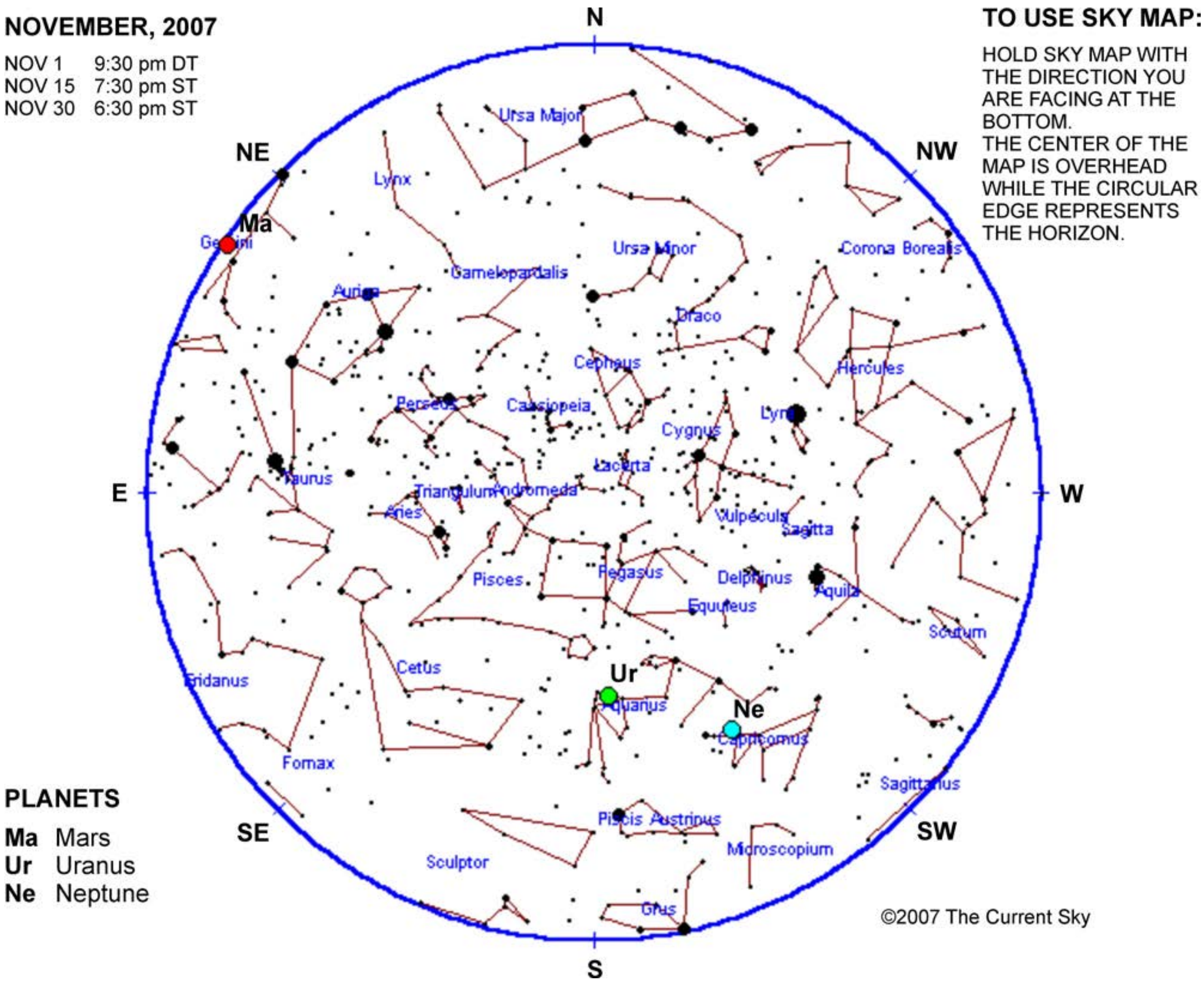
8° 96' - 105.6' = Current Declination

7° 156' - 105.6' = Current Declination

7° 50.4' = Current Declination

Magnetic declination is 7° 50.4' west.

SKY MAP



Sky Map, 2007, Sky Map for Chicago, IL, November 2007, Copyright 2007 by CyberSky 3.3.1. Retrieved November 30, 2007, from http://77illinois.homestead.com/files/astro/skypage.html

Figure 18P-1 Sky Map

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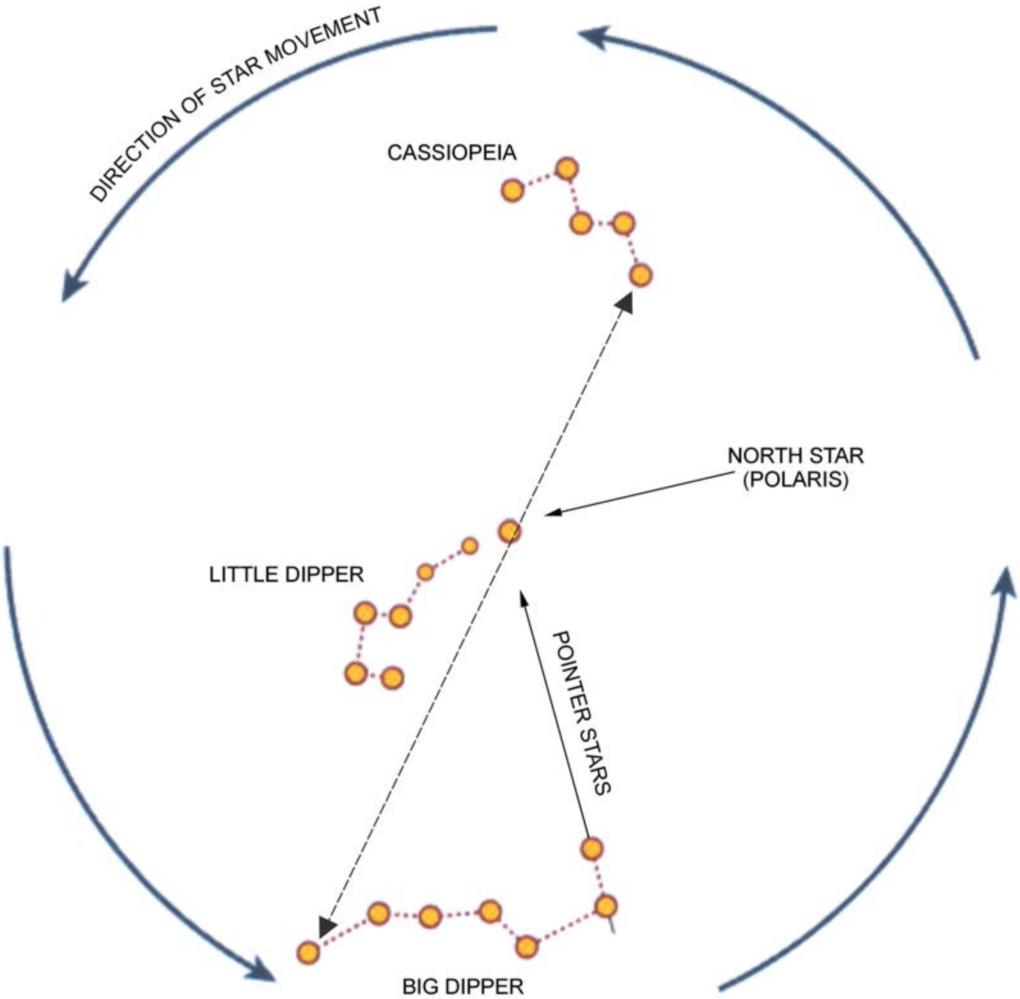
FINDING POLARIS



National Association of Search and Rescue, Fundamentals of Search and Rescue, Jones and Bartlett Publishers, Inc. Copyright 2005 by Jones and Bartlett Publishing (p. 76)

Figure 18Q-1 Finding Polaris

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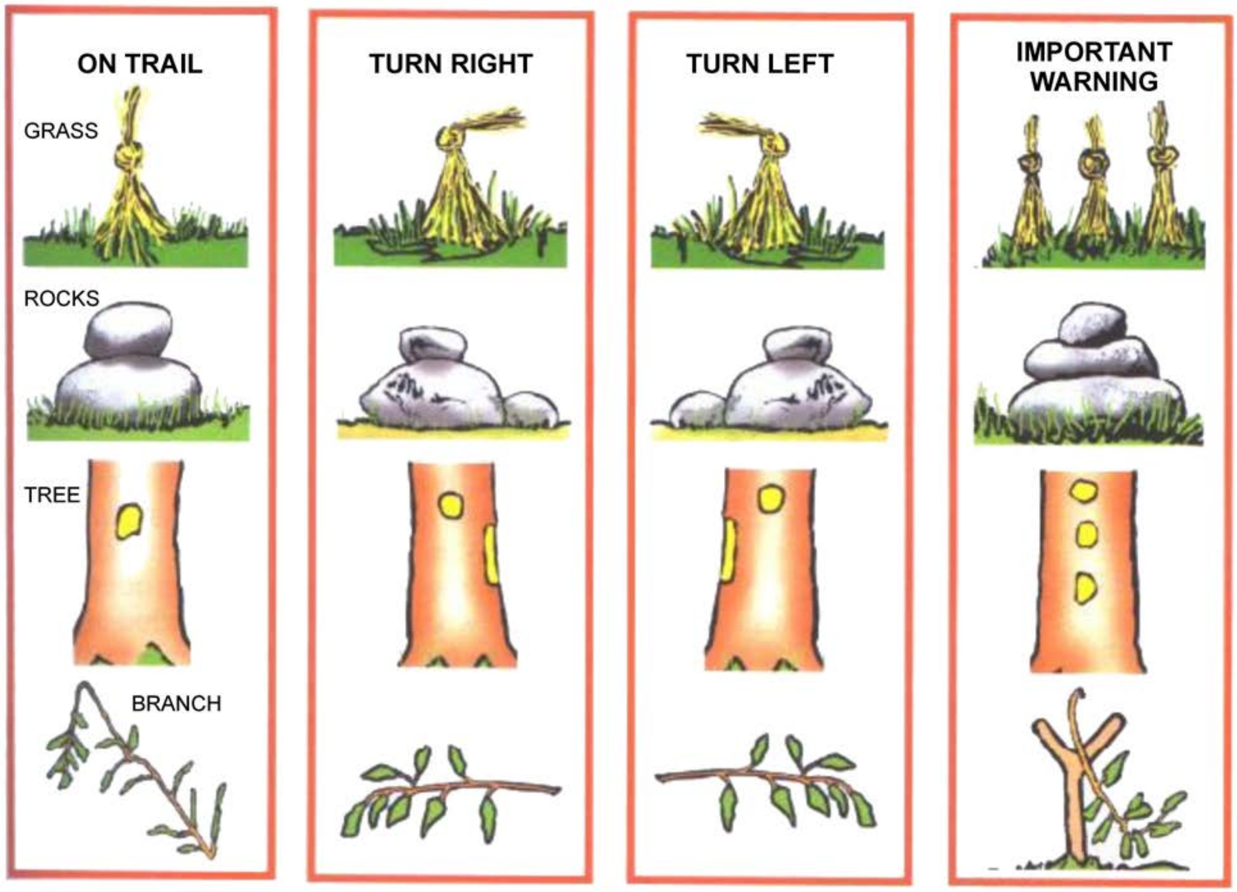
BLAZING TECHNIQUES



P. Tawrell, Camping and Wilderness Survival: The Ultimate Outdoors Book, Paul Tawrell (p. 547)

Figure 18R-1 Blazing Techniques

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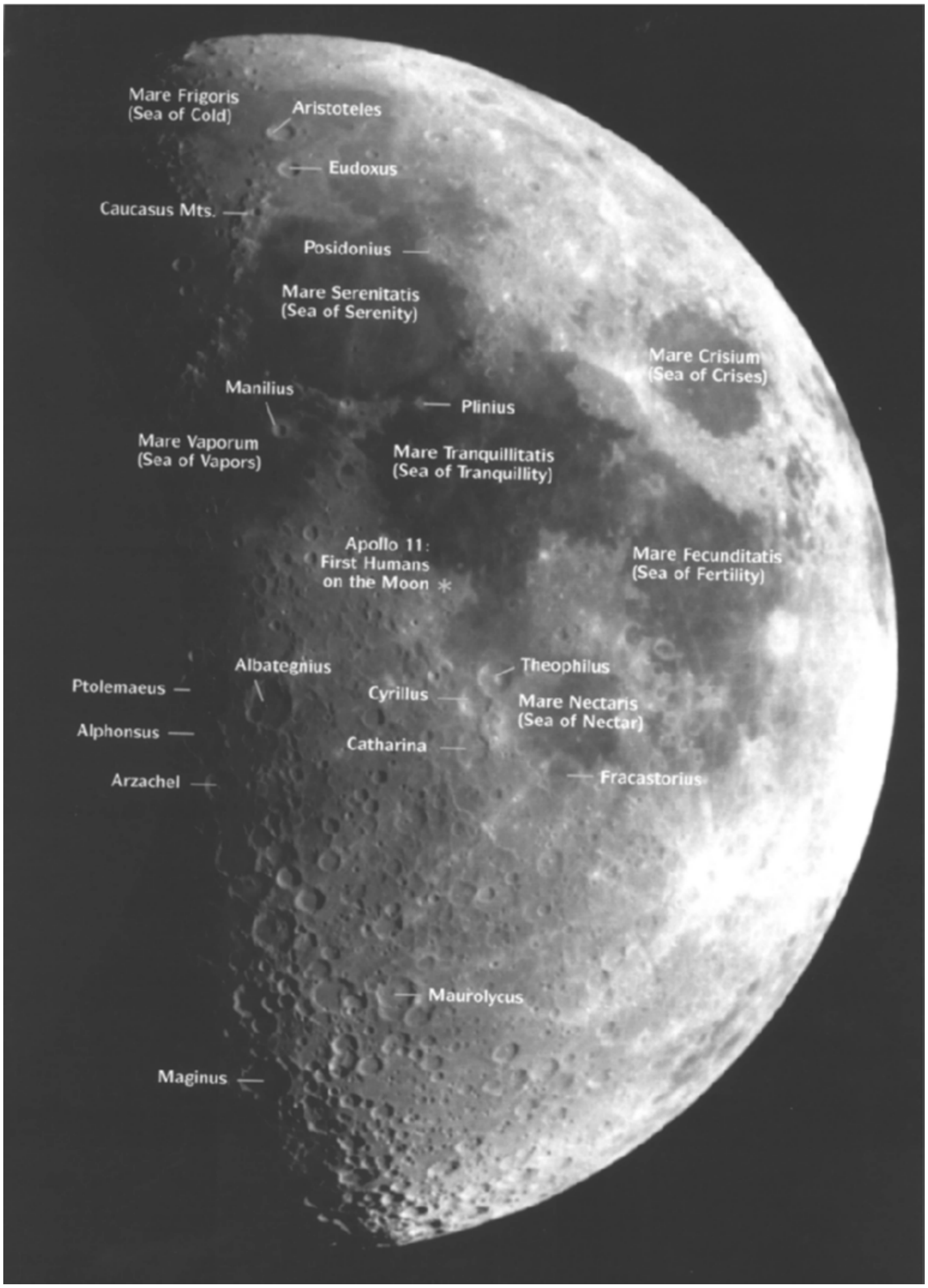
MOON QUARTERS

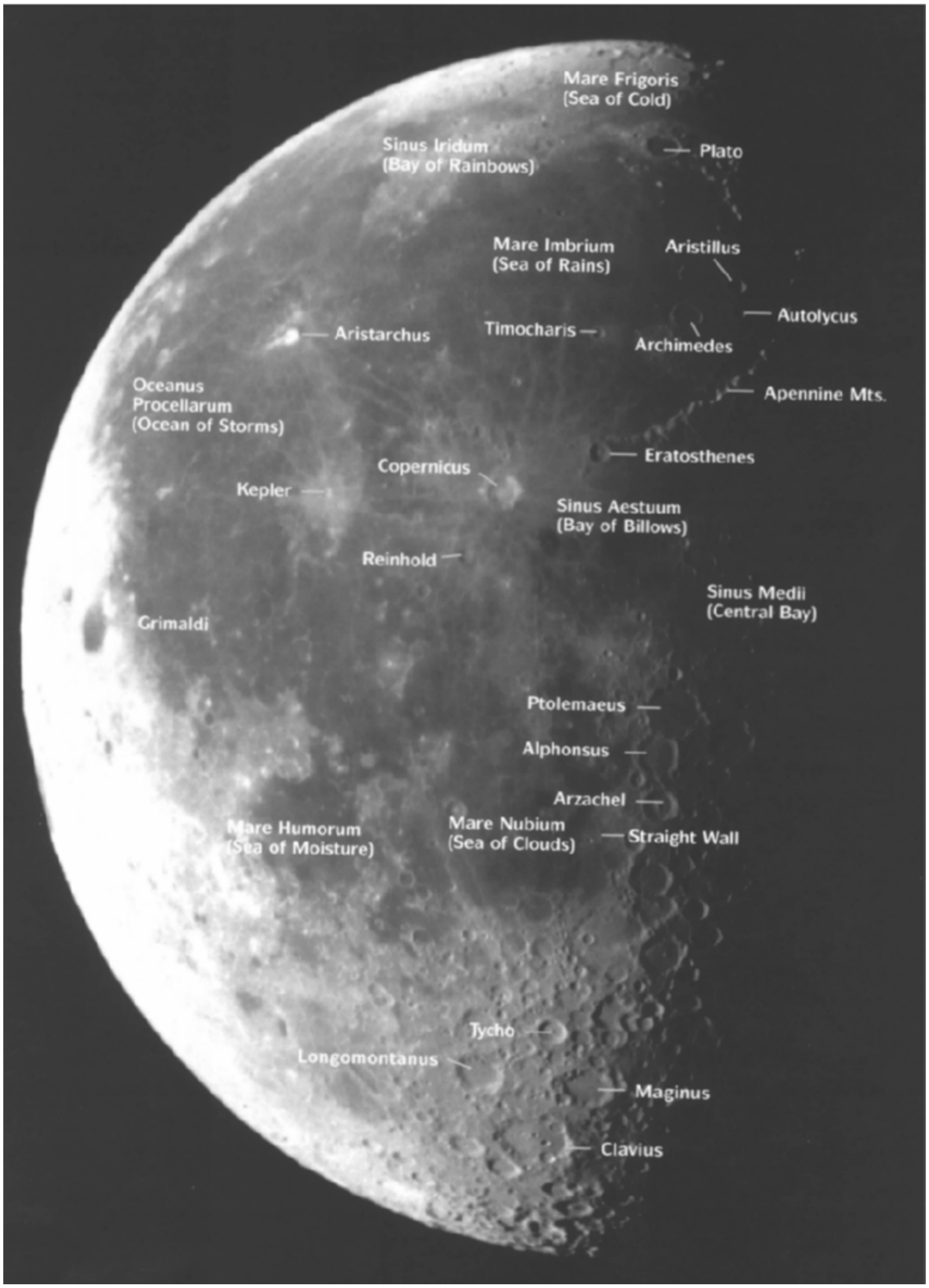
FIRST QUARTER MOON



T. Dickinson, NightWatch: A Practical Guide to Viewing the Universe, Firefly Books Ltd. (p. 141)

Figure 18S-1 The First Quarter of the Moon

LAST QUARTER MOON



T. Dickinson, NightWatch: A Practical Guide to Viewing the Universe, Firefly Books Ltd. (p. 140)

Figure 18S-2 The Last Quarter of the Moon

VENUS: PERIODS OF PROMINENT VISIBILITY

Although Venus is the brightest object in the night sky, apart from the moon, it is often close to the horizon. If possible, observe from a location with an unobstructed horizon in the specified direction.

Western Sky at Dusk

- early March 2010 to mid-September 2010
- early November 2011 to mid-May 2012
- late May 2013 to late December 2013
- early January 2015 to mid-July 2015
- mid-September 2016 to mid-March 2017
- mid-March 2018 to early September 2018

Eastern Sky at Dawn

- mid-November 2010 to mid-March 2011
- late June 2012 to late December 2012
- late January 2014 to late August 2014
- late August 2015 to mid-February 2016
- mid-April 2017 to late October 2017
- mid-November 2018 to early April 2019

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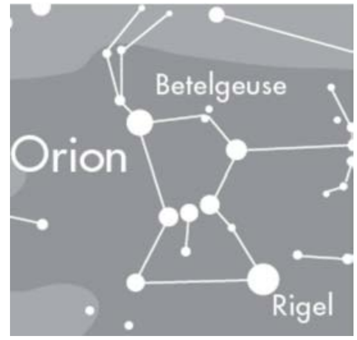
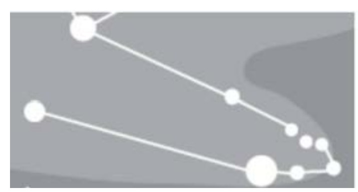
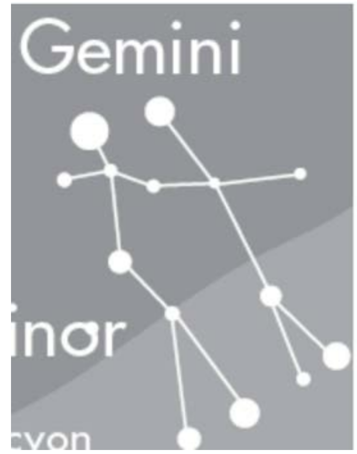
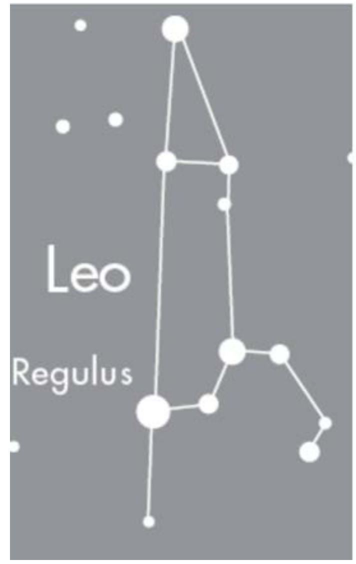
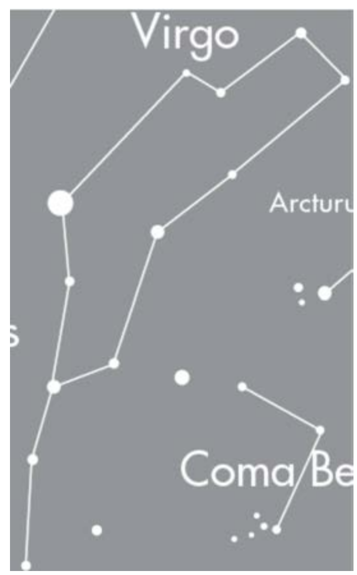
CONSTELLATIONS

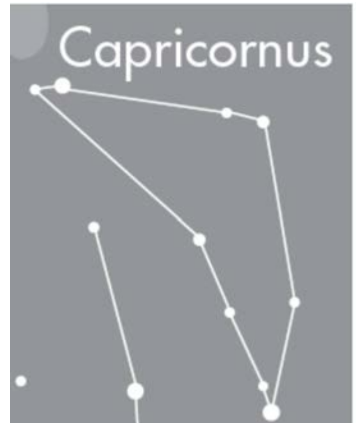
Constellations	Description	Picture
Ursa Major (the Great Bear) and Ursa Minor (the Little Bear)	The Great Bear was actually a beautiful nymph named Callisto. Callisto was turned into a bear by Zeus to protect her from his jealous wife Hera. One day, Callisto ran into her son, Arcas, who was hunting in the woods. Arcas raised his spear towards the bear, his mother. Zeus, watching from above, acted quickly to save his beloved, Callisto. He turned Arcas into a bear and hoisted them both into the sky by their tails. In doing so, Zeus stretched the bears' tails and they now appear that way in the sky. The legends of some Canadian First Nations, including the Micmac and Iroquois, also identify this constellation as a bear. Ursa Major includes the Big Dipper which is also known as "The Plough" in Europe. The Big Dipper's handle is the bear's tail, while its scoop is the bear's side. The second star from the end of the Big Dipper's handle is really two stars. In ancient times these stars were used to test eyesight. An individual had good eyesight if they could see two distinct stars. At the end of the Little Dipper, Ursa Minor, is the pole star, Polaris. Polaris, also known as the North Star, is about 50 times larger than the sun but it appears very faint as it is 600 light years away. Polaris is due north and was important in early northern hemisphere navigation.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-1 Ursa Major  *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-2 Ursa Minor
Cassiopeia (the Queen of Ethiopia)	When Cassiopeia died, she was placed next to her husband, Cepheus, in the sky. Her vanity and cruelty had never been forgotten by her enemy, Poseidon, who tilted her throne as she was placed in the sky. For half the night Cassiopeia is sitting upright, but for the rest of the night she must cling to her throne as she hangs upside-down in the sky.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-3 Cassiopeia

Constellations	Description	Picture
Orion (the hunter)	Orion was a famous hunter who claimed he could kill any animal. Nothing could protect him from the scorpion that stung his heel and killed him. Orion and Scorpius are placed at opposite ends of the sky so they will not fight again. Look for a star with a fuzzy appearance just below Orion's belt as this is the Orion Nebula where baby stars are born. Betelgeuse, or the "armpit" of Orion, is a red supergiant star that is 300–400 times the diameter of the sun and is among the best candidates to become a supernova in northern skies. Betelgeuse is a variable star; its brightness varies, but on average it is the 12th brightest star in the sky.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-4 Orion
Aries (the ram)	Aries was a magical ram who could speak, think and fly. The god Hermes gave Aries two children, Helle and Phrixus, who wanted to escape their evil stepmother. Helle fell off Aries during the escape, but Phrixus made it to safety and sacrificed Aries to show his thanks. He gave Aries' fleece to King Aeetes, who sent Draco the dragon to guard it. Eventually, Aries' Golden Fleece was stolen by Jason and the Argonauts. Aries' brightest star is Hamal, which means "the lamb." It is one of the few stars that has had its apparent size measured. Most stars are so far away they appear as just a point of light, but astronomers have measured the size of Hamal to be 0.00680 arcseconds. That is the same size as a penny would seem to be if you held it 60 km away.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-5 Aries
Taurus (the bull)	Taurus represents a bull. When Zeus fell in love with Europa, he transformed himself into a white bull. One day, as Europa was playing near the seashore, she noticed the new white bull. She went over for a closer look, and the bull knelt down to allow her to climb up. Once she was on, the bull leapt into to the sea and swam to the island of Crete. Then Zeus changed back into human form and told Europa of his love for her. Taurus is easy to spot from the constellation Orion. Follow the three stars of Orion's belt towards the west until a bright red-orange star is encountered. This is Aldebaran, the Eye of the Bull. Nearby are five more stars that make a V with Aldebaran and trace out the face of the bull.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-6 Taurus

Constellations	Description	Picture
Gemini (the twins)	The Twins, Castor and Pollux, were born to Leda, who was seduced by Zeus in the form of a beautiful swan. Every December, meteors appear to spray out of this constellation. This event is called the "Geminid meteor shower." Castor and Pollux, the heads of the Twins, are the two brightest stars in the constellation Gemini. Castor, "the Beaver" and Pollux, "much wine" are the 20th and 16th brightest stars in the night sky respectively.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-7 Gemini
Cancer (the crab)	Cancer represents a crab that played a small role in the story of Hercules whose stepmother, the goddess Hera, was his mortal enemy. Hera sent the crab to try to distract Hercules who was battling the dreaded Hydra. The crab grabbed on to Hercules' toe with its claws, but Hercules just shook him off and crushed him underfoot. To thank the crab for its brave attempt, Hera placed it in the sky.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-8 Cancer

Constellations	Description	Picture
Leo (the lion)	Leo was a lion that was sent from the moon down to Earth by Hera, the stepmother and mortal enemy of Hercules. Leo lived in a cave and would attack the people who lived nearby. Hercules was sent to fight Leo but his spears and arrows just bounced off the lion's invincible skin. Hercules finally decided to wrestle Leo and eventually managed to strangle the lion to death. Hercules then made a cloak from the lion's skin so that he could be invincible too. Regulus, the brightest star in the constellation Leo, means "the little king" in Latin. It is the 25th brightest star in our night sky and is relatively close to the Earth at a distance of 77 light years. Regulus is much brighter than our own star; it shines 350 times more brightly than the sun. The easiest way to find Leo in the sky is to look for a backwards question mark. This shape, often called The Sickle, marks the head and front paws of the lion.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/ docs/education/planisphere_e.pdf* Figure 18U-9 Leo
Virgo (the goddess of agriculture)	To the ancient Greeks, Virgo represented Demeter, the goddess of agriculture. Demeter's daughter, Persephone, was kidnapped by Hades, the god of the underworld, and taken to be his wife. Demeter searched high and low for her daughter neglecting the crops. Eventually, Zeus persuaded Hades to release Persephone. While she was in the underworld, Persephone had eaten some pomegranate seeds and could never fully leave. Each year Persephone returns to the underworld for a time and winter occurs as the crops die and her mother mourns. When Persephone returns, her mother rejoices and the earth becomes fruitful again. The brightest star in Virgo is called Spica. It is easy to find by following the arc of the Big Dipper's handle to Arcturus and then continuing in a straight line: "Arc to Arcturus, then speed on to Spica".	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/ docs/education/planisphere_e.pdf* Figure 18U-10 Virgo

Constellations	Description	Picture
Libra (the scales)	To the ancient Babylonians, Libra represented scales or balance. This might be because the sun was in front of the stars of Libra during their autumnal equinox, when days and nights were of equal length. To the Greeks, the stars of Libra were not their own constellation but rather the claws of the scorpion Scorpio. The Romans resurrected the idea of Libra representing scales and sometimes drew Virgo holding the scales, just like the goddess of justice. The two brightest stars in Libra have interesting Arabic names: Zubenelgenubi, "the southern claw," and Zubenelchemale, "the northern claw."	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-11 Libra
Scorpius (the scorpion)	Scorpius represents the scorpion that killed the hunter Orion. Orion was so proud of his hunting skills that he boasted he could track down and kill any animal on earth. His claim was so outrageous that the earth trembled in rage and cracked open. Out of the crack crawled a scorpion which stung and killed Orion. Out of pity, the gods placed Orion and Scorpius on opposite sides of the sky so there could be no more trouble between them. The brightest star in Scorpius is called Antares. This star is quite red and many people mistake it for Mars.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-12 Scorpius
Sagittarius (the archer)	Sagittarius was the ultimate archer, keen-eyed and with deadly aim. He is usually drawn as the Babylonians saw him, a centaur: half-man and half-horse. To the Greeks, though, he was a satyr: half-man and half-goat. He was the son of the pipe-playing god Pan and invented archery.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-13 Sagittarius

Constellations	Description	Picture
Capricornus (the goat-fish)	Capricornus is one of the oldest known constellations. The ancient Babylonians called it the goat-fish and said it ruled the part of the sky from which the mighty Tigris and Euphrates rivers flowed. The Greeks also saw Capricornus as a creature that was half-goat and half-fish. They associated it with the god Pan, who had a human torso and face, but goat legs and goat horns. One story about Pan is that he jumped in the river Nile to escape the sea monster, Typhon. The part of him below the water turned into a fish, while the rest of his body remained a goat. Capricornus is a hard constellation to find because it does not have any bright stars and it never gets very high in the sky.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-14 Capricornus
Aquarius (young man pouring water from a pitcher)	To the Babylonians, Aquarius was the ruler of all the watery constellations – Pisces, Capricornus, Piscis Austrinus and Cetus. To the Egyptians, Aquarius caused the yearly flooding of the river Nile. The Greeks personified Aquarius, drawing him as a young man pouring water from a pitcher.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-15 Aquarius

Constellations	Description	Picture
Pisces (two fish)	Pisces represents two fish in the sky. One day, the goddess Aphrodite and her son Eros were fleeing the terrible sea monster Typhon. They hid in the rushes along the bank of the river Euphrates but could not escape. The monster was just about to attack when two fish swam up and carried Aphrodite and Eros to safety. As a reward for their help, the fish were placed in the sky as the constellation Pisces. Pisces is a hard constellation to find. The easiest way is to locate the square of Pegasus and look underneath it towards the south. A ring of stars, called the Circlet of Pisces may be seen. This represents the body of one of the fish.	 *Constellations, by National Research Council of Canada. Retrieved December 3, 2007, from http://www.nrc-cnrc.gc.ca/docs/education/planisphere_e.pdf* Figure 18U-16 Pisces

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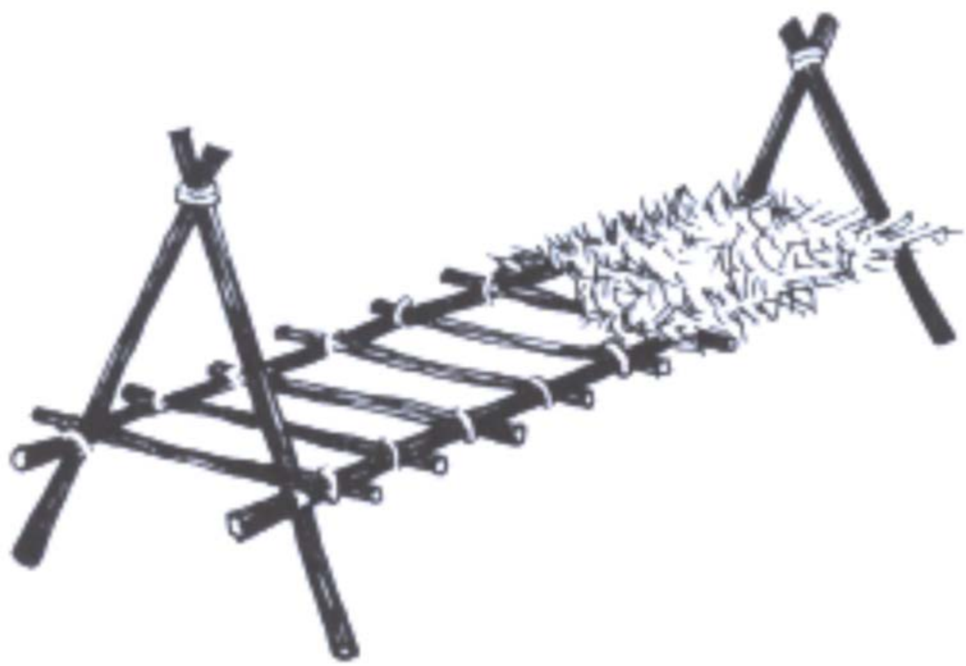
LADDER BED

Using natural resources and cord, a ladder bed can be constructed. Steps to constructing a ladder bed:

1. Collect the natural resources, including:
   (a) four poles 75–100 cm long to construct the A-frames,
   (b) two sturdy poles approximately 180 cm long to make the frame (length will depend on the height of the person), and
   (c) several crosspieces 50–60 cm long, the more flexible the better; length will depend on the width of the person.
2. Construct two A-frame supports using round lashings.
3. Attach the two frame poles to the A-frames, ensuring that the knots and wood are strong and will hold the weight of the individual.
4. Tie the crosspieces making a ladder along the frame.
5. Lay a bedding of boughs, leaves or moss, as desired. Ensure there is enough material to prevent heat from being transferred away from the body during the night.



J. Wiseman, The SAS Survival Handbook, HarperCollins Publishers (p. 309)

Figure 18V-1 Ladder Bed

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PACK FRAME

Using natural resources, cord and two straps, a pack frame can be constructed. Steps to constructing a pack frame:

1. Collect natural resources, including:
   (a) two poles to make the frame 75–100 cm long (length will depend on the height of the person),
   (b) several crosspieces 50–60 cm long, (length and number will depend on the width of the person), and
   (c) five pieces (two 15–20 cm long , two 50 cm long and one 50–60 cm long) to construct the right angle projection at the bottom.
2. Construct the ladder frame to the size of the individual.
3. Construct the right angle projection at the bottom and ensure the knots and wood are strong and will not break with a load.
4. Attach straps made from cord or from improvisation and adjust it to a comfortable position.

J. Wiseman, The SAS Survival Handbook, HarperCollins Publishers (p. 372)

Figure 18W-1 Pack Frame

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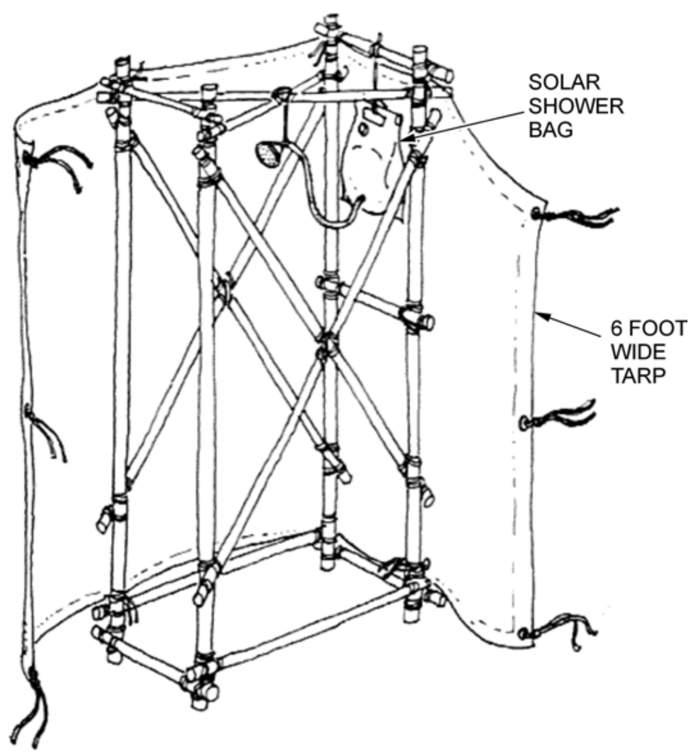
SHOWER

Using natural resources, cord, a large tarp and a shower bag or bucket; a camp shower can be constructed. Steps to constructing a shower:

1. Collect the natural resources, including:
   (a) four poles at least 180 cm in length, but may depend on the height of the person,
   (b) several poles for supports, (number and length will depend on the size of the shower being constructed and the strength of the material being used),
   (c) a tarp at least 180 cm in width and 240 cm in length, and
   (d) a shower bag or a bucket.
2. Lash the four poles at least to a square base frame and a cross-frame top.
3. Add cross-braces on two sides of the shower for support, remembering to leave one side open for accessibility.
4. Tie a large tarp with grommets to the outside of the frame and rig a latch on the open side.
5. Attach the shower bag or bucket to the top of the frame.



*PioneeringProjects.org, 2001, Camp Shower, Copyright 2001 by PioneeringProjects.org.
Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion39.gif*

Figure 18X-1 Shower

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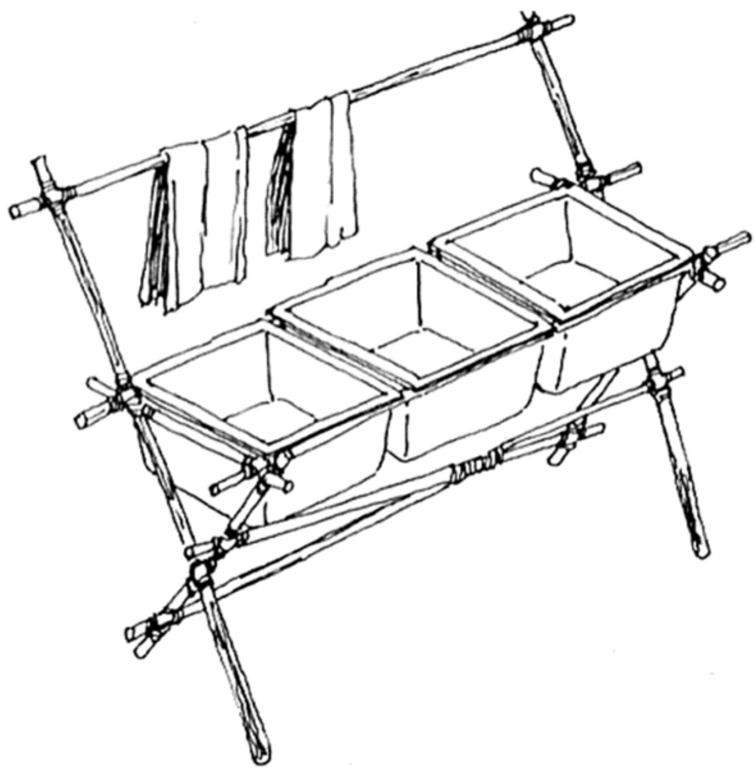
WASHSTAND

Using natural resources, cord and several wash basins or tubs, a washstand can be constructed. Steps to constructing a washstand:

1. Collect the natural resources, including:
   (a) four poles to construct the table top (the dimensions will depend on the size and number of wash basins the washstand is being constructed for),
   (b) four poles to construct the stand, two poles 180 cm in length and two 120 cm in length, and
   (c) two poles the length of the washstand to form a cross-brace at the bottom.
2. Construct a box frame for the wash basins to sit in using square lashings; use the wash basin as a measuring tool.
3. Lash two sets of poles (one pole 180 cm and the other 120 cm long) using square lashings to form the stand.
4. Lash the table top to the sides and add supports as necessary.



PioneeringProjects.org, 2001, Three Compartment Sink, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion33.gif

Figure 18Y-1 Washstand

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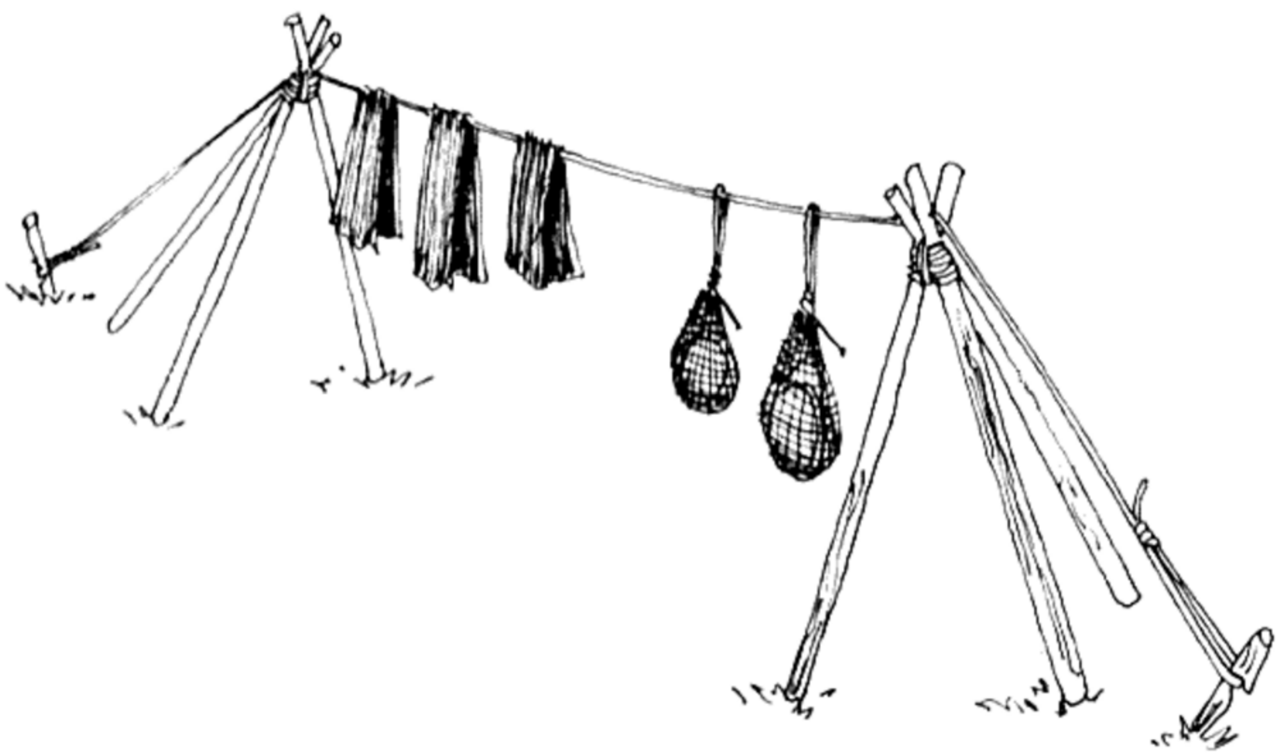
DRYING RACK

Using natural resources and cord, a drying rack can be constructed. Steps to constructing a drying rack:

1. Collect six poles 180 cm in length to construct two tripods.
2. Drive two uprights (piece of wood) into the ground and then lash a crosspiece of cord to join them across the top.
3. To ensure the structure is sturdy, add further poles lashed at an angle to form a simple ‘A’ frame at either end.
4. Attach guy wires to the two ends and peg out to keep the clothes rack on the ground in high winds. Add extra drying lines by lashing cord across the uprights.

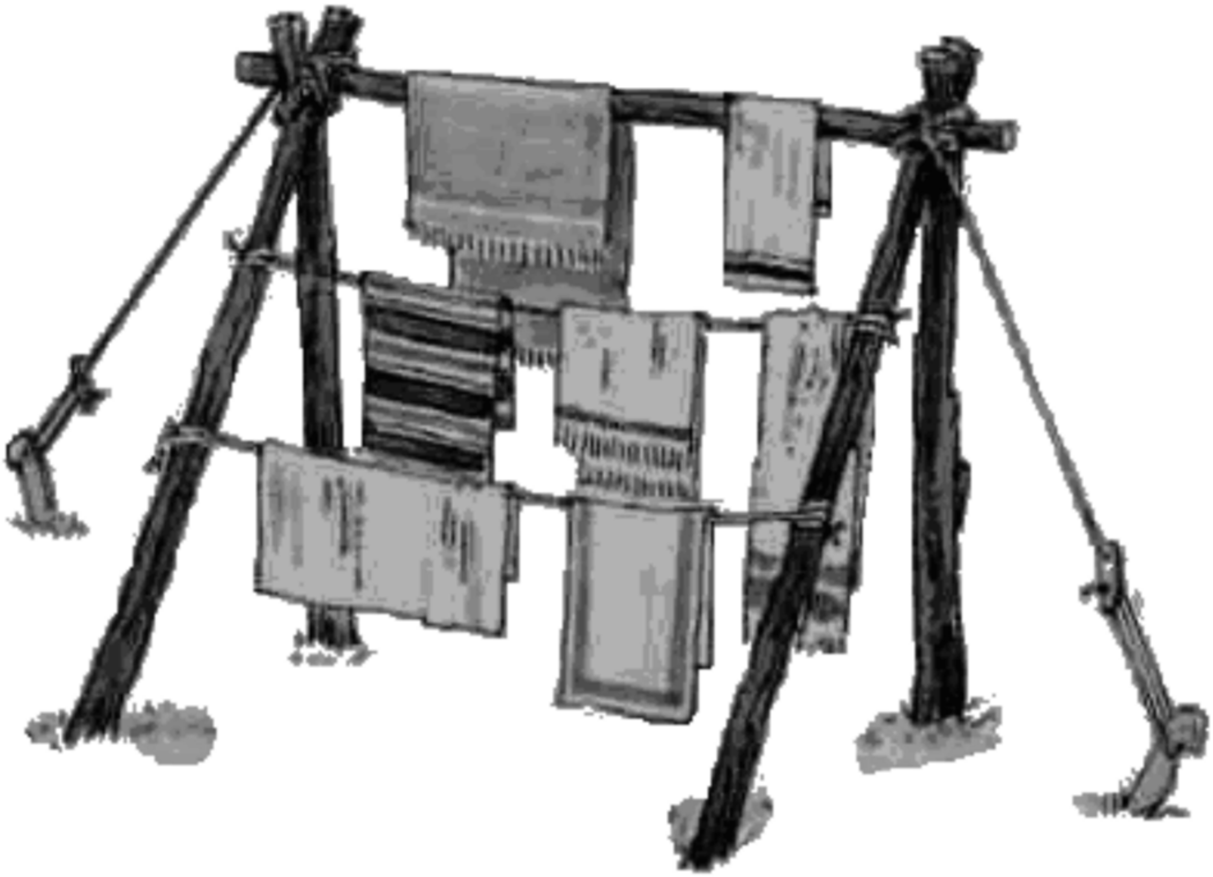
Dry clothing is essential in a survival situation to avoid exposure and possible hypothermia.



PioneeringProjects.org, 2001, Clothesline, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion24.gif

Figure 18Z-1 Drying Rack 1

Another option (as illustrated in Figure 18Z-2) is to build the entire frame out of wood.



PioneeringProjects.org, 2001, Drying Rack, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/pioneering/index.htm

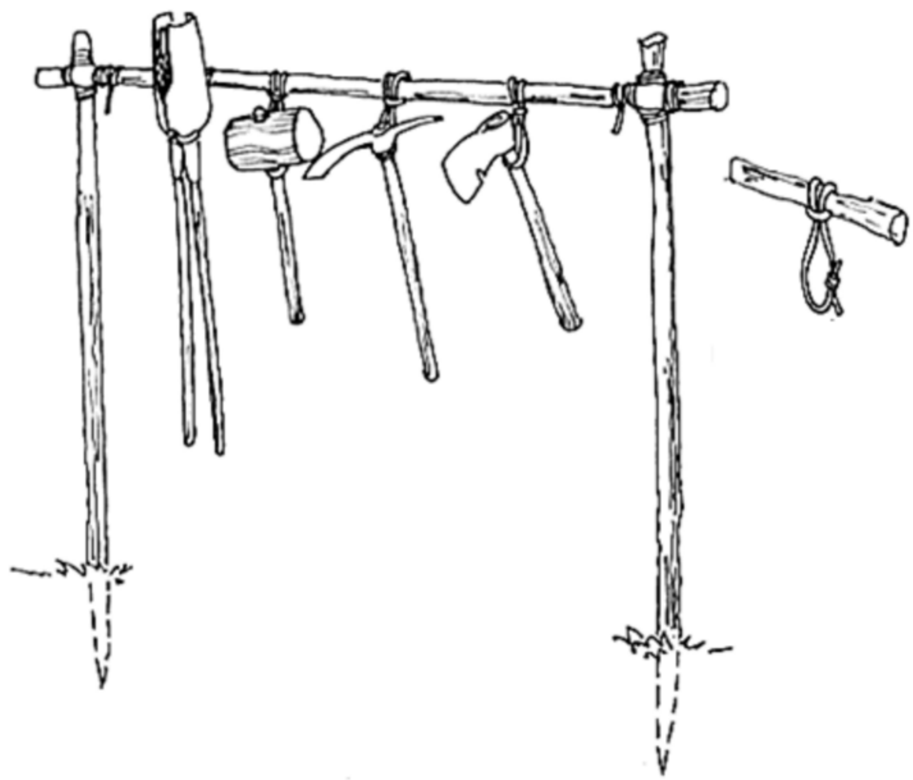
Figure 18Z-2 Drying Rack 2

TOOL RACK

Using natural resources and cord, a tool rack can be constructed. Steps to constructing a tool rack:

1. Collect the three poles 180 cm long from natural resources.
2. Drive two uprights into the ground or use two trees.
3. Lash a ridge pole between the two uprights to hang the tools from.
4. Tie pieces of cord into a loop using a reef knot and then loop it over the ridge pole (as illustrated in Figure 18AA-1).

A tool rack will keep tools off of the ground and prevent them from rusting or becoming dull too quickly. By having tools kept in one place they are less likely to go missing and site safety is increased.



PioneeringProjects.org, 2001, Tool Rack, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion27.gif

Figure 18AA-1 Tool Rack 1

Another example (as illustrated in Figure 18AA-2) has two crosspieces of wood for increased stability.

Scoutmaster, Knots and Pioneering, Retrieved November 18, 2007, from http://scoutmaster.typepad.com/.shared/image.html?/photos/uncategorized/chip5_copy_copy.jpg

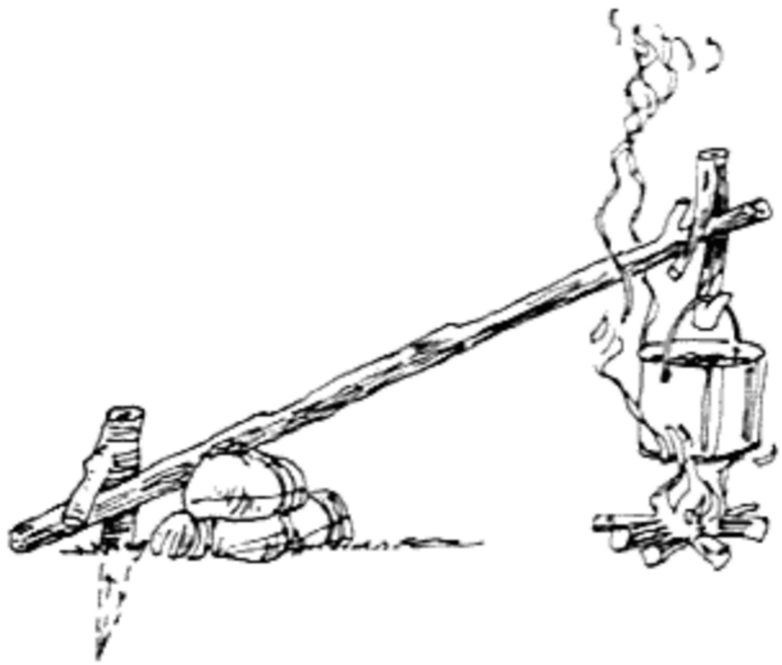
Figure 18AA-2 Tool Rack 2

CAMP CRAFTS FOR COOKING

Pot Rod

Using natural materials, cord and a pot, a pot rod for cooking over a fire can be constructed. Steps to constructing a pot rod:

1. Collect the natural resources, including:
   (a) one pole 180 cm long, and
   (b) two forked sticks, match size and shape to the pole.
2. Drive a forked stick into the ground near the fire, so that the forked part is facing down (as illustrated in Figure 18AB-1). Be careful in the placement so it does not catch on fire.
3. Pile rocks on the fire side of the forked stick and insert a long pole between the forked stick and the rocks so that the end is over the fire; add rocks to achieve the desired height.
4. Secure the pot by either lashing another forked stick (as illustrated in Figure 18AB-1) or by notching a groove so the handle stays in one spot.



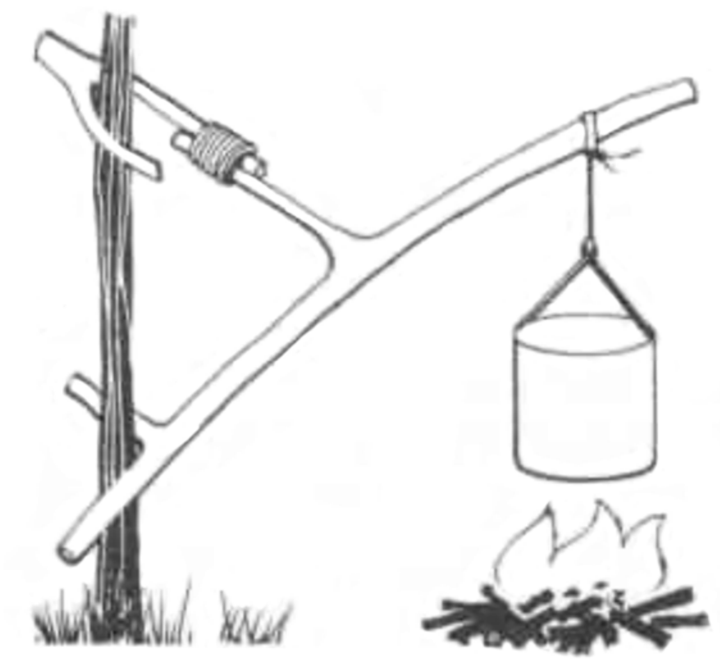
PioneeringProjects.org, 2001, Various Utensils, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion29.gif

Figure 18AB-1 Pot Rod

Swinging Pot Holder

Using natural materials, cord and a pot, a swinging pot holder for cooking over a fire can be constructed. A swinging pot holder is an extremely useful version of the simple pot rod. Steps to constructing a swinging pot holder:

1. Collect the natural resources, including:
   (a) one pole 150 cm long, with a forked end and another fork at the midway point,
   (b) one pole 90 cm long for an upright, and
   (c) one short stick with a fork (as illustrated in Figure 18AB-2).
2. Drive the 90-cm long upright 15 cm into the ground.
3. Lash the two forked sticks so that the forks fit in opposite directions on the upright. This will produce a cantilever action which not only maintains the height that it is set at, but will also swing freely allowing the pot to move away from the flames. Note that with a longer upright, the cooking height can be better controlled.
4. Secure the pot by either lashing another forked stick (as illustrated in Figure 18AB-2) or by notching a groove so the handle stays in one spot.



J. Wiseman, The SAS Survival Handbook, HarperCollins Publishers (p. 288)

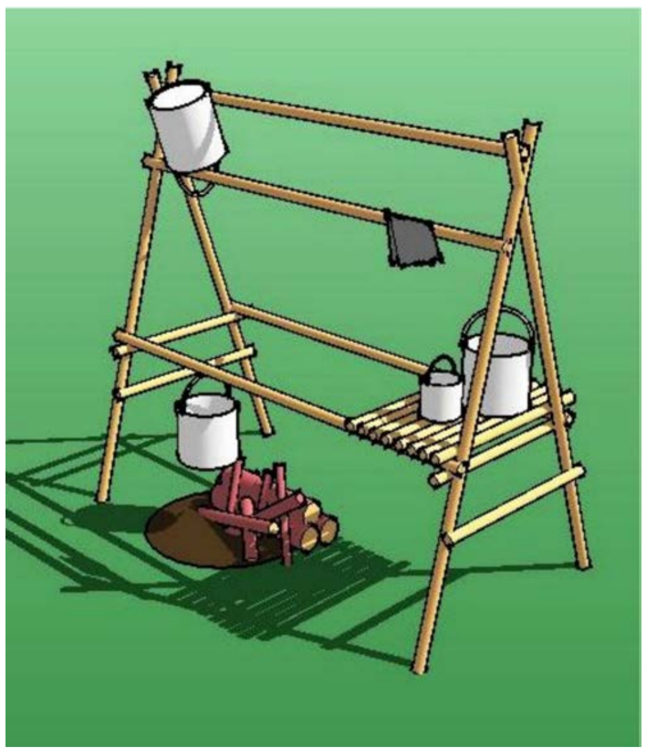
Figure 18AB-2 Swinging Pot Holder

Chippewa Kitchen

Using natural materials and cord, a Chippewa kitchen for cooking over a fire can be constructed. A challenging camp craft, but a nice set-up for long-term cooking, the Chippewa kitchen (as illustrated in Figure 18AB-3) is constructed by the following steps:

1. Collect the natural resources, including:
   (a) eight straight poles 240-cm long and 4 cm thick,
   (b) four straight poles 50 cm long and 4 cm thick, and
   (c) poles 50-cm long to create a table top.
2. Using round lashings and four 240-cm poles, lash two sets of ‘A’ frames.
3. Lash two 50 cm poles to each of the ‘A’ frames for support.
4. Lash the two ‘A’ frames together with the remaining four 240-cm poles (as illustrated in Figure 18AB-3).
5. Add poles to create a table top.

Scale the kitchen to available materials or conditions as appropriate.



Scoutmaster, Knots and Pioneering. Retrieved November 18, 2007, from http://scoutmaster.typepad.com/my_weblog/2006/05/chippewa_kitche.html

Figure 18AB-3 Chippewa Kitchen

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WHEELBARROW

Using natural materials and cord, a wheelbarrow can be constructed. A wheelbarrow is a tool that assists in gathering firewood or moving heavy objects around a survival site. Steps to constructing a wheelbarrow:

1. Collect the natural resources, including:
   (a) two poles 60–100 cm long,
   (b) two poles for crosspieces,
   (c) one cross-section of a log approximately 15 cm in diameter and 4 cm thick, and
   (d) one rod matched to the size of the hole.
2. Construct the wheel from a cross-section of a small tree that has been bored out and a rod to create an axle. The wheel portion can take a lot of time to create depending on available tools.
3. Insert a rod that has been shaped to fit into the hole.
4. Make a notch into each of the longer poles to match the diameter of the rod.
5. Tightly lash the two poles with a crosspiece as close to the wheel as possible. This crosspiece will hold the wheel in place and must be very tight.
6. Lash another crosspiece near the top of the two poles for support.
7. Add other crosspieces if necessary.

Ropesandpoles.blogspot.com. Retrieved November 18, 2007, from http://ropesandpoles.blogspot.com/2006/01/camp-wheelbarrow.html

Figure 18AC-1 Wheelbarrow

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COAT HANGER

Using natural materials and cord, a coat hanger can be constructed. Good for using on a drying rack, the coat hanger is one of the easier crafts to construct. Steps to constructing a coat hanger:

1. Collect the natural resources, including:
   (a) one slightly bent pole 60 cm long, and
   (b) one forked stick approximately 15 cm long or a bent stick approximately 30 cm long.
2. Lash either a forked stick or bent stick (as illustrated in Figure 18AD-1), to the slightly bent pole.

PioneeringProjects.org, 2001, Various Utensils, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion29.gif

Figure 18AD-1 Coat Hanger

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SIMPLE BENCH

Using natural materials and cord, a bench can be constructed. A simple bench can double as a tool storage area or a work bench. Steps to constructing a simple bench:

1. Collect the natural resources, including:
   (a) six sturdy logs approximately 100 cm long and 15 cm thick, and
   (b) one sturdy log approximately 150 cm long and 15 cm thick.
2. Using round lashings, create two tripod frames.
3. Attach a sturdy log to the tripod frames to sit on.

PioneeringProjects.org, 2001, Miscellaneous, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/images/pioneering/Miscellaneous.JPG

Figure 18AE-1 Simple Bench

Figure 18AE-1 shows the legs as a pair instead of a tripod frame. Tripod frames are required to make the bench stable.

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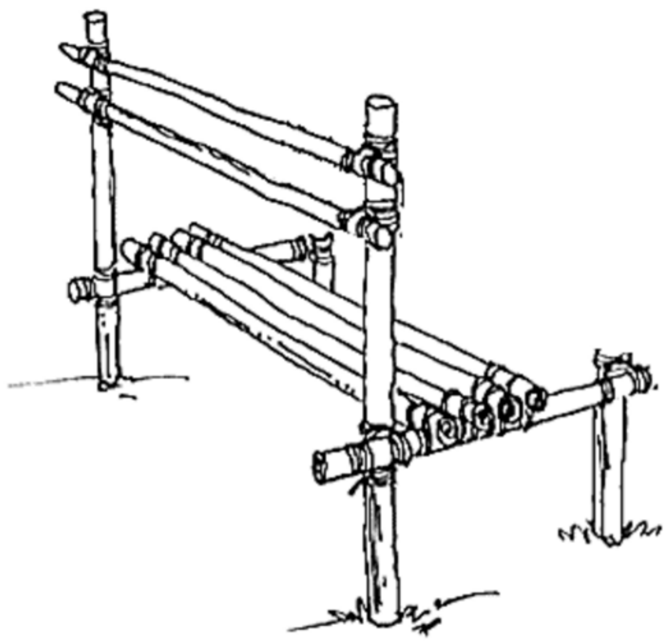
BENCH WITH BACK REST

Another example of a bench (as illustrated in Figure 18AF-1) uses more poles and has a back rest. Steps to constructing a bench with a back rest:

1. Collect the natural resources, including:
   (a) eight poles approximately 2 m each,
   (b) two poles approximately 1 m each, and
   (c) two poles approximately 0.5 m each.
2. Construct the sitting portion of the bench by attaching four long pieces of wood to the 1 m pieces, using square lashings.
3. Drive the two long and two short pieces of wood that will be used as the legs of the bench into the ground.
4. Lash the sitting portion onto the legs, using square lashings.
5. Construct the back rest using square lashings and attach it to the long legs in the ground.



PioneeringProjects.org, 2001, Bench With Back Rest, Copyright 2001 by PioneeringProjects.org. Retrieved February 20, 2007, from http://www.pioneeringprojects.org/projects/index.htm

Figure 18AF-1 Bench with Back Rest

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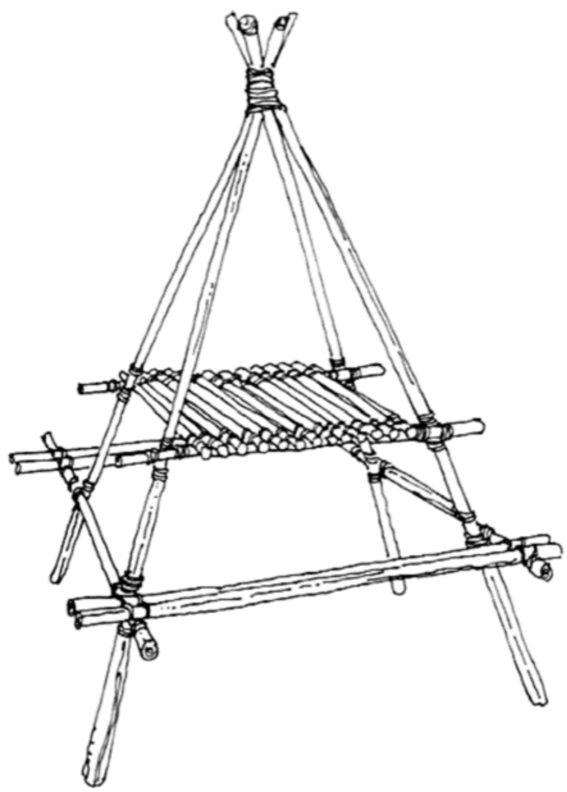
CAMP TABLE 1

Using natural materials and cord a table can be constructed (as illustrated in Figure 18AG-1). Steps to constructing a camp table:

1. Collect the natural resources, including:
   (a) four poles approximately 3 m long,
   (b) six poles approximately 2 m long,
   (c) two poles approximately 1.5 m long, and
   (d) fourteen poles approximately 0.5 m long.
2. Construct a figure-of-eight lashing around the four long pieces of wood, to make an A-frame.
3. Construct the table top, using square lashings.
4. Attach the table top portion to the long poles, using square lashings.
5. Make the sitting portion using square lashings and attach it to the long poles using square lashings.



PioneeringProjects.org, 2001, Camp Table, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion35.gif

Figure 18AG-1 Camp Table 1

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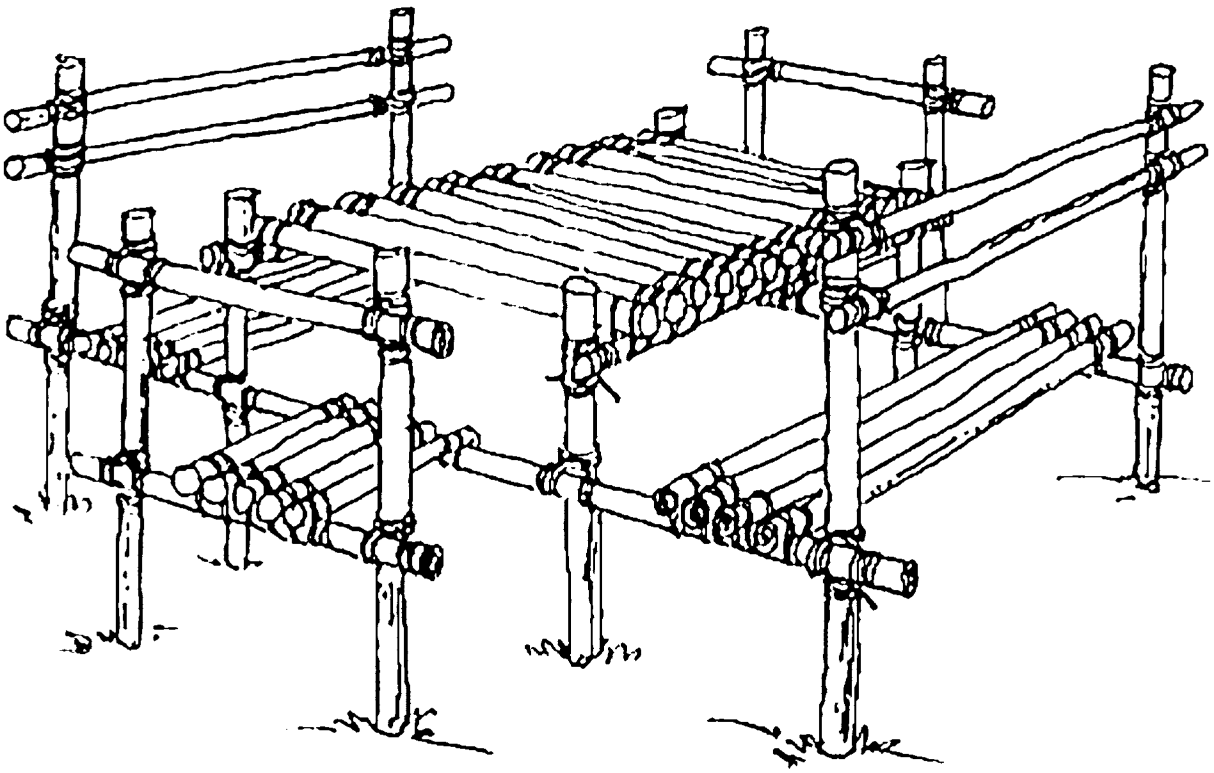
CAMP TABLE 2

An alternative to Camp Table 1, this camp table is a combination of the steps in Bench with a Back Rest combined with a variation of the steps in Camp Table 1. Steps to constructing camp table 2:

1. Collect the natural resources, including:
   (a) thirty poles approximately 1 m long,
   (b) fourteen poles approximately 2 m long,
   (c) two poles approximately 3 m long, and
   (d) ten poles approximately 0.5 m long.
2. Construct the table by lashing together the four 1-m uprights with two 1-m poles and two 2-m poles.
3. Add twelve 1-m poles as a table top.
4. Lash the two 3-m poles to either end of the table using square lashings.
5. Lash the four 1-m uprights to the end of the 3-m poles using square lashings at each end.
6. Lash eight 2-m long poles to the seat and two 2-m long poles to form the backrest.
7. Lash the five 0.5-m poles to the sides of the table and lash a 1-m long pole to the other end. Repeat on the other side.
8. Then using the 1-m long pole from Step 7., lash two 1-m uprights using square lashings. Repeat on the other side.
9. Finish the end seats by lashing the final 1-m long pole to the top to form a backrest. Repeat on the other side.

This elaborate camp craft can take many hours to build, a lot of personnel and resources are required.



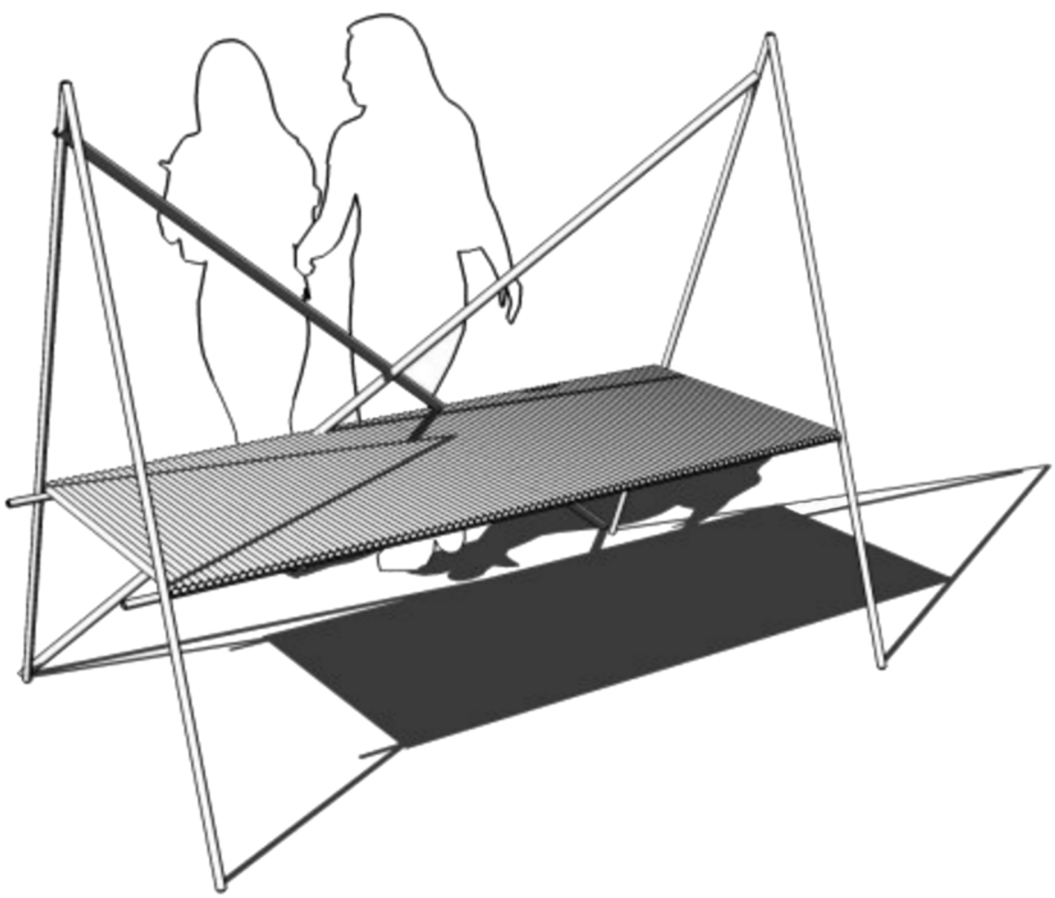
PioneeringProjects.org, 2001, Camp Table With Bench & Seat, Copyright 2001 by PioneeringProjects.org. Retrieved November 17, 2007, from http://www.pioneeringprojects.org/projects/images/pion38.gif

Figure 18AH-1 Camp Table 2

CAMP TABLE 3

Using natural materials and cord another example of a camp table (as illustrated in Figure 18AI-1).

1. Collect the natural resources, including:
   (a) two poles approximately 2 m long,
   (b) two poles approximately 2.5 m long,
   (c) two poles approximately 3 m, and
   (d) poles approximately 0.5 m long to create the table top.
2. Lash the two 2-m pole to make two ‘A’ frames.
3. Lash a cross-brace the two ‘A’ frames using two 3-m poles.
4. Lash the two 2.5-m poles to the frame to form the table top.
5. Add poles to the table top to complete the structure.



Ropesandpoles.blogspot.com. Retrieved November 18, 2007, from http://ropesandpoles.blogspot.com/2006/01/camp-table.html

Figure 18AI-1 Camp Table 3

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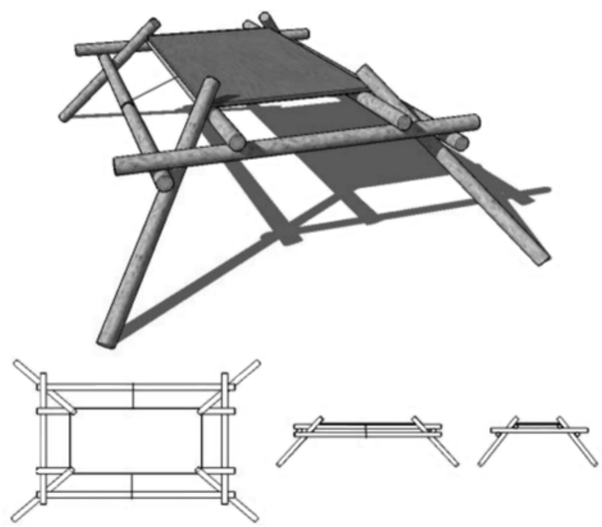
FRICTION-LOCK TABLE

Using natural resources and cord, a friction lock table can be constructed. This table only uses one piece of cord (as illustrated in Figure 18AJ-1). Friction locks the whole table together. There is one rope stopping the entire thing from spreading out and falling apart, running across the table (from left to right, under the table top). No lashings are used at all in this construction.

Steps to constructing a friction lock table:

1. Collect the natural resources, including:
   (a) four poles 180 cm in length and at least 15 cm thick, all poles used to construct this table should be of the same thickness to ensure a proper fit,
   (b) six poles 120 cm in length and at least 15 cm thick, and
   (c) natural materials to construct the tabletop.
2. Lay out the four parallel poles (the ones pointing towards the screen (as illustrated in Figure 18AJ-1) and tie together with clove hitches on each pole.
3. Lifting the two centre poles that were just tied, place the two cross-poles under these but over the outside poles.
4. Place natural materials or a piece of plywood to make a table top.
5. Lift the table (by the two outside tied poles) and hold up while the legs are inserted.



Ropesandpoles.blogspot.com. Retrieved November 18, 2007, from http://photos1.blogger.com/blogger/3732/1264/1600/friction%20lock%20tableS.jpg

Figure 18AJ-1 Friction-Lock Table

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SAMPLE BRIEFING

Situation

A 26-year-old male, Jim Grapevine, was a member of a group of hikers travelling through the park towards Hope Lake. He was lagging behind the group and was told to catch up. An hour after the group reached the lake, he still had not caught up. The group decided to look for him on their own and by nightfall, they returned to the lake without finding any sign of him. All the next day they backtracked along their trail to the point he was last seen. They searched back towards the lake, still finding no signs. After a day and a half of searching, they decided to contact the authorities. As there was no cell phone signal at the lake, they hiked the next morning to where they could make the emergency call. It has now been two days since Jim was last seen and through examining the clues we have, I have decided to concentrate the search in this area (point to the area on the map). Jim is an inexperienced hiker but very cool-headed. He has a very creative personality and was tired but in good spirits when he was last seen. He was only carrying his own gear. No other member of the group can say what he had except for a sleeping bag and clothes.

Details of the Confinement Area

A lookout has been airlifted to the top of Cloud Hill, which overlooks the area. Increasing low cloud cover will make the lookout ineffective in about two hours. The main road is being patrolled by vehicle and the Hope River is being patrolled by boat. Track traps have been set on the main trail from the lake.

Formation

The formation we will be using is the creeping line (as when cadets do a garbage sweep). Remember to move slowly so as to not get too far ahead of the other pairs.

Distance Between Pairs

Based on the type of terrain we will be encountering, the distance between pairs will be 10 m (30 ft).

Call Signs and Radio Frequency to be Used

Call signs that will be used are:

SAR leader: Sierra

Left anchor (end) team: Lima Major

Right anchor (end) team: Romeo Major

First pair to the left of the SAR leader: Lima One

Second pair to the left of the SAR leader: Lima Two

etc...

First pair to the right of the SAR leader: Romeo One

Second pair to the right of the SAR leader: Romeo Two

etc...

The radio frequency will be 6.07, check your radio now to ensure it is on the correct frequency.

Magnetic Bearing (Search Direction)

The magnetic bearing you will be searching on will be 72 degrees. It is important that you stay in your search lane and not veer into a neighbouring team’s lane. Remember your pacing techniques when bypassing obstacles. If possible, use a steering point.

Safety Bearing (If Lost or Disoriented)

If you become lost or disoriented, radio the SAR leader, who will assist you to get back on track. If you are also out of radio contact, use a magnetic bearing of 260 degrees which will bring you to Highway 43, which is being patrolled. Wait on the side of the road and flag down the patrol vehicle when you see it.

Actions to Take if the Cadets Discover a Clue/Lost Person: Radio In, Wait for Instructions

If you find a clue, stop and radio the SAR leader. Follow the instructions given. All other teams should stop and wait for instructions. Depending on the type of clue found, the search may be reoriented based on the new information.

If you find the lost person, one of you shall evaluate the situation to assess whether it is safe to approach. The other person should radio the SAR leader with the discovery and wait for instructions.

Does anyone have any questions?