ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 1

EO M426.01 – PREPARE FOR EXPEDITION TRAINING

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-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Obtain necessary examples of outdoor clothing, equipment and high-energy snacks.

The joining instructions and training schedule referred to in TP 2 will vary depending on the region. Acquire these documents from the local expedition centre.

Photocopy the Navigation Review Package located at Attachment A for each cadet.

If the expedition centre is conducting cold weather activities (snowshoeing / skiing), TPs 1 and 2 will have to be altered. Information is available in EO C121.03 (Select Cold Weather Clothing) and EO C121.04 (Recognize the Effects of Cold Weather).

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to orient the cadet to the selection of expedition equipment and expedition training.

An in-class activity was chosen for TP 3 to give directions to the Navigation Review Package that will be completed prior to attending the Gold Star expedition.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall be expected to prepare for expedition training.

IMPORTANCE

It is important for cadets to understand the importance of preparing for expedition training as a way to ensure everyone is comfortable when participating in an expedition. Reviewing the joining instructions prior to undergoing training as well as completing a navigation review will assist cadets in preparing for expedition training.

Teaching Point 1 **Review the selection of clothing and equipment for an expedition.**

Time: 10 min Method: Interactive Lecture

This TP is designed to familiarize cadets with the proper clothing and equipment to pack for expedition training. Cadets should have knowledge of this subject from previous expedition training.

Have examples of outdoor clothing, equipment and high-energy snacks available if possible.

Customize the lesson to the anticipated weather for the respective expedition centre and its activities. Cadets should be advised to check the weather forecast prior to the training.

CLOTHING

The most effective way to maintain warmth and comfort in varying conditions is by using multiple layers of clothing. Layers allow one to build a microclimate that surrounds the body, which can then be adapted to moisture, wind, temperature and exertion levels.

Remember:

- It is easier to stay warm than to try to warm up after getting cold.
- It takes more insulation to stay warm when sitting still than when moving.
- Heat is lost faster to a cold solid object through conduction than to cold air through convection, which is the transfer of heat by upward movement.

Where the expedition will be held in cold weather, ensure cadets follow the principles for keeping warm.

CLEAN CLOTHING. Important for both sanitation and comfort. Dirt and grease will fill air pockets in clothes and allow the heat to escape your body more easily, leaving you feeling cold sooner.

OVERHEATING must be avoided. Overheating causes perspiration, which causes clothing to become damp. Dampness fills the air pockets in the clothing with heat-conducting moisture, permitting the body heat to escape. Overheating can be prevented by ventilation or removing layers.

LOOSE and in **LAYERS**. Clothes and footwear that are too tight restrict the blood circulation, increasing the danger of frostbite. Clothes should not be too loose either, as this allows trapped air to move, causing heat loss. Layering allows you to take clothing off before you overheat and add clothing as you cool.

Keep clothes **DRY**. Moisture will soak into your clothes from both inside and outside. Frost or snow that collects on your clothes will melt, making your clothes wet.

FOOTWEAR

Footwear is an important aspect of dressing for expedition training. Properly fitting, comfortable shoes / boots will make the cadet more comfortable during training. Low-ankle hiking boots are the ideal footwear. Finding shoes / boots that provide adequate ankle protection is important.

Combat boots or other military issue high-ankle support boots should not be worn during expedition training. Also, never wear new boots for the first time during an expedition.

Where the expedition will be held in cold weather, ensure cadets are aware that feet are vulnerable to the cold because they get wet easily, both externally and from perspiration.

The following principles are valuable when choosing and wearing footwear:

- **Ensure footwear is loose and in layers.** The layers are made up by the boot and the different combinations of socks and insoles.
- **Avoid restriction of circulation.** Two or more pairs of socks worn too tightly or tying the boot too tightly can restrict the circulation of warm blood from the body core and allow the feet to become cold.
- **Change socks and insoles as often as possible.** Since footwear often gets wetter than other types of equipment, select footwear designed to help decrease this, eg, with a rubber lower and material upper. Dry socks should always be carried, and socks should be changed as soon as possible when they become wet. If wearing heavy footwear equipped with removable insoles, such as mukluks, both socks and insoles should be changed.
- **Dry footwear when wet.** Footwear should be dried thoroughly at the first opportunity available.
- **Ensure footgear and feet are kept clean.** Footgear should be kept clean of mud and dirt, and feet should be cleaned frequently. Feet should always be exercised and massaged when changing socks.
- **Ensure all footwear fits properly to avoid chafing and blisters.** Ski and snowshoe bindings must be adjusted carefully. Improperly adjusted bindings may chafe the feet or cause excess wear and tear to the boot.

PERSONAL EQUIPMENT

Consult the joining instructions for a specific list of requisite personal kit.

Personal expedition equipment are items that benefit the participant and should be maintained by that person. Personal equipment is the kit the cadets need to carry on them.

Items to bring from home:

- **Hygiene kit.** Includes all personal items required to maintain good health and hygiene. A hygiene kit should include:
    - camp soap (biodegradable),
    - toothbrush,
    - toothpaste,
    - toilet paper, and
    - facecloth or small towel.
- **Insect repellent.** The active ingredient in most bug repellent is DEET. Many brands are available and can be purchased at most grocery stores.
- **Lip balm.** Lip balm with sunscreen will help protect lips. Lips burn easily at any elevation and cold dry winds can make lips crack and bleed.
- **Sunscreen.** A Sun Protection Factor (SPF) of 4 means that it will take four times longer to burn as when unprotected. Most sunburns can be prevented with an SPF of 15 with ultraviolet A (UVA) and ultraviolet B (UVB) protection, however an SPF of 30 or higher is recommended for most activities.
- **Sunglasses.** Protective eyewear. Sunglasses will protect the eyes from the sun.
- **Notepad and pencil.** Allows for note taking / leaving a message in any situation.
- **Water carrier.** A leak-proof water bottle or canteen to carry water.
- **Camera.** Cameras are great to record experiences.

Items that the expedition centre may provide:

- **Flashlight / headlamp.** A flashlight / headlamp should always be carried; smaller is better to control weight (be sure to have a spare set of batteries and bulb before each trip). Headlamps allow for hands-free operation.
- **Matches.** At least 20 matches that can strike anywhere and are waterproof. Store matches with a striker in a separate container inside the kit (35 mm film cases would suffice).
- **Knife / multi-tool.** Useful tool for many applications in the field. Hunting-type knives with long fixed blades are not appropriate for cadet activities.
- **Survival kit.** A kit with beneficial items to have in a survival situation. Items should be specific for the environment you will be travelling in.
- **Whistle.** For use as a signalling device in emergencies.
- **High-energy snacks.** As detailed below.

There may be a requirement for each participant to have a plate, a bowl and cutlery depending on food being consumed during expedition training.

GROUP EQUIPMENT

Group equipment should be selected for its versatility, weight, ease of use and packing. The more compact an item is or can become, the easier it will be to pack and carry.

Group equipment will be given to cadets upon arrival at the expedition centre.

HIGH-ENERGY SNACKS

Expedition centres may provide high-energy snacks. If the cadets are bringing their own snacks, encourage careful selection, as they will need to be carried.

Food is one of the most important factors to consider when expending large amounts of energy during activities. Choosing the right snacks to supplement meals is important to maintain energy and nutrition.

People are more prone to injuries at around 1100 hours and 1500 hours when blood sugar is low and people are tired from activities.

Granola Bars

Granola bars are an easy snack that can be brought on the trail with little waste. The wrapper of the granola bar can be folded and placed in a resealable plastic bag for disposal. When eating on the move, the wrapper can simply be placed in a pocket.

Granola bars come in a variety of flavours and often include chocolate. The nutrition in granola bars is largely grain based and provides a high calorie count. Granola bars often have 10–14 g of sugar and 11–16 g of fat.

Stay away from granola bars with more than 20 percent fat. These bars will only impede energy levels.

Dried Fruit and Nuts

Dried fruits last for months and keep most of their nutritional value. Dried fruit provides energy benefits without the added weight of 80 percent water content. Most grocery stores have varieties of mixed fruit, which can be dried at home.

To make homemade dried apples:

1. Slice the apples thinly.
2. Place on baking tray in a single layer.
3. Place in oven on a low temperature setting (60 degrees Celsius [140 degrees Fahrenheit]).
4. Check dryness every 20 minutes.
5. Crack open the oven door to remove moist air and improve result.

This process can take up to four hours.

Seeds and nuts are great sources of carbohydrates, protein and fat. Proteins are an essential part of any diet; known as the "don't leave home without it" snack. The high fat content will slow digestion so seeds and nuts are best used for refuelling during longer breaks. Nuts also provide magnesium, guarding the muscles against burn from lactic acid.

Cheese

A good source of dairy on the trail, cheese is a great form of calcium.

Cheese with a high moisture content does not keep well when not refrigerated for extended periods of time. Cheeses with low moisture content can keep longer. The liquefied milk fat will run off at high temperatures. While this is not a pleasant sight, it is not a sign of spoilage.

Cheeses with a high moisture content include:

- mozzarella, and
- parmesan.

Cheeses with a low moisture content include:

- cheddar,
- colby, and
- swiss.

"Good Old Raisins and Peanuts" (Gorp)

"Good old raisins and peanuts" is just that— a mixture of raisins, peanuts and anything else a person might want to add. There is often a sugar source like chocolate chips added to a dried fruit.

There are many varieties of GORP recipes. GORP can be bought in most groceries stores—pre-made—or made at home. Everyone has their favourite recipe. A person's GORP may change every expedition depending on what is available, or what they feel like eating.

Small items like sunflower seeds will settle to the bottom of the bag while larger items will float to the top. Mix up the contents of the bag before eating.

To make a simple GORP recipe:

- 118 mL (1/2 cup) peanuts,
- 118 mL (1/2 cup) raisins,
- 59 mL (1/4 cup) chocolate chips*, and
- 59 mL (1/4 cup) dried cranberries.

*In warmer weather, chocolate chips can be substituted with candy-coated chocolate that will not melt.

Mix in a bowl and store in an airtight container or resealable bag. This recipe will make 354 mL (1 1/2 cups). Substitute or add items as desired.

Examples of food items to put in GORP:

- dried apples,
- banana chips,
- dried papaya,
- dates,
- dried cranberries,
- coconut,
- almonds,
- cashews,
- peanuts,
- chocolate,
- carob chips,
- candy-coated chocolate,
- chocolate- or yogurt-covered raisins,
- sunflower seeds,
- dried green peas, and
- pretzels.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS:

Q1. What is the most effective way to maintain warmth and comfort in varying conditions?

Q2. What are the personal items a cadet should bring to the expedition centre?

Q3. What nutrients are in nuts?

Q4. When are people more prone to injuries on the trail?

ANTICIPATED ANSWERS:

A1. The most effective way to maintain warmth and comfort in varying conditions is by using multiple layers of clothing.

A2. The personal items that should be brought to the expedition centre are:

- hygiene kit,
- insect repellent,
- lip balm,
- sunscreen,

- sunglasses,
- notepad and pencil,
- water carrier, and
- camera.

A3. Nuts are a great source of carbohydrates, protein and fat.

A4. People are more prone to injuries around 1100 hours and 1500 hours when blood sugar is low and people are tired from activities.

Teaching Point 2 **Brief the cadets on the joining instructions and training schedule for Gold Star expedition training.**

Time: 10 min Method: Interactive Lecture

This TP is designed to introduce and brief cadets on what is required during training at the expedition centre.

Review the joining instructions and after briefing cadets, answer any questions.

RISKS IN EXPEDITION TRAINING

Activities conducted at the expedition centres will likely include hiking, biking, canoeing and camping. Risk is the chance or possibility of danger, loss or injury. Each activity has its own risks.

Hiking is the activity of walking outdoors on unpaved trails in a wilderness environment and may include many types of terrain and environments. It is not uncommon for cadets to be injured by tripping, falling and slipping over wet roots or rocks, or falling down a small slope.

Mountain biking is riding a bike on trails and secondary roads, using specialized equipment. Cadets are at risk of falling off the bike or not using the bike properly, which may cause injury. Injuries that may occur while mountain biking are cuts and scrapes, bruising, flesh wounds, or broken bones.

Canoeing is travelling on water using a canoe. Cadets should be seated, wearing a personal floatation device (PFD) and acting responsibly. These actions will minimize the risks associated with canoeing.

Snowshoeing is the activity of walking outdoors on snow using specialized shoes. It is not uncommon for cadets to be injured by tripping, falling and slipping over ice and uneven snow or falling down a small slope. Also, with cold weather comes the risk of frostbite, hypothermia and snow blindness.

Backcountry skiing will sometimes be done on rough terrain and difficult snow. Cadets are at risk of falling and tripping. Backcountry skiing excursions require attention to traffic, road and trail conditions, weather, terrain and the capabilities of the cadets involved. Also, with cold weather comes the risk of frostbite, hypothermia and snow blindness.

Canoeing is of great cultural significance to Canadians. Canoeing in expedition training allows cadets to see Canada's wilderness from a different perspective.

Refer to CATO 40-01, *Army Cadet Expedition Program* for general expedition information.

Medical Information

Located at Chapter 1, Annex B of A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards* is the Medical Information Form. This form must be completed by all cadets prior to undertaking expedition training. This form asks general questions regarding health.

Consent to Adventure Training

In addition to the medical form, the Consent to Adventure Training Form, located at Chapter 1, Annex A to A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards* must be filled out by participating cadets. This form advises instructors and organizers that the cadet understands what they are undertaking and will comply with all rules and regulations.

Policies

Prior to participating in expedition training, all cadets shall be reminded of the following policies:

- CATO 11-08, *Environmental Stewardship Policy*,
- CATO 13-23, *Drug and Alcohol Policy*,
- CATO 13-24, *Harassment Prevention and Resolution Policy*,
- CATO 13-26, *Return To Unit Policy*, and
- CATO 15-22, *Cadet Conduct and Discipline Policy*.

JOINING INSTRUCTIONS

Joining instructions are issued to provide cadets with all the required information they may need to arrive at the expedition centre prepared and capable of performing the required training. They are issued for all activities outside of the local cadet corps.

Each region will have different joining instructions for each expedition centre.

Joining instructions for expedition training can be found at the regional website.

The joining instructions will have information such as:

- general information on the activity,
- directions to the expedition centre,
- dates of training,
- transportation requirements,
- what identification is required,

- administrative and claim information,
- rations and quarters information,
- uniform requirements,
- expected cadet conduct, and
- required kit list.

Joining instructions will often have a schedule / timetable included.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the briefing for the expedition centre training weekend will serve as the confirmation of this TP.

Teaching Point 3 **Describe the instructions for the Navigation Review Package.**

Time: 5 min Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity to have the cadets become familiar with and receive instructions for the Navigation Review Package.

RESOURCES

Navigation Review Package located at Attachment A.

ACTIVITY LAYOUT

Nil.

ACTIVITY INSTRUCTIONS

1. Distribute a Navigation Review Package to each cadet.
2. Allow the cadets two minutes to review the package.
3. Explain to the cadets that the Navigation Review Package is to be completed prior to attending the Gold Star expedition. The package is to be used as a self-assessment tool. If cadets experience difficulty in an area, they should review the material and seek assistance prior to attending the expedition.

There is no time allocated for the completion of the package. Each cadet is to complete the self-study package and bring it with them to the expedition centre.

Though there is no time allocated to review answers in the Navigation Review Package, the answers are located at Attachment B. Answers should be reviewed prior to the cadet attending the Gold Star expedition.

SAFETY

Nil.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the orientation to the Navigation Review Package will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the briefing for the expedition centre training weekend will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Cadets are to complete and take the following to the expedition centre:

- the Navigation Review Package;
- the Medical Information Form; and
- the Consent to Adventure Training Form.

METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

Participating in a briefing on the local expedition centre, wearing proper clothing, bringing equipment and snacks, and reviewing navigation will help ensure all personnel are prepared for the upcoming challenges of expedition training.

INSTRUCTOR NOTES / REMARKS

This EO shall be conducted a minimum of two weeks prior to the Gold Star expedition.

Where expedition centres are completing the Gold Star expedition in cold weather, it is advised that the cadets receive cold weather training at the corps.

The joining instructions and timetable referred to in TP 2 will vary depending on the region. Instructors should acquire these from the local expedition centre.

There is no time allocated for the cadet to complete the Navigation Review Package. This package is to be completed by the cadet on their own time. Corps staff should review the completed package with the cadet prior to the Gold Star expedition.

The Navigation Review Package shall be completed and brought to the expedition centre by the cadet.

REFERENCES

A2-001 A-CR-CCP-951/PT-002 Director Cadets 3. (2006). *Royal Canadian Army Cadets adventure training and safety standards*. Ottawa, ON: Department of National Defence.

C2-051 ISBN 978-0-7153-2254-3 Bagshaw, C. (2006). *The ultimate hiking skills manual*. Cincinnati, OH: David and Charles.

C2-066 ISBN 1-4000-5309-9 Curtis, R. (2005). *The backpacker's field manual: A comprehensive guide to mastering backcountry skills*. New York, NY: Three Rivers Press.

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NAVIGATION REVIEW PACKAGE

Name: _____

Use the Sydenham Map (Figures A-1, A-2 and A-3) to answer Questions 1–7 and the Mission Map (Figure A-4) to answer Questions 8 and 9.

1. Find grid reference (GR) 551 187 and mark it as the start point (point A) on the Sydenham map. What conventional sign is located at the GR?

   Answer: _____

2. Find GR 505 247 and mark it as the finish point (point B) on the Sydenham map.

3. Select a route to hike from point A to point B on the Sydenham map. Consider distance, terrain, obstacles, etc. Clearly mark the route chosen on the map and give a brief explanation below as to why the route was chosen.

   _____

   _____

   _____

   _____

   _____

4. Measure the distance along the route from point A to point B on the Sydenham map.

   Answer: _____

5. Estimate the time it will take to hike the route on the Sydenham map. Remember that rates of travel will differ, depending on factors such as the group, equipment, terrain, elevation above sea level, etc.

   On average, a person walks 4 km per hour, 1 km per 15 minutes or 100 m per 1.5 minutes. When off trail in open terrain, a person can be expected to travel 3 km / h. On rough, difficult terrain a person can be expected to travel 1–1.5 km / h. When gaining elevation, there should be an extra allowance of 1 hour per every 300 m. When above 3 000 m, the rate of travel will greatly decrease. Give a brief explanation as to why the answer was chosen.

   _____

   _____

   _____

   _____

   _____

6. Calculate the magnetic declination of the Sydenham map. Show all workings below.

7. Determine the magnetic bearing from point A to point B on the Sydenham map.

   Answer: _____

8. Determine the contour interval of the Mission map.

   Answer: _____

9. Determine the elevation at GR 390 540 on the Mission map.

   Answer: _____

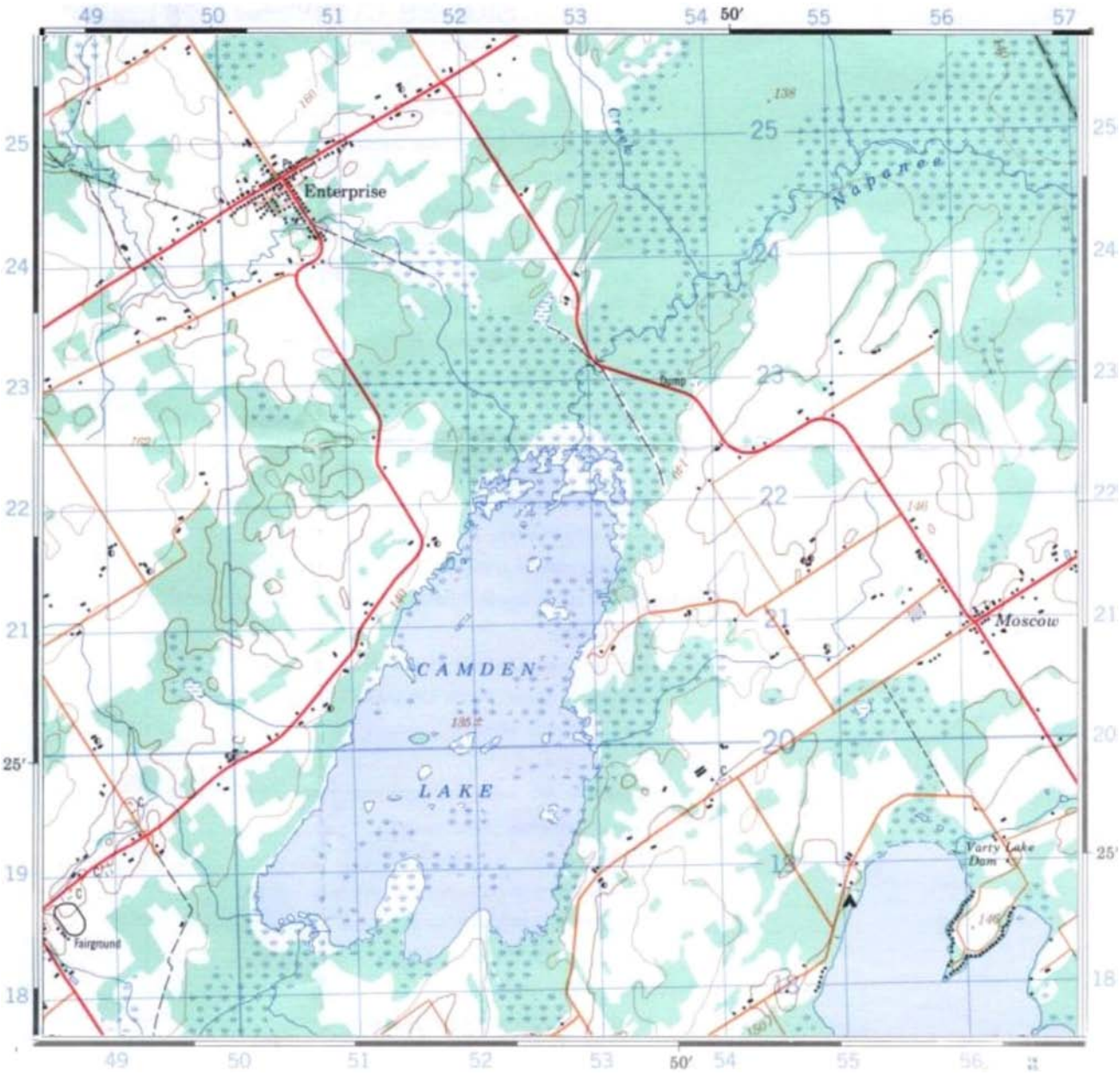

Figure A-1 Section of Sydenham Map

Note. From *Sydenham 31 C/7* (8th ed.), by Canada Centre for Mapping, 1988, Department of Energy, Mines and Resources. Copyright 1988 by Her Majesty the Queen in Right of Canada, Department of Energy, Mines and Resources.

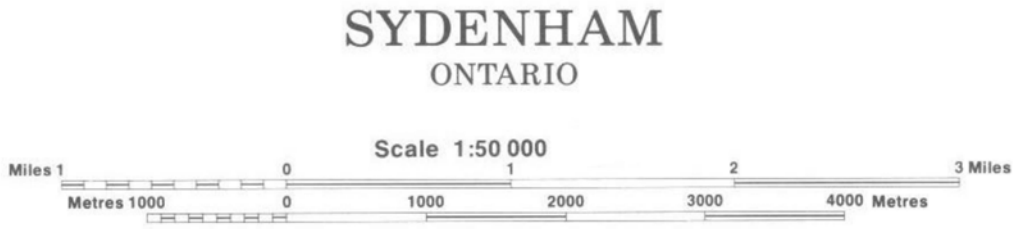

Figure A-2 Sydenham Map Scale

Note. From *Sydenham 31 C/7* (8th ed.), by Canada Centre for Mapping, 1988, Department of Energy, Mines and Resources. Copyright 1988 by Her Majesty the Queen in Right of Canada, Department of Energy, Mines and Resources.

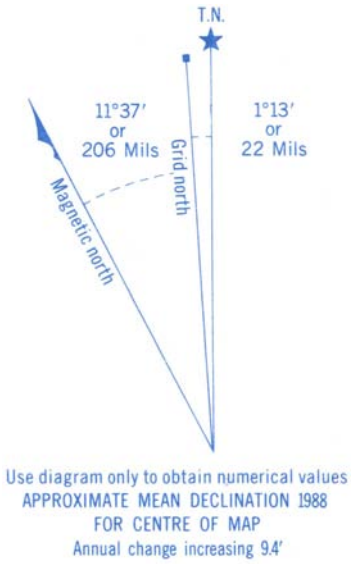

Figure A-3 Sydenham Map Declination Diagram and Information

Note. From *Sydenham 31 C/7* (8th ed.), by Canada Centre for Mapping, 1988, Department of Energy, Mines and Resources. Copyright 1988 by Her Majesty the Queen in Right of Canada, Department of Energy, Mines and Resources.

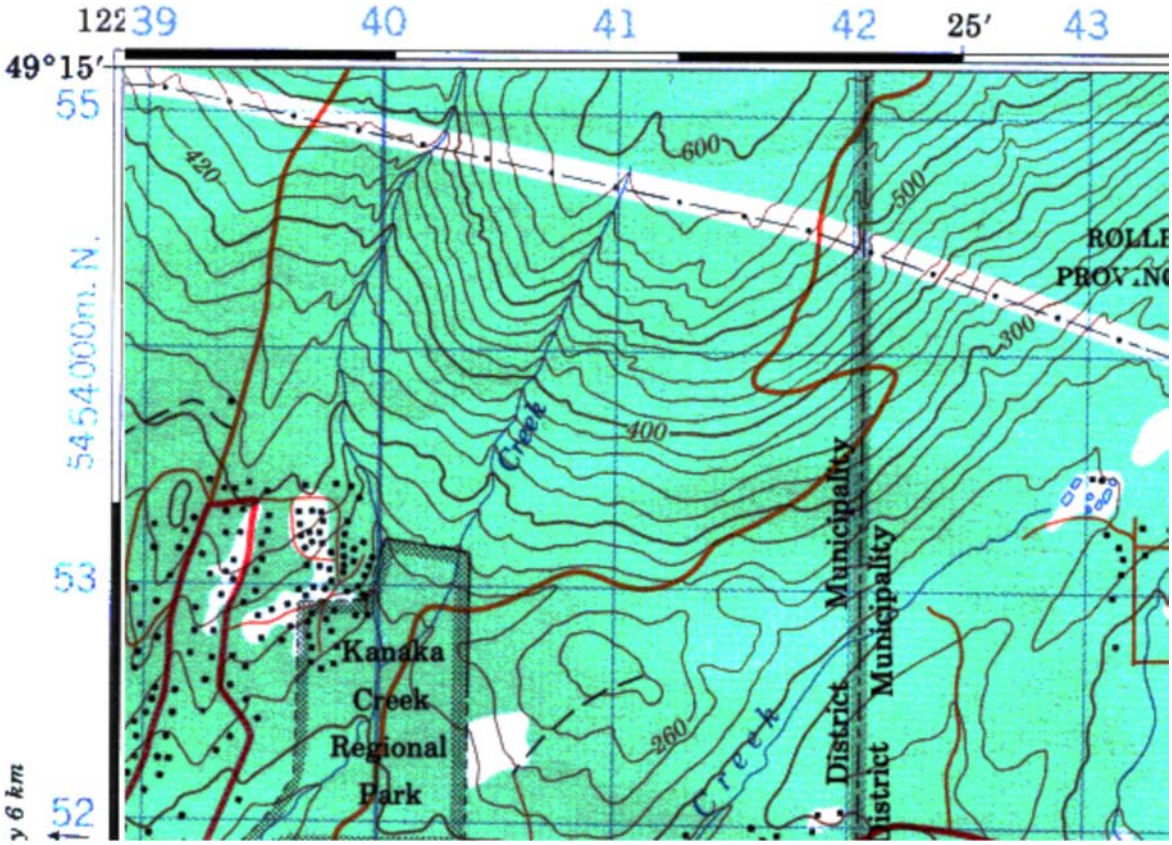

Figure A-4 Section of Mission Map

Note. From *Mission 92 G/1* (5th ed.), by Canada Centre for Mapping, 1992, Department of Energy, Mines and Resources. Copyright 1992 by Her Majesty the Queen in Right of Canada, Department of Energy, Mines and Resources.

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NAVIGATION REVIEW PACKAGE ANSWERS

1. See Figure B-1. The conventional sign is a **campsite**.

2. See Figure B-1.

3. Routes may vary. The answer provided is based on the route illustrated in Figure B-1.

The route chosen was the shortest distance. Leave the campsite and head south. Take the first road heading northwest. At intersection, head northwest. Take the trails / roads heading northwest until the intersection at GR 518 254. Head southwest until the Enterprise Intersection.

4. The distance along the route from point A to point B is **11 000 m or 11 km**.

5. The estimated time (based on the route illustrated in Figure B-1)

The terrain does not seem difficult and there are some elevation changes. The estimated time is 3 hours.

6. The magnetic declination is as follows:

Current year:	2011
Year of declination information:	- 1988
Difference in years:	23
Difference in years:	23
Annual change:	x 9.4'
Total change:	216.2' or 3°36.2'

Annual change is increasing so it is added to the original declination:

Original declination:	W 11° 37'
Total change:	+3° 36.2'
Current declination:	W 14° 73.2' or **W 15° 13'**

7. The magnetic bearing is **5750 mils or 323 degrees**.

8. The contour interval is **20 m**.

9. The elevation is **320 m**.

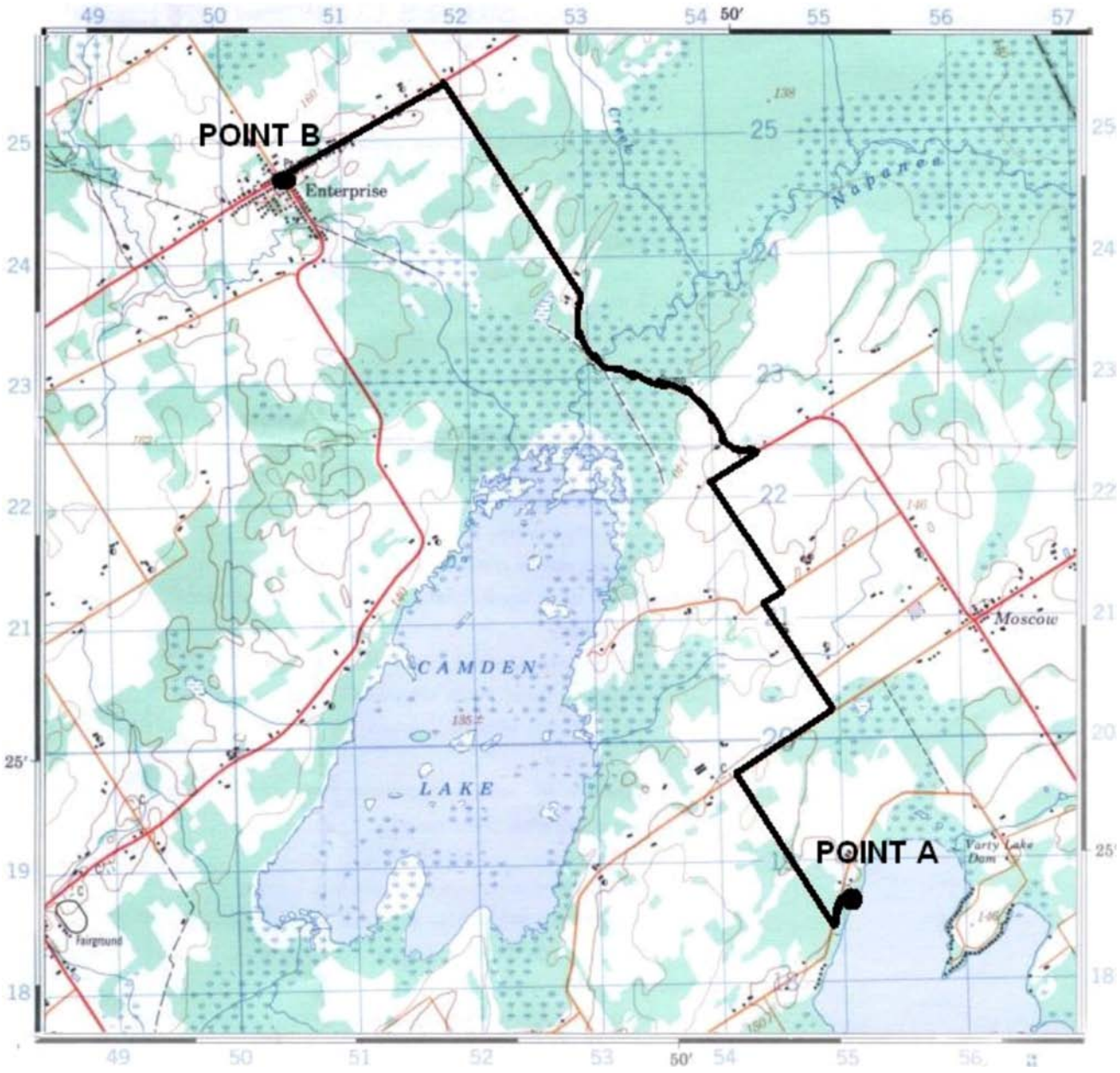

Figure B-1 Section of Sydenham Map (With Route)

Note. From *Sydenham 31 C/7* (8th ed.), by Canada Centre for Mapping, 1988, Department of Energy, Mines and Resources. Copyright 1988 by Her Majesty the Queen in Right of Canada, Department of Energy, Mines and Resources.

ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 2

EO M426.02a – PADDLE A CANOE

Total Time: 270 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Every cadet must have a water carrier prior to the start of this lesson.

All canoes, canoe safety equipment, personal canoe equipment, and group canoe equipment should be organized prior to the start of the lesson.

Review the canoe route. Be aware of locations where cadets may require additional supervision, such as portages.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

The experiential approach was chosen for this activity as it allows the cadet to acquire new knowledge and skills through a direct experience. The cadet experiences paddling a canoe on flatwater during an expedition and defines that experience on a personal level. The cadet will be given the opportunity to reflect on and examine what they saw, felt and thought while canoeing and consider how it relates to what they already learned and experienced as well as how it will relate to future experiences.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have paddled a tandem canoe on flatwater during an expedition.

IMPORTANCE

It is important for cadets to be able to paddle a tandem canoe on flatwater during an expedition because it can provide opportunities for exploration of new places, relaxation, wildlife-watching and physical fitness. Cadets will be required to work with their canoe partner to paddle a significant distance during the expedition. Understanding stroke mechanics and being able to manoeuvre their canoe will make the expedition more enjoyable and less strenuous. The expedition will provide an opportunity to further develop paddling skills in an environment that challenges them both physically and mentally.

Teaching Point 1 **Paddle a tandem canoe on flatwater during an expedition.**

Time: 270 min Method: Experiential Learning

BACKGROUND KNOWLEDGE

The TP for this lesson will occur during the canoe portion of the expedition. In some situations, cadets will have already received instruction and been provided the opportunity to practice canoe skills during the Silver Star Expedition / at the CSTC. The requirement to review skills will be based on the experience level of the cadets and the expedition training centre. Should a review be required, it is suggested that it is completed on-water as the need arises.

IDENTIFY THE PARTS OF A CANOE

There are many different styles of canoes. The technological improvements in canoe building have made it quite difficult to choose an ineffective canoe. Despite the advances in design, the basic elements of the canoe remain the same. The parts of the canoe are:

Bow. The front section of the canoe. The bow can be easily spotted by looking at the seats. There is more leg room between the end of the canoe and the bow seat.

Stern. The back section of the canoe. Most of the steering is done from the stern.

Gunwales. The upper edges of the sides of the canoe.

Gunwales is pronounced 'gunnels'.

Thwart. A crosspiece that is attached on either side to the gunwales, two-thirds of the way back from the bow. The thwart provides structure and support to the gunwales and the hull.

Hull. The body of the canoe, which displaces water and provides the buoyancy for the canoe.

Keel. A narrow strip that runs along the centre of the bottom of the hull from bow to stern. The keel helps to provide better tracking (movement in a straight line) and stability; as well as providing a small barrier between the ground and the hull.

Bow seat. Located in the front (bow) of the canoe. It is further from the end of the canoe to provide leg room for the bow paddler.

Stern seat. Located in the back (stern) of the canoe. It is narrow and fastened to the gunwales closest to the rear of the canoe.

Bow handle. A handhold at the bow, used for lifting and carrying. It is sometimes called the bow carrying thwart.

Stern handle. A handhold at the stern, used for lifting and carrying. It is sometimes called the stern carrying thwart.

Deck plate. A triangle piece of material that is fastened between the gunwales at both ends of the canoe. It is often called the bow deck and the stern deck. The deck plate provides a convenient handhold in the case of no bow or stern handle, as well as a place to attach a painter line.

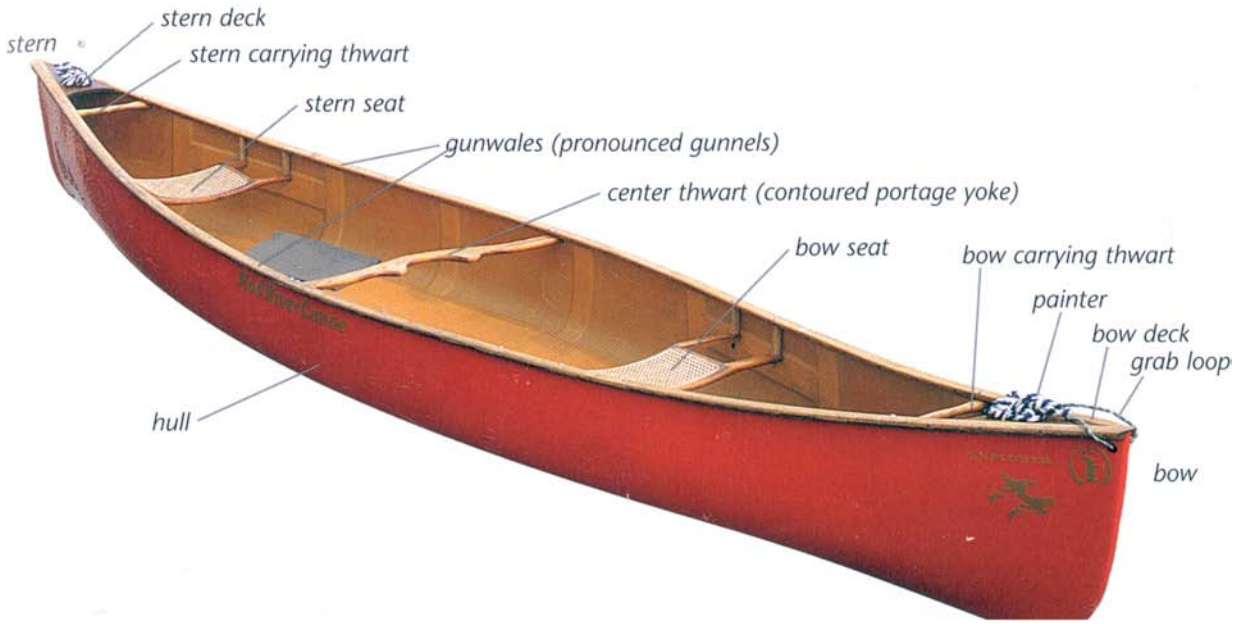

Figure 1 Parts of the Canoe

Note. From *Paddle Your Own Canoe* (p. 13), by G. McGuffin & J. McGuffin, 2005, Erin, ON: The Boston Mills Press. Copyright 2005 by The Boston Mills Press.

OUTFIT A CANOE WITH SAFETY EQUIPMENT

Every boat that enters the water has to be outfitted with certain safety equipment that is required by law. The Canadian Coast Guard and Transport Canada deem every canoe must have the following safety equipment:

Buoyant Heaving Line or Throw Bag

One buoyant heaving line not less than 15 m (49 feet) in length must be available for use in emergencies such as capsized paddlers. The heaving line shall be capable of floating and shall be attached using a figure-of-eight knot, or by clipping the throw bag to the thwart or bow handle.

A throw bag is a nylon rescue bag with a length of rope stuffed loosely inside, so it can pay out through the top when thrown to a person in the water.

Bailer

A bailer is any container capable of removing water from a canoe. It must be made of plastic or metal, with an opening of 65 cm^2 and a minimum volume of 750 mL. The bailer will be attached to the thwart of the canoe using a clove hitch.

Spare Paddle

In addition to the paddles used by the paddlers, a third paddle is required in the case that one is lost, broken or forgotten on shore. The spare paddle should be secured, but immediately available in an emergency. Lashing the paddle into the canoe is not recommended.

Whistle

A pealess whistle or noise-making device is required to communicate with other paddlers and to signal in case of emergency. The whistle is often attached to the paddler's PFD; if not, it should be worn on a cord around the paddler's neck.

White Navigation Light

The white navigation light is a watertight flashlight complete with working batteries. This light can be used to signal other paddlers or during an emergency. It is attached to the bow plate using a carabiner or a piece of cordage.

Painter Lines

Painter lines are two lines 6 m (19 feet) in length made of 10 mm buoyant polypropylene rope, with no knots. The lines are attached to the bow (bow line) and stern (stern line) of a canoe. They are used for pulling the canoe through shallow water and securing it to the shoreline or other stationary object. Painter lines will be attached to the bow and stern handles using a re-woven figure-of-eight knot.

PFD

A vest style jacket filled with foam panels or tubes that provide buoyancy. A PFD must be worn when an individual is within 3 m (10 feet) or less of the shoreline, prior to or upon completion of an on-water activity and when they are on the water. It is important to ensure that the PFD is properly zipped and buckled prior to moving to the waters edge.

The A-CR-CCP-030/PT-001, *Water Safety Orders*, states "the PFD shall always be worn over the outer layer of clothing. When worn, the PFD must have all fasteners and tighteners secured as they are intended to be used. A properly fitted PFD should be snug around the cadet's upper body when in or out of the water. The PFD should not ride up to the cadet's face when all fasteners and tighteners are fitted and secured. If it is riding up under these conditions, a smaller size is required."

The A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*, states that one Canadian-approved PFD or lifejacket of appropriate size must be available for each person participating in on-water activities.

IDENTIFY THE PARTS OF A PADDLE

The paddle is the most important piece of equipment required to canoe, with the exception of the canoe itself. The paddle provides the momentum to move the canoe.

Shaft. The narrow neck of the paddle between the grip and the blade.

Grip. Found at the top of the paddle shaft, where the paddler holds the paddle.

Throat. Located at the bottom of the shaft, where the paddler's shaft hand holds the paddle.

Blade. The part of the paddle that is placed in the water. The blade has two sides:

- **Power face.** The side of the paddle blade that presses against the water during a forward stroke.
- **Back face.** The side of the paddle blade that has no pressure against it during a forward stroke. The back face is the opposite side of the power face.

Tip. The very bottom edge of the paddle blade.

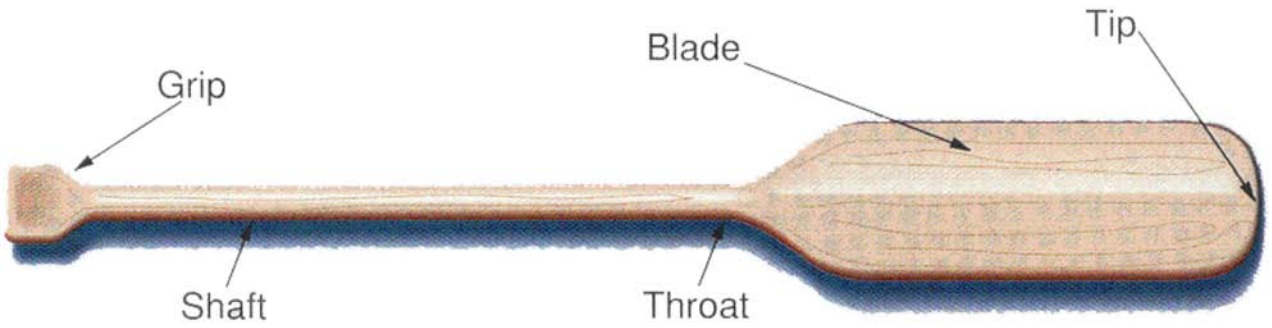

Figure 2 Parts of a Paddle

Note. From *Outdoor Pursuits Series: Canoeing* (p. 21), by L. Guillon, 1994, Champaign, IL: Human Kinetics Publishers. Copyright 1994 by Human Kinetics Publishers.

Sizing a Paddle

When selecting a paddle, it is important to size it correctly. Torso length, canoe seat height and paddling style will determine the proper paddle length.

Most tandem paddlers will require a paddle length between 137 cm and 147 cm. Shorter paddles allow for higher tempo strokes. If the grip hand is above the head during strokes, the paddle is too long.

Paddle length will differ with individual preference, based on comfort and efficiency.

When choosing a paddle from a group of paddles, there are two ways to size a paddle.

1. Hold the paddle in both hands over your head with one hand on the grip and the other on the shaft, close to the throat. With the paddle rested on the head, the arms should be able to bend comfortably at the elbow in a 90-degree bend.

2. Hold the paddle in one hand and rest the blade on the top of the foot. The grip should come to the chin.

Holding a Paddle

The paddle is held in both hands. One hand will hold the grip (control hand) and the second hand, called the shaft hand, will hold the paddle somewhere between the shaft and the throat of the paddle. If the paddler has shorter arms, the shaft hand will be higher up on the shaft.

Fitting a PFD

Fit is the most important thing when selecting a PFD. A PFD should:

- not be able to be pulled off easily,
- fit snugly, and
- be properly fastened.

A PFD must always be worn on and near water, and worn as the top layer.

Refer to A-CR-CCP-030/PT-001 *Water Safety Orders* for more information.

DISCUSS SAFETY CONCERNS WHILE CANOEING

Understand Personal Responsibilities

Skill Level. It is the responsibility of the paddler to ensure that they have the proper skill set for paddling. Participants should always advise staff when they feel uncomfortable or unprepared for any aspect of canoe training.

Physical Fitness. Fitness and well-being are an important part of canoeing. Individuals must take responsibility for themselves. Every paddler must make sure they are physically and mentally prepared for paddling. Physical preparedness includes having the endurance to be able to paddle the entire trip. The paddler should not be suffering from a cold or illness, and should not have any physical injuries, such as cramped or sore muscles.

Identify Paddle Signals

The water can be a noisy place. Using a whistle, paddle or gestures are the best ways of getting the attention of other paddlers.

Before heading out on any body of water, it is important to know and understand universal paddle signals. Paddle signals are important in times when there is distance between canoes and it is difficult to hear. Good communication on the water is essential to prevent accidents and ensure swift emergency response.

When receiving a signal, it is important to repeat the signal to the sender and pass the signal on to paddlers behind.

Paddle signals are used to alert the entire group to the direction of travel or to an unexpected situation, such as an overturned canoe.

Stop. Form a horizontal bar with the paddle and move with an up and down motion until remaining paddlers see it. If you are already stationary, stay where you are. Wait for the all clear signal before proceeding.

Figure 3 Stop

Note. From *Basic Kayaking: All the Skills and Gear You Need to Get Started* (p. 83), by J. Rounds, 2005, Mechanicsburg, PA: Stackpole Books. Copyright 2005 by Stackpole Books.

Paddle signals should be given to indicate the direction of travel; not the location of the obstacles.

Help required / emergency. A paddle, helmet or a bright object (not a PFD) are waved in a continuous motion side to side above the head. This means "assist the signaller as quickly as possible".

Figure 4 Emergency

Note. From *Basic Kayaking: All the Skills and Gear You Need to Get Started* (p. 83), by J. Rounds, 2005, Mechanicsburg, PA: Stackpole Books. Copyright 2005 by Stackpole Books.

Raft up. Raise the paddle vertically above the head and move in a circular motion. This signal means "come to me".

All clear. Extend the paddle over the head vertically. Maintain the paddle in the air in order to ensure that all members of the group have seen the signal. This signal is used when it is safe to continue on and indicates that there are no obstructions or danger ahead.

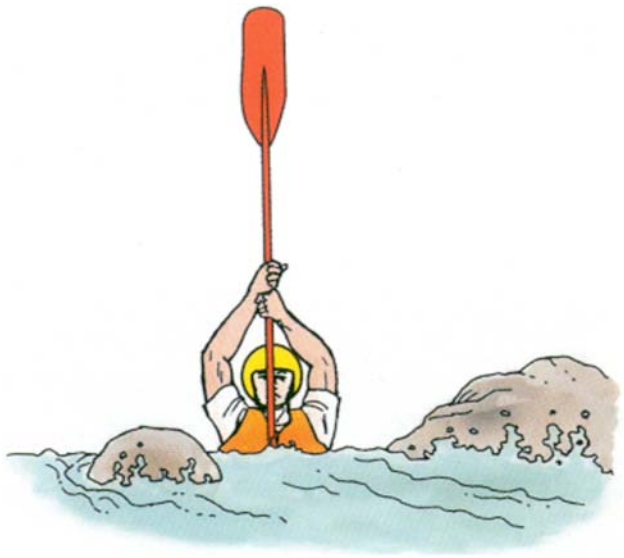

Figure 5 All Clear

Note. From *Basic Kayaking: All the Skills and Gear You Need to Get Started* (p. 83), by J. Rounds, 2005, Mechanicsburg, PA: Stackpole Books. Copyright 2005 by Stackpole Books.

Identify Whistle Signals

A whistle is an effective way to get the attention of other paddlers when visibility is limited and there is a lot of noise. Before heading out on any body of water, it is important to know and understand universal whistle signals. Good communication on the water is essential to prevent accidents and ensure swift emergency response.

Cadets shall be reminded that they will not play with or blow whistles unless they are in an emergency situation.

Universal distress signal. Three whistle blasts indicate that there is an emergency. All action should stop, and action should be taken for the emergency. This signal means assist the signaller as quickly as possible.

Figure 6 Universal Distress Signal

Note. From *Basic Kayaking: All the Skills and Gear You Need to Get Started* (p. 83), by J. Rounds, 2005, Mechanicsburg, PA: Stackpole Books. Copyright 2005 by Stackpole Books.

Move to shore / raft up. Two whistle blasts indicates that there is a need for the group to get together. When two whistle blasts are heard, all personnel will look to the instructor or group leader for instructions and guidance on where to meet up, whether to move to the shore or to raft up at a given point. It should only be used when other forms of communication are not working.

All clear / look at me. When one whistle blast is heard, focus attention on the instructor (look at me). It is used to get the attention of the group. This signal could also mean all clear.

As there are alternative meanings for one and two whistle blasts, it is imperative that the group understands what the signal means for their group. The team / group leader will specify before moving to the water.

Any series of three signals such as three whistle blasts or three horn blasts indicates an emergency. Immediately stop all activity and assist.

IDENTIFY ACTION ON CAPSIZING

Although strong rescue skills are important, preventing rescues by making careful, informed decisions will reduce the chances of capsizing. Anticipating changes in weather, actions of other paddlers and being properly trained will aid in the prevention of accidents.

Discuss Rescue Priorities

The priority of rescue is listed below, but rescuers will only initiate rescue if it is safe to do so without harm to themselves.

When carrying out rescues, it is imperative that every individual involved be aware of the priorities of rescue. The rescue priorities are:

Rescuer. Rescuer safety is priority. The rescuer should not complete any part of the rescue that is beyond the scope of the rescuer's ability. Another casualty will only escalate the emergency.

People. The paddler(s) in the water. Each paddler will make sure they are okay, and that their partner is okay. If they cannot see their partner, they must establish voice contact to confirm that their partner is conscious, is not seriously injured and is preparing to self-rescue.

Canoes. Canoes will be retrieved once all the paddlers in the water are safe.

Equipment. Equipment is the last thing to be retrieved as it is not essential. Clothing and food can be shared if need be.

If involved in a high risk rescue, the rescuer or rescue team should be prepared and trained to perform effectively and efficiently and to follow the procedures.

Cold water and wind will accelerate the loss of body heat. People can become hypothermic very quickly, even in warm weather.

Canoe Over Canoe Assisted Rescue

The canoe over canoe assisted rescue is the universal rescue means.

The figures below depict two solo paddlers completing a canoe over canoe assisted rescue. The procedure is virtually the same as a tandem rescue with only minor adjustments, which are detailed in the numbered procedure. Use the figures as a guideline.

Step 1

Step 2

Step 3

Step 4

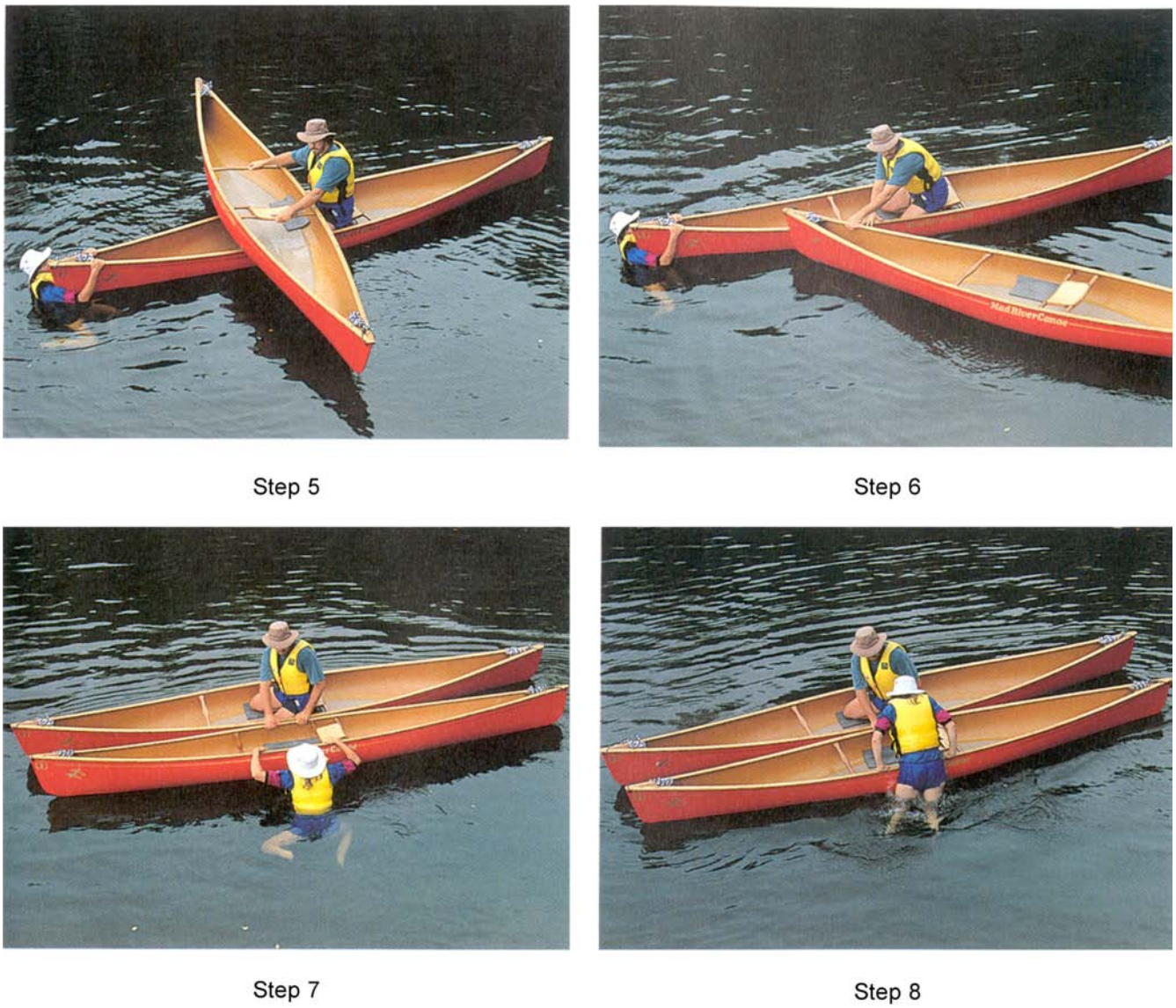

Figure 7 Canoe Over Canoe Assisted Rescue (Solo Paddlers)

Note. From *Paddle Your Own Canoe* (p. 36), by G. McGuffin & J. McGuffin, 2005, Erin, ON: The Boston Mills Press. Copyright 2005 by The Boston Mills Press.

The procedure to follow in a tandem canoe over canoe assisted rescue is:

1. One paddler will swim to the stern of a rescue canoe, hang on and get as much of the body out of the water as possible.
2. The second paddler will swim to the far end of the capsized canoe.
3. The rescuers will lift up on the capsized canoe as the second paddler pushes down on the opposite end of the capsized canoe to break the suction.
4. The second paddler will then move to the bow of the rescue canoe, hang on and get as much of the body out of the water as possible.

5. Both paddlers will remain in that position until told to move by the rescuers. The rescuers will move the canoe across the gunwales of their canoe. Once it is centred they will flip it over and gently continue to slide it into the water.

6. Maintain communication and when instructed to do so the paddlers will, one at a time, get back into the canoe by one of two ways:

   a. hook one leg over each canoe and pull up out of the water and climb into the canoe; or

   b. propel themselves upward by scissor kicking, tucking the shoulder in and rolling into the canoe.

7. Return to the paddling position.

PORTAGING A CANOE

Carrying a Canoe to The Water

Once a canoe is off the vehicle or trailer, it still needs to get to the water. There are several ways to carry a canoe; having one person at each end is a typical way. Hand and arm placement should allow for maximum comfort and provide balance and security against dropping.

It is critical that the canoe is not dragged along the ground. This damages the keel and the bottom of the canoe which may result in holes.

Tandem Hand Carry

For a short distance over relatively flat ground, a canoe can be carried much like a briefcase. This is referred to as the tandem hand carry.

To execute the tandem hand carry:

1. The bow paddler will stand at the bow on the left or right of the canoe.

2. The stern paddler will stand at the stern on the side opposite to the bow paddler.

3. Each paddler will lift the canoe by the handle at their end.

Figure 8 Tandem Hand Carry

Note. From *Outdoor Pursuits Series: Canoeing* (p. 36), by L. Guillon, 1994, Champaign, IL: Human Kinetics Publishers. Copyright 1994 by Human Kinetics Publishers.

Tandem Portage Carry

For longer distances, a canoe can be carried on the shoulders in the tandem portage carry. The canoe is lifted over the head and carried in such a manner that the stern seat rests across the shoulders of the person at the rear and the bow deck rests on one shoulder of the person in front.

To execute the tandem portage carry:

1. Stand up straight, with the legs slightly apart and knees bent. Grasp the gunwale closest to the body, near the bow and stern seats respectively. Place the fingers inside the gunwale and the thumbs outside the gunwale.
2. Keeping the back straight and knees bent, lift the canoe to the thighs in a rocking motion.
3. Reach across the canoe and grasp the far gunwale. The fingers are pointing out and the thumb is in. Re-position the hand from step one so that the fingers are out and the thumb is in.
4. Rocking the canoe again, use your legs to launch and lift the canoe over the head.
5. As the canoe is raised, turn to face the bow and then guide the bow and stern seats onto the shoulders.
6. Rest the weight of the canoe on the shoulders. The bow person will move further forward to improve visibility.
7. To move forward, the bow paddler hand-walks along the gunwale toward the front of the canoe. Balance the canoe's weight side to side and bow to stern.
8. Rest the deck plate on the bow paddler's shoulder.


1


2


3


4

Figure 9 Tandem Portage Carry Steps 1–8

Note. From *Canoeing: The Essential Skills and Safety* (p. 136), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

To lower the canoe, complete the procedure in reverse. It is important to lower the canoe onto the thighs, then onto the ground.

LOADING AND UNLOADING EQUIPMENT FROM A CANOE

Weight Distribution and Stability

Stability is the first consideration when canoeing. Canoes are floats and their stability depends primarily on their shape and the position of the centre of gravity. The more expansive the float over the water and the lower the centre of gravity, the more stable a float becomes.

An empty canoe resting on the water has two centres on the same vertical plane, the centre of gravity and the centre of buoyancy. The canoe is evenly trimmed bow and stern and side to side.

Centre of gravity is the point around which a person's body weight is equally balanced in all directions. The total weight of the person is concentrated at this point. The position of the centre of gravity of an object depends on the shape of the object and the distribution of its weight.

If weight is added to the canoe, such as a heavy pack, the centre of buoyancy changes to stay on the same vertical plane as the centre of gravity.

Loads should not be higher than the gunwales of the canoe and must be evenly distributed over the keel line. Weight should be adjusted so that the canoe is neither bow nor stern heavy.

Canoe Trim

Trim is the way the canoe rides in the water once it has been loaded. It is important to keep the gunwale line parallel to the water surface. In addition, it is crucial that the stern does not ride lower than the bow.

Weight of Paddlers

The weight of the paddlers is often overlooked and must be taken into consideration. Most canoes are rated with a maximum capacity, normally between 500–635 kgs (1100–1400 pounds) with a load range of 135–270 kgs (300–600 pounds). The paddlers' weight must be considered, as this will limit the weight of equipment that can be loaded in the canoe. This weight will also affect the trim of the canoe.

Packs and equipment are tied to the centre thwart using a tether line. This will ensure the equipment is not separated from the canoe. The equipment should be placed in the middle section of the canoe. By trial and error, adjustments may have to be made so that the canoe will be trimmed evenly.

LAUNCHING AND LANDING A CANOE

Identifying a Location

Putting a canoe on water and taking it out of water should be done carefully, smoothly and without damage to the canoe.

The ideal location to launch a canoe is a soft shore or beach where the water is calm. Avoid locations where there are large rocks, stumps and roots, strong wind or large waves.

If you are launching from a shallow beach, launch the canoe at a right angle to the beach and hold it with its stern touching the bottom at the water's edge.

Avoiding Equipment Damage

A canoe should not be pushed, pulled or slid in or out of the water on a beach, bank, or dock. When launching, it is best to lay the canoe in the water from a lift position. It should be raised with the same care when being taken out of the water.

The canoe should be empty when launching. Once the canoe is placed on the water, it can be loaded with equipment while it is floating.

Entering a Canoe

Getting into a canoe for the first time is difficult; with practice, it will become easier. The stern paddler should always hold the canoe steady while the bow paddler enters. Likewise, once the bow paddler has entered the canoe, they will steady the canoe, using their paddle and body, while the stern paddler enters.

The steps for getting into a canoe are:

1. Keep the body low at all times, to lower the centre of gravity; never stand in a canoe.
2. Place the paddle shaft across the gunwales for stability.

3. Grasp both gunwales and step into the canoe over the centreline.

4. Step along the centreline and slide the hands and paddle along the gunwales to move to the seat.

Launching a Canoe at a Shoreline

Launching and landing a canoe in waves is inadvisable. Wait for a lull and keep the canoe at a right angle to the water.

If the canoe swamps at any time, avoid getting between the canoe and the shore. A canoe full of water weighs approximately 1 ton (1 000 kg) and can seriously injure a paddler.

There are several ways to launch a canoe from shore. The most common is the bow first launch:

Procedure for the bow first launch:

1. Put on a PFD and have paddles in the canoe or on the shoreline. Set the canoe at a right angle to the shore.

2. Place the spare paddle and stern paddle in the centre of the canoe. Have the stern paddler hold the canoe while the bow paddler walks up the length of the canoe keeping their weight low and balanced over the centreline. Stability is maintained by keeping the paddle shaft across the gunwales.

3. Have the bow paddler sit or kneel and place the paddle in the ready position as detailed in Figure 10. The stern paddler will hold the paddle shaft across the gunwales for stability.

4. Have the stern paddler slide their paddle forward along the gunwales, continuing to hold both paddle shaft and gunwales while keeping their weight low and balanced over the centreline. The blade is positioned on the side opposite to the bow paddlers' paddling side.

5. Once the stern paddler is kneeling and in the ready position, move the canoe away from the shore.

Figure 10 Bow First Launch

Note. From *Paddle Your Own Canoe* (p. 36), by G. McGuffin & J. McGuffin, 2005, Erin, ON: The Boston Mills Press. Copyright 2005 by The Boston Mills Press.

On windy days, face the canoe directly into the wind when launching.

Landing a Canoe at a Shoreline

When a suitable location to exit the canoe is found, the following procedure shall be followed:

1. Bring the canoe into landing without running up on shore.
2. Have the bow paddler exit first to steady the canoe for the stern paddler.
3. Have the stern paddler move forward, keeping their weight low in the canoe.
4. Have the stern paddler exit at the bow.

Exiting a Canoe

To exit the canoe, reverse the entry procedures:

1. Bring the canoe into the landing slowly and carefully.
2. Keep the body low at all times, lowering the centre of gravity.
3. Place the paddle shaft across the gunwales for stability.
4. Grasp both gunwales and the paddle shaft, and move to the bow of the canoe.
5. Step out of the canoe, keeping weight low.

EXECUTE CANOE STROKES

Kneeling is the position of choice for paddling because it provides increased canoe stability. When a person kneels, their centre of gravity is lowered. To give sore knees a break, a paddler can sit on the seat.

There are four phases of a stroke that help ensure the transition between each stroke is natural and smooth.

Catch. The beginning of the stroke where the blade is inserted into the water.

Power. The movement of the paddle through the water by rotating the torso to transmit power to the blade. When paddling, it is important to use the muscles of the torso, which have more strength and endurance than the arm muscles.

Exit. When the paddle leaves the water.

Recovery. When the paddle is returned to the catch position. This is completed by feathering the blade (keeping it flat and just above the water surface) to minimize wind resistance.

The stern paddler will control the direction of the canoe using corrective strokes where applicable. The bow paddler will complete mostly power strokes when canoeing, unless the stern paddler requires assistance with corrective strokes.

Power Stroke

The power stroke is used to move the canoe forward. It is the foundation stroke on which most other strokes are built. The power stroke is made close to the side of the canoe and parallel to the keel, with the shaft of the paddle moving in a vertical or near-vertical plane. To complete the power stroke:

1. Rotate the torso forward toward the bow to engage the muscles for the stroke.
2. Place the blade deep into the water with as little splash as possible.
3. Unwind the torso while pulling on the shaft hand (lower hand) and pushing with the control hand (upper hand).
4. Power the stroke through the water until the blade of the paddle is in line with the knee.
5. Lift the paddle out of the water by slicing it out to the side.
6. Recover the stroke with the blade clear and flat across the water (to reduce wind resistance) and complete another stroke.

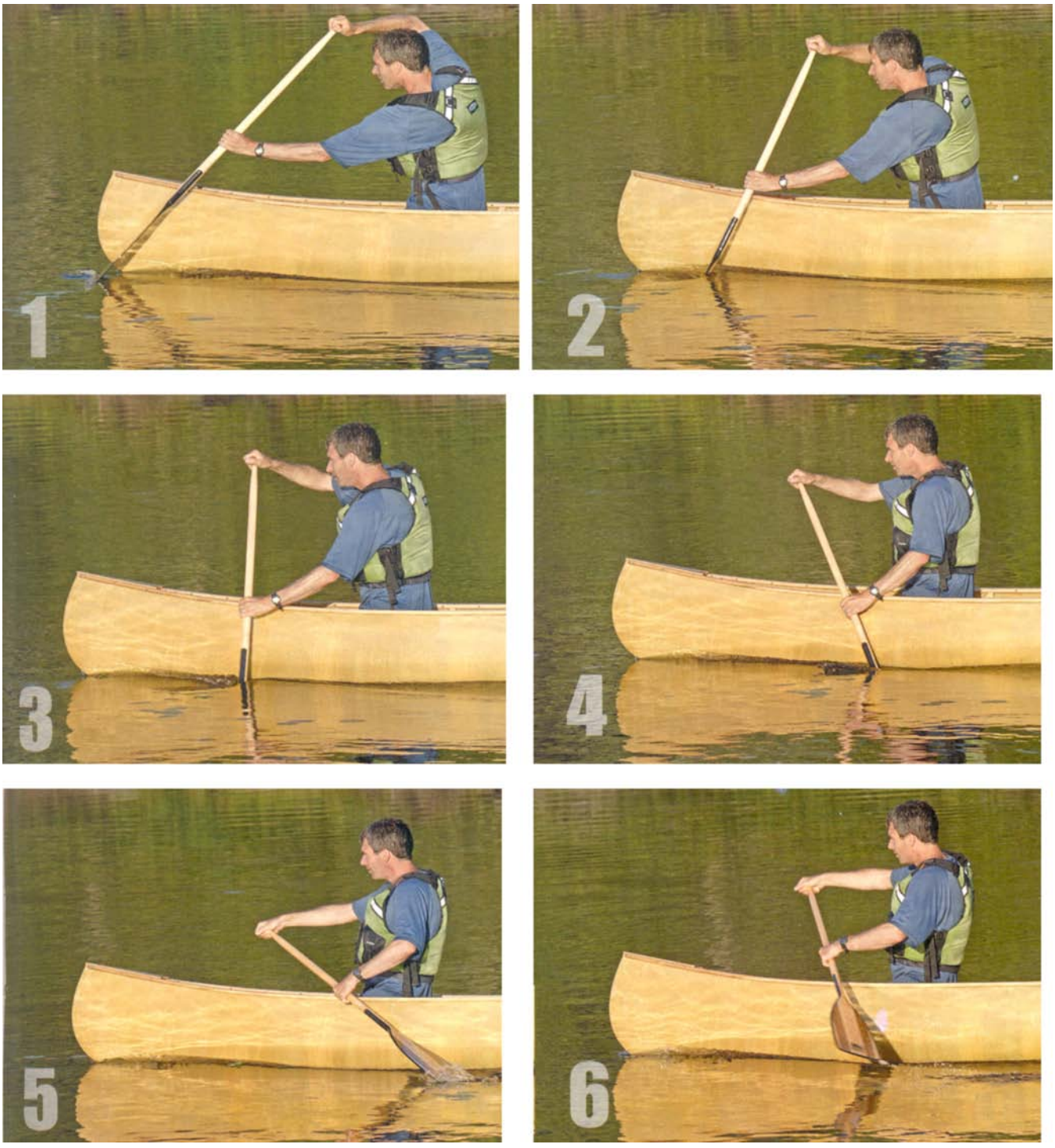

Figure 11 Power Stroke

Note. From *Canoeing: The Essential Skills and Safety* (p. 71), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

J-Stroke

Watch for ruddering as the cadets' practice the J-stroke. Ruddering is when the stern paddler places their paddle in the water behind the hip and manoeuvres it back and forth to turn the canoe. This will create drag and slow the forward momentum of the canoe.

The J-stroke is a version of the power stroke used as a corrective stroke by the stern paddler to help keep the canoe travelling in a straight line. When applied with force, it can be used to turn the canoe to the stern paddler's side (the side they are paddling on). To complete the J-stroke:

1. Complete the first four steps of the power stroke, ending with the control hand above the gunwale and the shaft hand at the hip.
2. Twist the control hand thumb forward and down while pulling the shaft hand inward, forming a "J".
3. Recover to complete another stroke.

Figure 12 J-Stroke

Note. From *Canoeing: The Essential Skills and Safety* (p. 74 and p. 75), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

Forward Sweep

The purpose of the forward sweep is to turn the canoe away from the canoeist's paddling side. It is a wide sweep of the paddle, using the power face of the blade. There are many occasions when this stroke would be used, such as:

- swinging the canoe for pivot turns or partial turns;
- manoeuvring the canoe around obstacles;

- following along the bends of streams or rivers;
- making sudden changes of direction in paddling;
- aiding in holding a straight course in crosswinds; and
- incorporating with other strokes as necessary to control the canoe.

Reverse sweeps use the back face of the blade and are the opposite of forward sweeps. Both sweeps have many of the same functions.

As the bow paddler, to complete the forward sweep:

1. Rotate the torso and bend forward slightly while immersing the blade of the paddle almost horizontally by the bow of the canoe.
2. Push the shaft hand out slightly from the waist while swinging in a 90-degree arc until the arm extends out from the hip (the paddle should be at a right angle to the side of the canoe).
3. Recover to complete another stroke.

As the stern paddler, to complete the forward sweep:

1. Lean back slightly as the upper body rotates while extending and immersing the paddle almost horizontally at a right angle to the side of the canoe at the hip, keeping the lower hand at waist height with the thumb pointing up.
2. Push out slightly with the shaft hand while swinging in a 90-degree arc (the paddle should be almost touching the stern).
3. Recover to complete another stroke.

When the bow paddler is completing a forward sweep, the stroke should never move past the paddler’s body. Any further movement will result in drag and loss of momentum.

Step 1

Step 2

Step 3

Figure 13 Forward Sweep

Note. From *Paddle Your Own Canoe* (p. 51), by G. McGuffin & J. McGuffin, 2005, Erin, ON: The Boston Mills Press. Copyright 2005 by The Boston Mills Press.

Draw

The purpose of the draw is to turn the canoe or to move it sideways. The draw stroke can be completed by both the bow and stern paddler. To complete the draw stroke:

1. Rotate the torso and extend the arms fully to position the paddle at the side of the canoe, adjacent to the knee.
2. Reach across the canoe with the control hand and place the paddle vertically into the water.
3. Plant the blade deeply in the water and pull the power face toward the body.
4. Twist the control hand thumb away from the body and rotate the blade 90 degrees (before the blade hits the canoe).

5. Bring the paddle back to the beginning position by slicing it through the water.
6. Twist the blade back into the original position to complete another stroke.

Figure 14 Draw

Note. From *Canoeing: The Essential Skills and Safety* (p. 95), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

Pry

The pry is a powerful, deep-water stroke that can be applied by the bow or the stern paddler to move the canoe away from the paddler's side. To complete the pry stroke:

1. Place the paddle vertically against the gunwale adjacent to the knee with both hands above the gunwale.
2. Pull inward with the control hand to force the paddle away from the canoe.
3. Rotate the blade 90 degrees by twisting the thumb of the control hand away from the body and slicing the blade back to the beginning point.

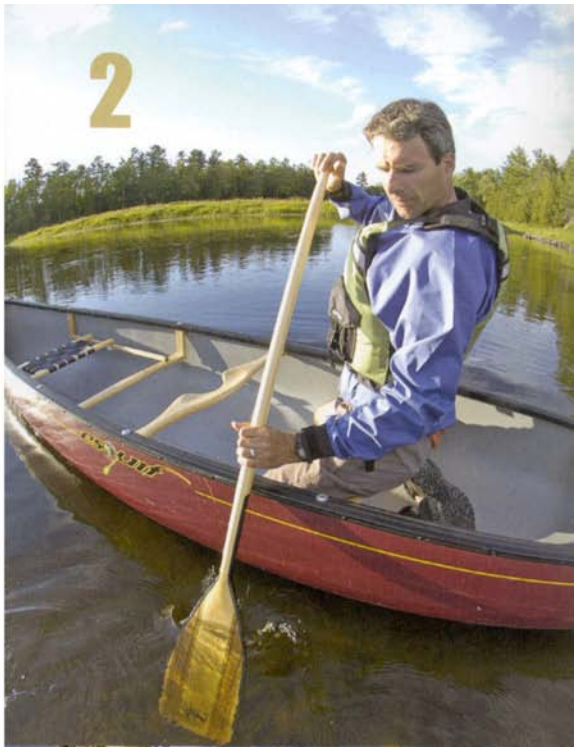

Figure 15 Pry

Note. From *Canoeing: The Essential Skills and Safety* (p. 96), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

If the bow paddler completes a pry and the stern paddler completes a draw, the canoe will move sideways. This combination of strokes is useful if trying to move a canoe parallel to a dock or when rafting up.

Low Brace

The low brace will assist in righting a canoe from capsizing or if it begins to tip. This stroke will also help a paddler rely on the paddle to steady the canoe as well as lean into turns. It can also be used by the stern paddler to steady the canoe when the bow paddler is initiating a turn. To complete a low brace:

1. Twist the upper body to face the water, with the paddle out at a 90-degree angle to the canoe.
2. Smack the water with the flat backside of the paddle to provide support to balance the body in the canoe.
3. Begin to get the knees level in the canoe by dropping the head towards the shaft of the paddle.
4. Assume a stable posture with the head centred inside the canoe once the canoe has levelled.

Figure 16 Low Brace

Note. From *Canoeing: The Essential Skills and Safety* (p. 98 and p. 99), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

Jam

The jam stroke will stop a canoe's forward momentum quickly when applied. To execute the jam, the paddler will shove the paddle into the water at a right angle to the canoe in a vertical position.

Backpaddle

To go backward, the bow paddler can complete a reverse power stroke. If necessary, the stern paddler can do a pry in the beginning to steady the canoe. To backpaddle:

1. Lean slightly back, rotate the shoulders back and place the blade of the paddle vertically in the water at the rear of the canoe up to the throat.

2. Unwind the body while pushing forward with the shaft hand and pulling with the control hand.

3. Continue with the stroke until the shoulders are square with the gunwales.
4. Lift the blade out of the water and recover to complete another stroke.

Figure 17 Backpaddle

Note. From *Canoeing: The Essential Skills and Safety* (p. 98–99), by A. Westwood, 2007, Beachburg, ON: The Heliconia Press. Copyright 2007 by The Heliconia Press.

If both paddlers are backpaddling, the canoe will turn away from the bow paddler's side.

ACTIVITY

Time: 270 min

OBJECTIVE

The objective of this activity is to have the cadets, in teams of no more than six, paddle a tandem canoe on flatwater, for 15–20 km, during an expedition.

RESOURCES

- Fully equipped tandem canoe (one per two cadets),
- Personal canoe equipment (one per cadet),
- Group canoe equipment (one per team), and
- Water carrier (one per cadet).

ACTIVITY LAYOUT

Designate a flatwater canoe route, IAW A-CR-CCP-030/PT-001, *Water Safety Orders*.

ACTIVITY INSTRUCTIONS

1. Conduct a briefing, to include an explanation of:
   a. the objectives and importance of the activity;
   b. the resources that may be required to perform the activity; and
   c. any safety guidelines that must be followed while performing the activity.
2. Have cadets size and fit paddles and PFDs.
3. Place cadets in canoe partners.
4. Assign a bow and stern paddler (groups will be required to switch at the half-way point of the route).
5. Have cadets outfit their canoes with safety equipment.
6. Have cadets, in teams of no more than six, paddle a tandem canoe on flatwater, following the designated route for a distance of 15–20 km during an expedition to practice:
   a. launching and landing the canoe;
   b. turning the canoe;
   c. pivoting the canoe;
   d. moving the canoe laterally;
   e. paddling in a straight line; and
   f. stopping the canoe.
7. Upon arrival at the end point, have the cadets store / return all equipment.

8. Conduct a debriefing by asking the cadets:

   a. how they felt about the activity;

   b. how they felt their team worked together;

   c. what portion of the activity challenged them the most;

   d. how their teammates assisted them when they were challenged;

   e. if there are any specific examples of when their team bonded;

   f. how the team made decisions;

   g. whether or not all team members ideas / suggestions were considered; and

   h. what they would do as a leader of this type of activity to ensure their subordinates enjoyed the experience.

SAFETY

- Cadets must wear their PFDs at all times.
- Each team will be led by the assigned team leader.
- All canoes in a team must travel together—there can be no more than two canoe lengths between team canoes.
- Team Instructor(s) (TIs) must be in sight / sound of the team at all times.
- Teams will travel separately along the canoe route.
- There will be a minimum of 500 m between teams at all times.
- Cadets must carry at least 1 L of water.
- Water re-supply points will be located along the route.
- Meals will be provided at a pre-determined location(s) and detailed in the route instructions.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in paddling a canoe will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

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

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

This lesson is assessed IAW A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, Chapter 3, Annex B, 426 PC.

CLOSING STATEMENT

Canoeing is a fun and challenging mode of travel that can be used during expedition training. Being able to efficiently manoeuvre a canoe while on expedition provides a great sense of freedom and accomplishment. Canoe strokes only improve with practice, it is important to make an effort to continue the development of the skills.

INSTRUCTOR NOTES / REMARKS

Expedition centres are required to select two dynamic modes of travel from EO M426.02a (Paddle a Canoe), EO M426.02b (Ride a Mountain Bike), EO M426.02c (Hike Along a Route), EO M426.02d (Snowshoe Along a Route) and EO M426.02e (Ski Along a Route) to incorporate into the expedition training.

This EO has been allocated nine periods in the overall course period allocation. Each expedition centre may adjust this allocation to reflect the choice of activities, facilities and available resources in the expedition centre.

Upon arrival at the expedition centre, cadets will be divided into teams. Cadets will be given an opportunity to navigate and lead peers. These teams will remain the same for the duration of the expedition.

IAW A-CR-CCP-030/PT-001, *Water Safety Orders*:

1. a fully equipped tandem canoe is described as having the following items:
    a. bailer,
    b. buoyant heaving line or throw bag,
    c. sound signalling device,
    d. spare paddle, and
    e. painter lines;
2. the following personal canoe equipment is required when paddling a canoe:
    a. PFD, and
    b. paddle; and
3. the following group canoe equipment is required when paddling a canoe:
    a. topographical or river map of area as required,
    b. compass,
    c. GPS receiver,
    d. first aid kit,
    e. communication device (eg, cellular phone or hand-held radio), and
    f. canoe repair kit.

The intensity level of the activity shall follow the progression matrix outlined in A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*.

IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*, there are pre-training requirements for canoeing. Assess the level of pre-training required and plan time into the expedition as necessary.

Ensure that each cadet has an ample supply of drinking water when canoeing.

REFERENCES

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C2-078 ISBN 1-55013-079-X Mason, B. (1988). *Song of the paddle: An illustrated guide to wilderness camping*. Toronto, ON: Key Porter Books Limited.

C2-106 ISBN 0-900082-04-6 Rowe, R. (1997). *Canoeing handbook* (2nd ed.). Guildford, UK: Biddles Limited.

C2-112 ISBN 1-55046377-2 McGuffin, G., & McGuffin, J. (2005). *Paddle your own canoe: An illustrated guide to the art of canoeing*. Erin, ON: Boston Mills Press.

ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 3

EO M426.02b – RIDE A MOUNTAIN BIKE

Total Time: 270 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Every cadet must have a water carrier prior to the start of this lesson.

All mountain bikes and helmets being used should be organized by size prior to the start of this lesson.

Have mountain bike pumps and mountain bike repair kits available to complete the pre-ride check.

Have cleaning materials available to complete the post-ride check.

Review the terrain and trail features of the mountain bike route. Be aware of challenging areas where cadets may require additional supervision.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

The experiential approach was chosen for this activity as it allows the cadet to acquire new knowledge and skills through a direct experience. The cadet experiences mountain biking on familiarization / intermediate trails during an expedition and defines the experience on a personal level. The cadet will be given the opportunity to reflect on and examine what they saw, felt and thought while mountain biking and consider how it relates to what they already learned and experienced as well as how it will relate to future experiences.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have ridden a mountain bike on familiarization / intermediate trails during an expedition.

IMPORTANCE

It is important for cadets to be able to ride a mountain bike on familiarization / intermediate trails during an expedition. Cadets will be required to work as a member of an expedition team to travel a significant distance during the expedition. Being able to perform basic mountain bike skills will assist them in keeping up with their team. Mountain biking over more difficult terrain features will provide cadets the opportunity to put into practice new mountain bike skills while further developing their basic mountain bike skills in an environment that challenges them both physically and mentally.

Teaching Point 1 **Ride a mountain bike on familiarization / intermediate trails during an expedition.**

Time: 270 min Method: Experiential Learning

BACKGROUND KNOWLEDGE

The TP for this lesson will occur during the mountain bike portion of the expedition. In most situations cadets will have already received instruction and been provided the opportunity to practice basic mountain bike skills during the Silver Star Expedition / at the CSTC. The requirement to review skills will be based on the experience level of the cadets and the expedition training centre. Should a review be required, it is suggested that it is completed along the route as the need arises.

SELECTING AND ADJUSTING A MOUNTAIN BIKE

Since the first introduction of the mountain bike in the mid- to late-1970s, the design of bikes has evolved. The quest for improved products has led to continued improvements and advancements in materials being used to construct the bikes, as well as the overall design of the bikes themselves. With the introduction of new bikes each year by key manufacturers the use of stronger and lighter materials, and cutting edge designs compete to maximize speed, power and strength.

While it is important to have a well-designed mountain bike, if the bike chosen does not fit the mountain biker the excellence in design will be lost. Having a properly-fitted mountain bike is important for riding efficiency and power, as well as safety. When a mountain bike does not fit the mountain biker properly, injuries are more likely.

Selecting a Helmet

A properly-fitted helmet should:

- fit level and square on the head;
- cover the front of the forehead;
- sit snug on the head, without fastening the chin strap;
- not slip when the head moves; and
- have straps adjusted to meet just below the ear and fastened tightly.

Figure 1 Proper Fit of a Helmet

Note. From *Cycling Skills: Cycling Safety for Teen and Adult Cyclists* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved October 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/cyclingskills.htm

Helmet sizes vary from extra small to extra large. It is important to try on a variety of sizes to make sure the fit is correct.

Adjusting the Helmet

A helmet will not necessarily fit without making some minor adjustments. The following are some basic adjustments that can be made to ensure the helmet will protect the mountain biker in an accident:

1. Adjust removable pads, if required, to make the fit firm and comfortable.
2. Centre the chin clip so it is just under the chin and so the strap is even on both sides. This is done by pulling the strap from one side to another through the underside of the helmet.
3. Adjust the side straps by pulling or pushing them through the sliders. The slider should sit just below the ears, forming a 'V'.
4. Use the rear adjuster (if there is one) by sliding the mechanism to make it bigger or smaller.
5. Buckle the chin clip and ensure no more than two fingers can fit under it.

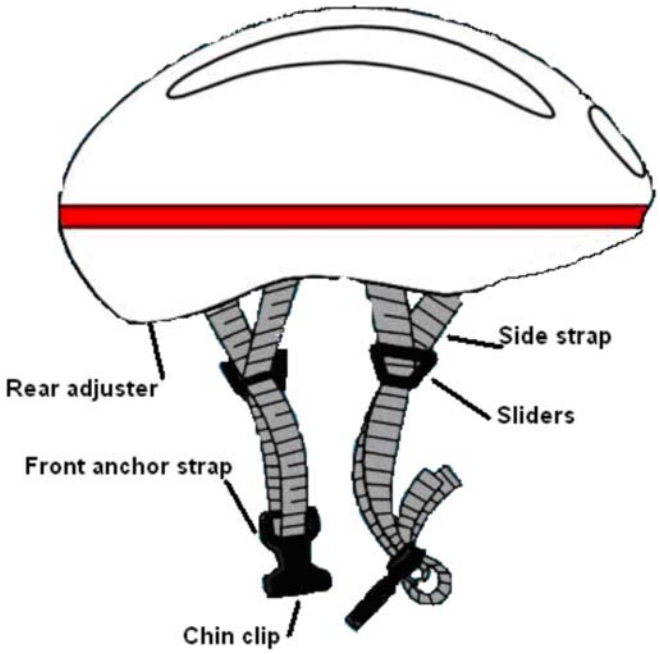

Figure 2 Parts of a Helmet

Note. From *CPSC Issues New Safety Standard for Bike Helmets* by U.S. Consumer Product Safety Commission. Retrieved October 30, 2007, from http://www.cpsc.gov/cpscpub/prerel/prhtml98/98062.html

Selecting a Mountain Bike

While some manufacturers size their mountain bikes by labelling them as small, medium, large and extra large, in most cases mountain bike size is given in inches and is based on leg length. The frame size is determined by measuring the distance from where the crank attaches to the mountain bike to the intersection of the seat tube and the top tube.

Figure 3 Sizing Measurements

Note. From *Bike Sizing Guide* by Dynamic Bicycles, 2005 , Copyright 2005 from Dynamic Bicycles, Inc. Retrieved October 31, 2007, from http://www.dynamicbicycles.com/bikes/sizing.php

The following steps should be followed when sizing a mountain bike:

1. **Size by eye.** The initial step in sizing a mountain bike is to select a mountain bike with a frame size that coincides with the height of the mountain biker.

2. **Stand-over test.** The next step is to straddle the mountain bike. There should be minimum 5-cm (2-inch) clearance between the top tube and the crotch when the mountain biker is straddling the mountain bike.

3. **Saddle adjustment.** Standing next to the mountain bike, the mountain biker will adjust the saddle height to just above their hip by opening the seat post release, raising or lowering the saddle, and closing the release. The mountain biker will then sit on the saddle, and place their left foot on the pedal with the ball of the foot over the centre of the pedal. The left leg should be almost perpendicular, without the knee locking.

COMPLETE A PRE-RIDE BIKE CHECK

Mountain biking is incredibly hard on the mountain bikes and equipment. Before the start of a ride it is important to run through a pre-ride check to ensure the mountain bike is in the best possible condition for riding. It may seem redundant to do this before every ride, especially when a post-ride check was completed; however, it only takes one broken cable or one flat tire to ruin a ride.

The ABC Quick Check is an easy way to remember what parts of the mountain bike should be checked during a pre-ride check. The check is a series of questions that the mountain biker must ask themselves, in relation to five areas of the mountain bike. The ABC Quick Check should be practiced so that it can be done quickly and efficiently. The mountain biker will correct any minor issues at the time of the pre-ride check; any major issues, or those that require a mountain bike tool, will have to be brought to the attention of the ride leader.

Air

The first step in the ABC Quick Check begins by focusing the mountain biker's attention on the wheels and tires of the mountain bike.

Do the tires have enough air?

This can be checked using a bicycle pump that has a built-in tire pressure gauge. The tire pressure for mountain bike tires should be between 35 pounds per square inch (psi) (240 kpa) and 65 psi (448 kpa).

When pumping the tires, aim to ensure the tire pressure is between 45–50 psi (310–345 kpa). This will allow for a variety of trail conditions.

Different trail conditions require different tire pressures. Harder surfaces are easier to ride with harder tires; (50–65 psi [345–448 kpa]), and conversely, softer surfaces are easier with softer tires; (35–40 psi [240–275 kpa]).

Is there any excessive wear on the tread or any cuts on the side walls of the tires?

Any loose or engrained mud or debris that is lodged in the tread should be removed. This will help eliminate the possibility of sharp objects working their way through the tire casing into the inner tube, causing a flat.

Brakes

Next the mountain biker will inspect the front and rear brakes of the mountain bike. It is important to spend time inspecting the brake levers, as well as the actual braking mechanism.

Do the brake levers work effectively?

There should be at least two finger's distance between each brake lever and the handlebar when pulled. It should require little effort to engage the brake lever. If it is hard to pull then the brake cables require adjustment.

Figure 4 Brake Lever Positioning

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved November 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

Do the brakes function as they are supposed to?

The front and rear brakes should be checked independently. The mountain biker should stand beside the mountain bike and push it forward by the handlebars. When the front brake lever is pulled, on its own, the rear wheel should lift up as the front wheel locks. When the rear brake lever is pulled, on its own, the rear wheel should lock and slide across the ground.

Chain and Crank

The chain and crank are what make the mountain bike move forward. If they are not in good working order the mountain bike will be difficult to manoeuvre and will most likely not get very far.

Is the chain on and lubricated?

The chain should be able to move freely around the front and rear sprockets when the pedals are moved with no visible signs of bends or kinks. There should be no evidence of rust on the chain. If there is, an application of lubricant should work out the rust.

Figure 5 Lubricating the Chain

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved November 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

Do the pedals spin freely?

The mountain biker should lift up the rear wheel and move the pedals with one hand to check the functionality.

Quick Release

Quick release levers are located on the front and rear wheels, as well as the seat post.

Are the wheel quick releases working?

Open and close both the front and rear tire quick release levers. They should be easy to open and close. If not, lubricant should be applied. Ensure they are fully tightened following the check and that the lever is flush with the fork of the mountain bike.

Figure 6 Quick Release Incorrect Position–Example 1

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved November 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

Figure 7 Quick Release Incorrect Position–Example 2

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved November 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

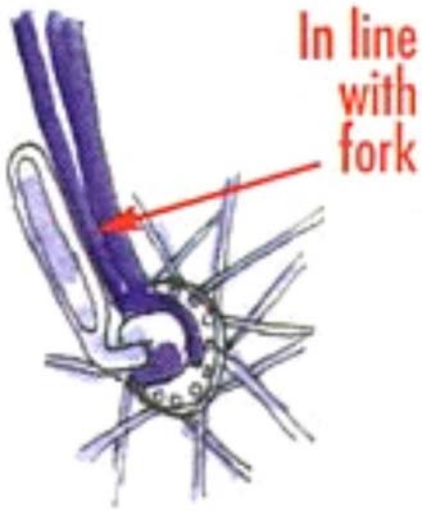

Figure 8 Quick Release Correct Position

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved November 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

Is the saddle quick release working?

Open and close the lever to ensure that it is in good working order. It should be easy to open and close. If not, lubricant should be applied. When closed the lever should be flush with the seat post, pointing towards the back of the mountain bike.

Final Check

Finally, the mountain biker should complete a final check of their mountain bike. The mountain bike should be lifted five to seven centimetres (two to three inches) off the ground and then dropped in a controlled manner. When it drops the mountain biker should be listening for sounds associated with loose parts (clings / clangs / pings).

IDENTIFY SAFETY PERCAUTIONS WHICH MUST BE ADHERED TO WHEN MOUNTAIN BIKING

Keeping safe on mountain bikes is part common sense and part informed risk-taking, together with a healthy dose of good judgment. Preventing injuries is far easier than seeking medical attention after the fact. Following basic trail and road safety rules will ensure that the ride is safe, not only for the mountain biker but for all trail users.

Investigate the specific rules and regulations associated with mountain bike safety for your province or territory to pass along to cadets in conjunction with the material presented in this TP.

Each province and territory has specific rules and regulations in relation to mountain bike safety. Bikes are the smallest vehicles on the road which makes it very important for mountain bikers to be as visible as possible to other road users at all times.

Rules of the Road

Each province has specific rules of the road which form laws within the province. In Ontario, these rules are stated in the *Highway Traffic Act* (HTA).

Some important rules that cyclists should know are:

- A mountain bike is a vehicle and as a cyclist, the same rights and responsibilities apply as to other road users.
- Stop at red lights and stop signs, and travel in the designated direction on one-way streets.
- A mountain bike is a slow vehicle and must travel as far to the right as possible, except when preparing for a left turn or passing. Ride out from the curb far enough to maintain a straight-line path.
- Never compromise safety for the convenience of a motorist; use any part of a lane if the safety of the mountain biker requires it.
- Stop for pedestrians at crosswalks, and walk the mountain bike across crosswalks.
- Stop for school buses when the upper red lights are flashing and the stop arm is out.
- Stop 2 m (6.5 feet) behind streetcar doors and wait until the passengers have boarded or reached the curb.
- Do not attach a mountain bike to a vehicle to hitch a ride.
- Do not ride on expressways, freeways or on roads where "No Bicycle" signs are posted.
- Mountain bikers must correctly identify themselves when stopped by the police for breaking traffic laws.

Signalling

When riding a mountain bike on the road it is important to ensure that drivers of motor vehicles are aware of the biker's direction of travel at all times. Making a surprise turn in front of a car is dangerous to both the mountain biker and the driver. Demonstrating proper hand signals will help to eliminate some of the risk associated with riding a mountain bike on roadways.

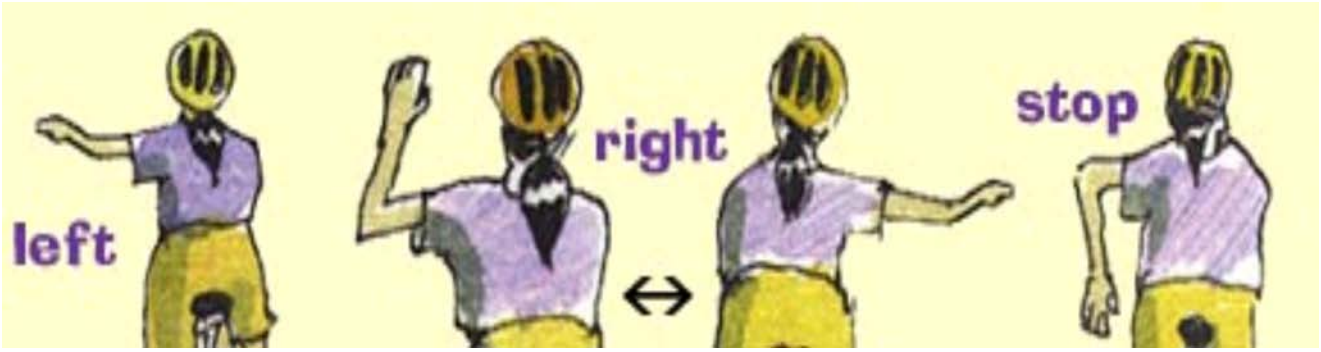

Figure 9 Hand Signals

Note. From *Young Cyclists Guide* by Ministry of Transportation Ontario, 2005, Copyright 2005 by Government of Ontario. Retrieved October 5, 2007, from http://www.mto.gov.on.ca/English/pubs/cycling/youngcyclists.htm

Riding Discipline

Whether riding a mountain bike on the side streets of town or on a double track in a conservation area, demonstrating awareness for the other mountain bikers will ensure that everyone has a safe ride. Ride discipline is a multi-faceted term that coincides with a variety of aspects of mountain biking, from personal and group organization, to stopping and starting procedures.

Riding in a group is one of the safest ways to ride. It is important to remember that each mountain biker is responsible for the person following them. Always have visual contact with the mountain biker behind. If, when looking back, the other mountain biker is not visible, stop and wait for a moment. If the mountain biker does not appear in a reasonable amount of time, call a halt to the mountain bikers ahead, and go back and look for the other mountain biker.

There are a few safety tips to keep in mind when travelling in groups:

- Ride in single file on roads and trails as much as possible.
- The lead mountain biker must communicate turns, obstacles and changes in momentum to the remainder of the group through hand signals and voice commands.
- Keep at least 1 m (3.2 feet) between mountain bikers in the group on flat ground.
- When descending hills, keep at least 3 m (9.8 feet) between mountain bikers.
- When ascending hills, stay in single file and keep to the right.
- When stopping, ensure the entire group is completely off the trail or road.
- When stopped, all group members should get off their mountain bikes, turn mountain bikes so they are facing the road, close in ranks and stand to the left of their mountain bikes.
- If travelling on roads in a large group, break into smaller groups of about 10 with at least 1 km (0.62 miles) between each group to allow traffic to pass.
- Road crossings should be completed with the group lining up parallel to the other side of the road and then, in line, walking their mountain bikes across.

PERFORM MOUNTAIN BIKE SKILLS

Braking

Braking is used not only for stopping, but for slowing down and controlling the mountain bike on roads and trails. It is important for a mountain biker to be able to judge the amount of pressure to use and when to brake for various situations while on the roads and trails. This knowledge will ensure personal safety as well as the safety of other mountain bikers and trail users.

The left-hand brake lever controls the front brake while the right-hand lever controls the rear. Most braking is completed by the right hand, rear brakes, with the left adding assistance as required.

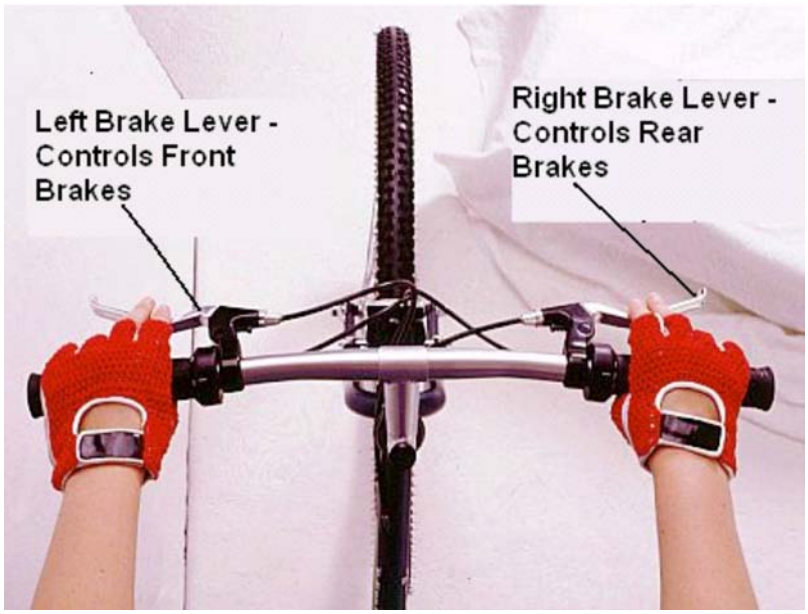

Figure 10 Braking Hand Position

Note. From *Sports, Games, Recreation, Mountain Biking* by DK Images, 2007, Copyright 2007 by DK Limited. Retrieved November 5, 2007, from http://www.dkimages.com/discover/Home/Sports-Games-Recreation/Outdoor-Adventure/Mountain-Biking/index.html

Riders should be cautioned against using the left brake lever by itself. While this will stop the mountain bike, the forward momentum may cause the mountain biker to continue over the front of the handlebars and mountain bike, resulting in a possible injury.

Shifting Gears

Terrain can change quickly when mountain biking. The ability to time a perfect gear shift is a crucial mountain bike technique to master. Smooth shifting makes the difference between a smooth, easy ride and a rough, hard ride. Gear components are equipped with pre-set gears and ramps built into the chainrings and cogs to help the chain move smoothly from one to another. The mountain biker has to shift to the correct gear at the appropriate time.

Gearing adjusts the pedalling load so the mountain biker can adapt to changes in terrain. A gear is described by the number of teeth on the sprocket that is being used.

Gear Ratio

The gear ratio is the relationship between the front chainring and the rear cassette being used. If the chainring and the cog have the same number of teeth the rear wheel would turn once for every pedal stroke and the ratio would be 1 : 1. If the chainring has more teeth than the cog, for example, 34 versus 17, then the ratio would be 2 : 1 and the rear wheel would revolve twice for every pedal stroke. There can also be negative gear ratios where the rear cog has more teeth than the smallest chainring, which makes the rear wheel turn slower than the pedal stroke.

Front Chainset

Rear Cassette

Figure 11 Front Chainset and Rear Cassette

Note. From *Sports, Games, Recreation, Mountain Biking* by DK Images, 2007, Copyright 2007 by DK Limited. Retrieved November 5, 2007, from http://www.dkimages.com/discover/Home/Sports-Games-Recreation/Outdoor-Adventure/Mountain-Biking/index.html

Typically, mountain bikes have two or three chainrings in the front and seven to nine cogs in the back. Each of these sprockets is attached to a numerical value, which corresponds to the numbers on the gear-shifting mechanism attached to the handlebars.

Chainset

The chainset is numbered one through three. The biggest chainring in the chainset—three—is located on the outside of the set while the smallest chainring in the chainset—one—is located on the inside of the set.

The biggest chainring in the chainset is used for flat terrain, high speeds, downhill and road pedalling. The middle chainring in the chainset is for most off-road situations including single track, small hills and bumpy downhills. The smallest chainring in the chainset is used for steep uphills and very difficult technical terrain.

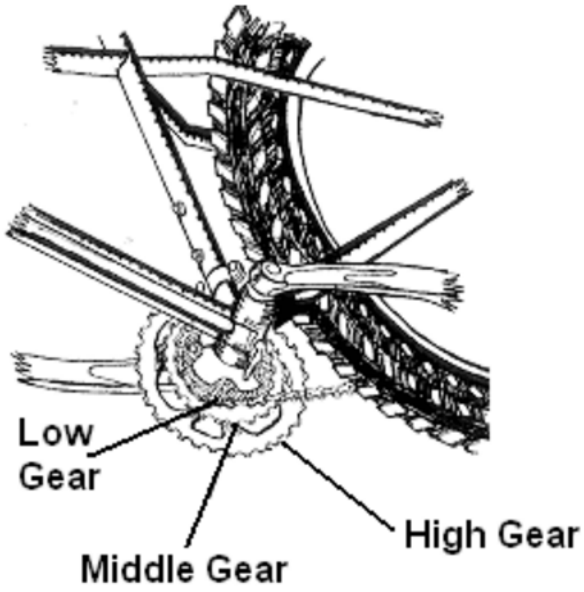

Figure 12 Front Chainset

Note. From *Your First Mountain Bike Moves: Shifting Gears* by Gorp, 2007, Copyright 2007 by Orbitz Away LLC. Retrieved November 7, 2007, from http://www.gorp.away.com/gorp/publishers/menasha/how_ride5.htm

Cassette

The cassette is numbered one through nine from the inside, closest to the frame, to the outside. The inside cogs, the larger sprockets, equal the low and easiest gears which are primarily used to climb hills and when traversing uneven terrain. The outside, smaller sprockets, equal the highest and hardest gears which are used to gain speed on flat terrain.

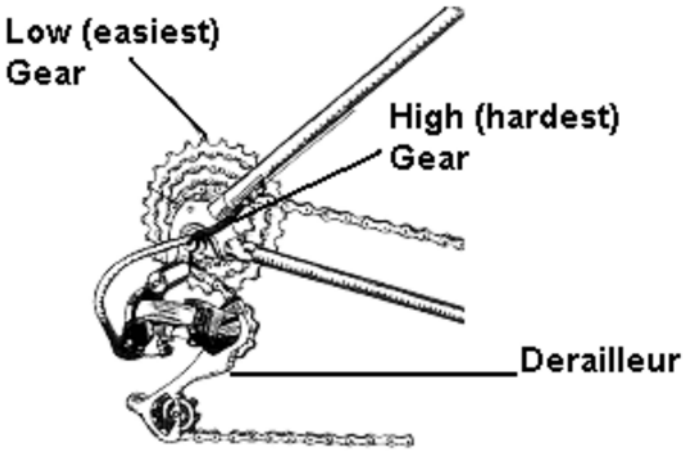

Figure 13 Rear Cassette

Note. From *Your First Mountain Bike Moves: Shifting Gears* by Gorp, 2007, Copyright 2007 by Orbitz Away LLC. Retrieved November 7, 2007, from http://www.gorp.away.com/gorp/publishers/menasha/how_ride5.htm

The mountain bike chain should never be in the big rings on the front and rear at the same time. It places an enormous amount of tension on the chain as it moves the chain from a straight to a diagonal line.

Shifting Gears

As with braking, the left gear shifter controls the chainrings on the front chainset, while the right gear shifter controls the cogs on the rear cassette. When the gear shifter is pushed, the derailleur, front or rear, will move the chain from one sprocket to another.

Figure 14 Right Gear Shifter

Note. From *Suspension Mountain Bikes* by 2 Wheel Bikes. Retrieved November 7, 2007, from http://www.2wheelbikes.com/suspension-mountainbikes/sm3000-mountain-bike.html

All mountain bike gears are indexed, which means they are pre-set and will click into place when the gear lever is activated. Most mountain bikes have a visual indicator on both sides, which shows what gear the mountain bike is in.

Pushing the gear shifter moves the chain onto a bigger chainring or cog, because the movement is against the spring tension in the derailleur. The mountain biker will have to push the lever further than the resting point so that the chain can make it onto the bigger chainring or cog. This is done with the mountain biker's thumb, because it is stronger than the index finger.

Changing to the smaller chainrings or cogs is an easier motion because the lever is releasing the spring tension, letting the derailleur fall naturally into position. These gear changes are completed using the mountain biker’s index finger to pull the lever forward.

It is possible to change more than one gear at a time. This is done through either a series of several clicks or one movement depending on the type of gear shifting mechanism the mountain bike uses.

There are several important points to remember when gearing:

- Gears cannot be changed if the pedals are not moving.
- Cogs are used for small changes in speed, like when the mountain biker is climbing a long steady hill.
- Chainrings are for bigger changes in speed, such as descending the summit of a hill.
- The ideal gear to begin biking is somewhere in the middle of the cassette, four or five, and the middle chainring.

Ascending Hills

Climbing hills is a challenge when mountain biking and the mountain bike has been specifically designed to meet this challenge. Its broad, knobby tires, the position of the mountain biker over the back wheel and the increased number of gears give the mountain bike the technical ability to ascend hills.

A mountain bike can handle inclines close to 45 degrees on badly broken ground.

Being able to ascend a hill is influenced by two factors—balance and power. Balance is gained through awareness and practice, while power is gained through repetition of the skill and muscular and cardiovascular strength.

The following are factors that affect the mountain biker's technique while attempting to ascend a hill.

Position. The centre of gravity of a mountain bike and the mountain biker is located at the mountain biker's abdomen. When climbing a hill, the centre of gravity must move forward on the mountain bike to enable the mountain biker to keep their balance. The mountain biker should pull their body weight forward on the mountain bike as the climb gets steeper, otherwise the front tire will not have enough weight on it and will lift up, resulting in a fall.

Centre of gravity is the point where all the weight of an object is concentrated.

Figure 15 Proper Ascent Position

Note. From *The Complete Mountain Bike Book* (p. 51), by T. Brink, 2007, Camden, ME: Ragged Mountain Press. Copyright 2007 by New Holland Publishers Ltd.

While it may seem easier to stand up from the saddle when climbing hills, it in fact requires more power and expends more of the mountain biker's energy. Keeping the body low and forward on the saddle is a much more effective climbing position.

Gearing and Shifting. Depending on the steepness of the hill, it is acceptable to have the front chainset on the middle chainring, index two. The rear cassette is more dependent on the grade of the hill. It is advisable, when approaching a hill to begin shifting down into a medium-intensity gear, perhaps four or five. Once the mountain biker has begun the ascent they will have to continue to lower the cogs in relation to their ability to maintain pedal power. Remember that in order to change gears, the pedals have to be moving and the more steep the incline, the harder it will be to pedal.

Descending Hills

Descending is about letting gravity do the work, while the mountain biker concentrates on braking and distributing weight. It becomes a combination of balance and applying the brakes at the correct time. Riders must always think ahead and be aware of rough terrain, corners, obstacles and other mountain bikers that may be on the trail. It is critical to apply the brakes enough to move around or by disturbances but not too much to avoid completely losing the momentum from the hill.

Position. When descending a hill it is critical that the centre of gravity of the mountain biker does not fall more than halfway down the top tube of the mountain bike. If it does, the mountain biker may go over the handlebars. The mountain biker should move their body weight toward the back of the mountain bike, be as low as possible and extend their arms so they are almost straight in front of them. Depending on the steepness of the hill, the mountain biker may want to slide their bottom off and behind the saddle for further stability.

Figure 16 Proper Descent Position

Note. From *Suspension Mountain Bikes* by 2 Wheel Bikes. Retrieved November 7, 2007, from http://www.2wheelbikes.com/suspension-mountainbikes/sm3000-mountain-bike.html

Gearing and Shifting. Gearing and shifting are not as critical when descending hills as they are in ascending hills. The key thing to remember is that descending hills provides momentum, and speed must be maintained once the hill has ended. To do this, think ahead and shift into gears that will provide the most momentum. The

front chainset should be in the biggest chainring and the rear cassette should be in the highest gear, eight. It may be necessary to shift to lower gears once the momentum from the hill begins to slow and pedalling gets harder.

Speed must be controlled when descending hills, with the mountain biker applying equal brake pressure, as required, on both the front and rear brakes. The mountain biker's hands must remain on the brake levers for the duration of the descent and should be ready to brake at all times.

DISCUSS MOUNTAIN BIKING ON INTERMEDIATE TRAILS

Mountain bike trails are classified by mountain biking organizations. The mountain biking community has been very persistent in establishing consistent criteria for the rating of all types of mountain bike trails—multi-use, single-use, double track and single track.

The International Mountain Bicycling Association (IMBA) developed a basic method to categorize the technical difficulty of recreation trails. The system was adapted from the International Trail Marking System used at ski areas throughout the world.

The IMBA Trail Difficulty Rating System has been created to:

- help trail users make informed decisions;
- encourage visitors to use trails that match their skill level;
- manage risk and minimize injuries;
- improve the outdoor experience for a wide variety of visitors; and
- aid in the planning of trails and trail systems.

Mountain bike trails, in accordance with the IMBA Trail Difficulty Rating System have been divided into three categories based on trail width, trail surface, trail grade, obstacles and technical features.

The CCM has developed its own rating system that combines similar categories of the IMBA—familiarization trails, intermediate trails and advanced trails.

Intermediate trails. Intermediate trails are defined as having some loose surface with minor obstacles such as roots and rocks with a variety of moderate hills that require skills to ascend and descend. Intermediate trails conform to the IMBA category of "More Difficult".

Part of the attraction of mountain biking on intermediate mountain bike trails is the unpredictability of terrain and the obstacles that may be encountered. The following riding considerations should be considered and implemented by the mountain biker when riding on intermediate trails:

- body position,
- speed, and
- control.

Adopt the Appropriate Body Position

A mountain biker's body position is a key factor to successfully mountain bike on intermediate trails. In most cases, body position is dependent on the successful manipulation of the mountain biker's centre of gravity in relation to the type of terrain being ridden on and the obstacles that are being crossed.

Centre of gravity. The point where all the weight of an object is concentrated. The centre of gravity of a bike and the rider is located at the rider's abdomen.

Have the cadets stand with their feet shoulder width apart, locate their navel (belly button) and lean over like they are riding a mountain bike. Have them move from side to side and front to back in the riding position to see how their balance changes as their centre of gravity shifts locations. They may need a partner for this activity.

Adopting the correct position when mountain biking can mean the difference between getting over an obstacle and falling off the mountain bike. Mountain bikers use a standard 'attack' or 'ready' position when mountain biking and adjust it as required depending on the terrain / obstacle being crossed. The attack or ready position is:

- elbows bent and out,
- head up,
- chin low,
- centre of gravity low, and
- seat hovering over the saddle.

Regulate Speed

To successfully traverse the obstacles and varied terrain found on intermediate trails a mountain biker must be able to understand and effectively regulate their speed. Momentum is an ally—without it, riding over rocks / logs / roots / mud would be virtually impossible. Many new mountain bikers, who have low levels of confidence and skill, will slow down as they approach an obstacle—this is due to fear—however, if they keep their speed constant or even a bit faster, they would be able to tackle the obstacle successfully. Speed is controlled by efficient braking and gearing. These two skills are developed through practice and experience.

Braking. Understanding the finer nuances of how the brakes—front and rear—work when engaged together is an important facet of riding on intermediate mountain bike trails.

Gearing. Gearing is a skill that is driven by each individual mountain biker, depending on skill, physical ability and strength. Knowing personal gear efficiencies is critical when traversing over obstacles and varied terrain.

Maintain Control

To ensure safety when mountain biking on intermediate trails, a mountain biker must always be in complete control. Control is maintained by:

- being aware of centre of gravity and adjusting body position accordingly;
- keeping a loose but firm grip of the handle bars; and
- keeping the head up—looking ahead to where the mountain biker wants to go.

Looking up and ahead is one of the hardest skills for mountain bikers to master. At first it feels unnatural, however, looking ahead and not at the ground or object that is being ridden over will ensure success.

TERRAIN AND OBSTACLES THAT MAY BE ENCOUNTERED ON INTERMEDIATE TRAILS

Mountain bikers must be aware of the different types of terrain and obstacles they may encounter when riding on intermediate trails because this will ensure they are well prepared to execute the appropriate mountain bike skill in order to ride over / cross that section of terrain or obstacle.

Terrain

The *Canadian Oxford Dictionary* defines terrain as ground or a track of land, focusing on its physical characteristics and / or its capacity for use.

The following is a list of the different types of terrain a mountain biker may encounter and be required to travel over when mountain biking on intermediate trails:

- grass,
- mud,
- sand,

As soon as sand becomes more than a couple of centimetres (inches) deep, mountain biking feels like riding in molasses.

- water, and
- gravel.

One of the hardest surfaces to ride a mountain bike across is a grassy meadow without a marked trail. River and stream crossings can be dangerous depending on their depth and should only be crossed at the shallowest point. When crossing, push the mountain bike rather than ride it.

Obstacles

The *Canadian Oxford Dictionary* defines an obstacle as a person or thing that obstructs progress.

The following is a list of the different obstacles a mountain biker may encounter and be required to travel over when mountain biking on intermediate trails:

- rocks,
- roots,
- logs,
- ruts,
- crevices, and
- potholes.

Dry rocks present few difficulties for mountain bikers—they require skill in order to tackle them effectively without losing momentum—but moss and rain make riding a very unpredictable experience. Wet or mossy rocks remove traction and can turn a wheel in the opposite direction from where the mountain biker intended. Roots are slippery when dry and dangerous when wet.

MOUNTAIN BIKE ON DIFFERENT TYPES OF TERRAIN

Part of the attraction of mountain biking on off-road trails is the unpredictability that these types of trails offer. A good mountain bike trail will combine a variety of different types of terrain—grass, mud, sand, water and gravel—that will challenge the mountain biker from start to finish. Many mountain bikers hate to be unseated from their mountain bike and hate to walk their mountain bikes. Knowing the intricacies for mountain biking over different types of terrain will limit the occurrences of such events.

Grass

Grass is a constantly changing surface that a mountain bike will react differently to depending on if it is new, worn, dry or wet. A mountain biker will have to adapt their riding technique to suit the conditions. On short, dry grass a mountain bike's tires can grip well and the mountain biker will have little difficulty controlling their mountain bike. However, tire grip will be affected as grass becomes worn and / or wet.

Mountain biking on worn or wet grass is difficult, as the tires' ability to grip the ground is diminished. The following considerations should be taken into account:

- stay in the saddle when ascending hills;
- select a medium to low gear to prevent wheel spin;
- brake lightly; and
- be aware of ruts as they will be slippery and may contain water and holes that cannot be seen.

Mud

Mud is a type of terrain that mountain bikers look forward to and dread at the same time. Compared to dry trails, mud is harder to mountain bike on / through and requires strong mountain bike skills in order to make the ride more manageable, quicker and enjoyable. Mountain bike tires have significantly less grip / traction when going through mud than when on dry trails. Mud slows down the mountain bikers' speed and momentum and clogs up the gears and brakes.

The following considerations should be kept in mind when mountain biking in mud:

- If possible release some air from the tire; this will provide a larger surface area to grip with.
- Keep all actions as smooth as possible.
- Stay seated in the saddle.
- Move the centre of gravity towards the middle of the mountain bike (over the bottom bracket).
- Shift into a low gear (eg, 1 : 4, 1 : 6, 2 : 3, 2 : 4).

Bottom bracket. The bottom bracket is the axel bearing around which the pedals and cranks turn to move the chain.

Sand

Sand is an extremely difficult surface to mountain bike on. Sand is common in coastal areas, but can also be found on inland trails. In dry weather, sand can be found on eroded and well-used trails. Sand is a very loose substance and as such provides nothing for the tires to dig into and severely limits traction, affecting momentum. Mountain bikers must ensure they do not sink in the sand or lose speed in order to make it through the section.

The following considerations should be kept in mind when mountain biking on sand:

- When approaching a section of the trail with sand, look for and follow an already established path.
- Approach the sand with a significant amount of speed.
- Keep the weight off the front wheel by moving the centre of gravity towards the middle of the mountain bike (over the bottom bracket).
- Shift into a medium gear (eg, 1 : 6, 2 : 4, 2 : 5).
- Pedal as smoothly as possible to stop the wheels from spinning.
- Keep the handlebars as straight as possible, using the shoulders and upper body to guide the mountain bike rather than steering it.

Water

There is always a chance that a mountain biker will have to cross some type of water on the trail. Water can be anything from a large puddle to a small creek or stream to a large river. When mountain biking over large rocks covered in water, it is best to aim directly for the stream of water as this will be the cleanest, least slippery section.

The following considerations should be kept in mind when mountain biking through water:

- Approach the water at a medium to high speed to ensure momentum is maintained throughout the crossing.
- Be aware that under the water could be loose and slippery.
- Keep a loose but firm grip on the handlebars—executing smooth controlled movements.
- Move the centre of gravity toward the middle of the mountain bike (over the bottom bracket).
- If the depth of the water is unclear get off the mountain bike and push / carry the mountain bike.

Figure 17 Mountain Biking Through Water

Note. From *Sports, Games, Recreation, Mountain Biking* by DK Images, 2008, Copyright 2008 by DK Limited. Retrieved November 20, 2008, from http://www.dkimages.com/discover/Home/Sports-Games-Recreation/Outdoor-Adventure/Mountain-Biking/index.html

In some cases, tackling difficult terrain is easier on foot than on the mountain bike. A mountain biker needs to be aware that this is a possibility and make the decision based on their own skill level and the type of terrain that they are crossing.

The following process should be used to shoulder carry a mountain bike:

1. Stand beside the mountain bike.
2. Keep the mountain bike steady by putting the left (right) hand on the handlebars.
3. Bend at the knees and crouch to put the right (left) arm through the frame.
4. Stand up, with the top tube resting on the right (left) shoulder.
5. Keep the mountain bike steady by holding either the stem or the handlebars.
6. Use the opposite arm as a counterweight to balance while walking or running.

Gravel

Gravel is generally an unpredictable surface to mountain bike on. It usually forms in patches and it is very hard to see and / or determine its depth. The best way to tackle gravel is to avoid it—available alternatives should be taken.

On well-used trails, gravel usually gets pushed to the outside portion of the trail. This allows the mountain biker to avoid the gravel as long as they stay to the middle of the trails.

If a mountain biker must ride through gravel, it is important that they keep movements and actions smooth and controlled—sudden changes in direction and hard braking can cause the wheels to slip and the mountain biker to crash.

PERFORM ADVANCED MOUNTAIN BIKE SKILLS

Falling Off a Mountain Bike

There is a right and wrong way to fall off a mountain bike. When a person falls their natural instinct is to stick out their arm and try to break the fall. This method does not work and usually causes injury to one or more of the following: thumb, finger, hand, arm, and / or collar bone.

To fall correctly, execute a shoulder roll by:

1. pushing the mountain bike away from the body;
2. tucking the arms and head in towards the chest;
3. hitting the ground with the shoulder first; and
4. rolling over.

Log Hops

The most useful skill a mountain biker can have is getting air—being able to lift the wheels off the ground either one or both at a time. Momentum is one of the main reasons a mountain biker would want to lift their front wheel off the ground. Any time the front wheel of the mountain bike hits an obstacle while on the trail, momentum will be lost which will slow down speed.

Many beginner mountain bikers will attempt to lift the front wheel by simply yanking up with their arms. While this method does work, it is not highly effective as the front wheel will only lift marginally off the ground as there is only a small range of motion before the mountain bikers hands hit their chest.

The process to complete a log hop is as follows:

1. Adopt the attack position.
2. Shift the mountain bike into a medium gear (eg, 2 : 5 or 2 : 6).
3. Pedal toward the obstacle at a medium speed and at a right angle.

It is sometimes difficult for a mountain biker to judge when they should begin to execute a skill such as a log hop. A good rule of thumb is to begin the skill at a distance equal to the obstacles height. For example, if the obstacle is 15 cm (6 inches) high then, the mountain biker should begin to execute the skill approximately 15 cm (6 inches) from the obstacle.

4. Adjust body position, approximately one metre (one yard) away from the obstacle by:
   a. stopping pedalling;
   b. moving the pedals so they are horizontal;

Pedals are horizontal when they are in the 3 o'clock and 9 o'clock position.

c. sitting down on the saddle; and

d. shifting the body weight toward the rear of the mountain bike.

5. Lift the front wheel just before reaching the obstacle by:

a. pedalling one half turn;

b. compressing the body toward the ground by pushing down on the front fork and front tire;

c. pushing the hips backwards to shift the centre of gravity;

d. straightening up and pulling up on the handle bars in one fluid motion, while squeezing the saddle with the inner thighs; and

e. moving the weight toward the rear wheel to lift up the front wheel.

Step 5 should happen almost simultaneously. Correct timing is critical when attempting to execute a log hop.

6. Place the front wheel on the obstacle.

7. Stand up on the pedals and move the body weight over the handlebars to transfer the centre of gravity from the rear of the mountain bike to the front.

8. Push forward on the handlebars and allow momentum and pedalling action to roll the mountain bike over the obstacle.

9. Move the body weight toward the rear of the mountain bike as soon as the front wheel hits the ground.

10. Allow the back wheel to roll off the obstacle.

11. Continue mountain biking forward.

Figure 18 Log Hop

Note. From *Sports, Games, Recreation, Mountain Biking* by DK Images, 2008, Copyright 2008 by DK Limited. Retrieved November 20, 2007, from http://www.dkimages.com/discover/Home/Sports-Games-Recreation/Outdoor-Adventure/Mountain-Biking/index.html

Cornering

Cornering is a skill that all mountain bikers will be required to execute on a trail. Mountain bikers will turn corners when riding over grass, on loose gravel, in ruts, on steep downhills or during sharp ascents. Wherever the corner is, it is important to steer the bike around the corner safely and without losing their momentum.

There are three essential elements associated with cornering:

- plotting a line;
- controlling the speed; and
- looking ahead.

A corner can be divided into three main parts:

- entry,
- apex, and
- exit.

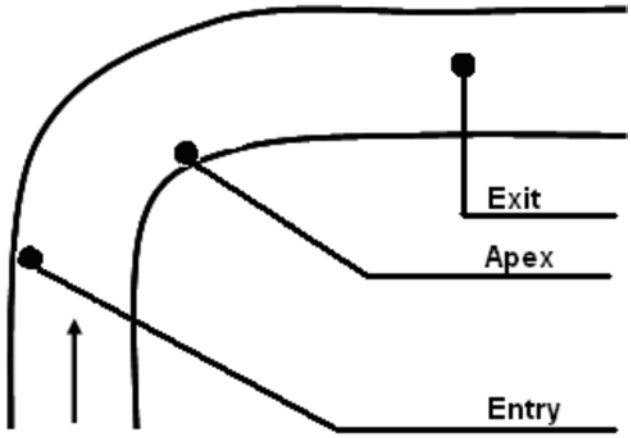

Figure 19 Parts of a Corner

Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Types of corners:

Bermed corner. A bermed corner is also known as a banked corner. The outer perimeter of the corner may be raised too steeply.

Off-camber corner. An off-camber corner is the opposite of a bermed corner. The top of the slope is on the inside and slopes down to the outside of the curve.

Flat turn. A flat turn is the most common type of corner. There are no raised embankments on either side of the corner.

Decreasing radius corner. A decreasing radius corner gets narrower and tighter as it turns. Usually this type of corner is also off-camber.

Increasing radius corner. An increasing radius corner gets wider as it turns.

Plotting a Line

The standard approach to plotting a line is:

1. Approach the corner on the outside.
2. Shift to the inside at the apex of the corner.
3. Move to the outside to exit the corner.

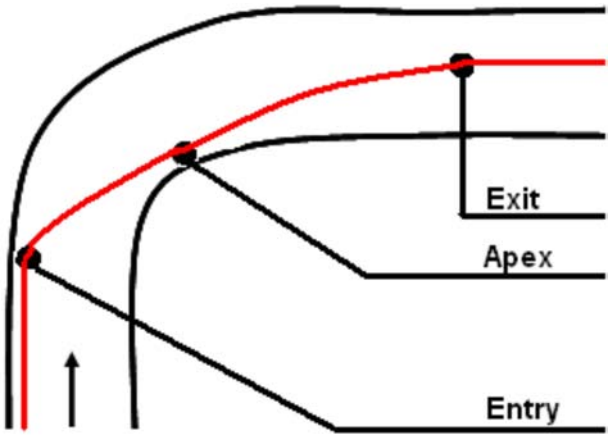

Figure 20 Plotting a Line

Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Controlling Speed

When cornering, all the braking should be completed before starting to turn. This is done because it allows the mountain biker to concentrate on exiting the corner. Braking in a straight line is far safer than braking on a corner—a locked rear brake in a corner will slide unpredictably possibly causing a crash.

It is recommended to use the front brakes as much as possible when cornering. It offers more power and control as the mountain biker's weight shifts forward during the turn.

Looking Ahead

It is in people's nature to want to look at the obstacle that they are attempting to steer around and try to avoid it. However, when cornering, the mountain biker should look ahead to where the mountain bike is going and ignore the obstacle. This will allow the mountain biker to look further into the corner and allow their mountain bike to follow the line that has already been established.

Use the following process when cornering:

1. Prepare for the corner by:
    a. plotting the line;
    b. engaging the front brakes to slow the mountain bike down; and
    c. shifting into the appropriate gear for the exit, in order to ensure speed is maintained.
2. Execute the corner by:
    a. keeping the fingers over the brake levers, applying them as necessary;
    b. balancing the body between the handlebars and the saddle;
    c. moving the inside pedal to the 12 o'clock position;
    d. pushing the weight of the body onto the outside leg;
    e. bending the inside elbow to pull the body weight forward and inward;

f. bending the inside knee; and

g. pressing down on the straight outside leg.

3. Pedal once the corner has been turned.

Figure 21 Body Position When Cornering

Note. From *Sports, Games, Recreation, Mountain Biking* by DK Images, 2008, Copyright 2008 by DK Limited. Retrieved November 20, 2008, from http://www.dkimages.com/discover/Home/Sports-Games-Recreation/Outdoor-Adventure/Mountain-Biking/index.html

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ACTIVITY

Time: 270 min

OBJECTIVE

The objective of this activity is to have the cadets, in teams of no more than six, mountain bike on familiarization / intermediate trails, for 40–50 km, during an expedition.

RESOURCES

- Fully equipped mountain bike (one per cadet),
- Personal mountain bike equipment (one per cadet), and
- Group mountain bike equipment (one per team).

ACTIVITY LAYOUT

Designate a familiarization / intermediate mountain bike trail(s), IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*.

ACTIVITY INSTRUCTIONS

1. Conduct a briefing to include an explanation of:
    a. the objectives and importance of the activity,
    b. the resources that may be required to perform the activity, and
    c. any safety guidelines that must be followed while performing the activity.
2. Have the cadets retrieve their mountain bikes and helmets.
3. Have the cadets conduct a pre-ride bike check.
4. Explain and demonstrate the following advanced mountain bike skills, to include:
    a. log hops, and
    b. cornering.
5. Have the cadets, in teams of no more than six, ride a mountain bike on familiarization / intermediate trails, following the designated route for a distance of 40–50 km during an expedition, to practice:
    a. following road / trail safety regulations;
    b. braking;
    c. shifting gears;
    d. ascending hills;
    e. descending hills;
    f. log hops; and
    g. cornering.
6. Upon arrival at the end point, have the cadets complete a post-ride check and then store / return all equipment.
7. Conduct a debriefing by asking the cadets:
    a. how they felt about the activity;
    b. how they felt their team worked together;
    c. what portion of the activity challenged them the most;
    d. how their teammates assisted them when they were challenged;
    e. if there are any specific examples of when their team bonded;
    f. how the team made decisions;
    g. whether or not all team members ideas / suggestions were considered; and
    h. what they would do as a leader of this type of activity to ensure their subordinates enjoyed the experience.

SAFETY

- Each team will be led by the assigned team leader.
- Team Instructor(s) [TIs] must be in sight / sound of the team at all times.
- In areas of complex / technical terrain TI(s) will demonstrate requisite skills as required.
- Teams will travel separately on the same trail.
- There will be a minimum of 500 m between teams at all times.
- Each team will have a cadet positioned at the rear wearing a reflective vest.
- Cadets must travel in single file at all times.
- Cadets must ensure there are at least two mountain bike lengths between them and the person to their front and rear.
- Cadets must carry at least 1 L of water.
- Water re-supply points will be located along the route.
- Meals will be provided at a pre-determined location(s) and detailed in the route instructions.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in riding a mountain bike 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

Nil.

METHOD OF EVALUATION

This lesson is assessed IAW A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, Chapter 3, Annex B, 426 PC.

CLOSING STATEMENT

Mountain biking is a fun and challenging mode of transport that can be used during expeditions. It is critical to understand the importance of maintaining a mountain bike and riding it safely. Being able to perform mountain bike skills will allow for an enjoyable and safe experience when mountain biking.

INSTRUCTOR NOTES / REMARKS

Expedition centres are required to select two dynamic modes of travel from EO M426.02a (Paddle a Canoe), EO M426.02b (Ride a Mountain Bike), EO M426.02c (Hike Along a Route), EO M426.02d (Snowshoe Along a Route) and EO M426.02e (Ski Along a Route) to incorporate into the expedition training.

This EO has been allocated nine periods in the overall course period allocation. Each expedition centre may adjust this allocation to reflect the choice of activities, facilities and available resources at the expedition centre.

Upon arrival at the expedition centre, cadets will be divided into teams. Cadets will be given an opportunity to navigate and lead peers. These teams will remain the same for the duration of the weekend.

IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*:

1. a fully equipped mountain bike is described as having the following:
    a. bell or horn,
    b. lights, and
    c. reflectors;
2. the following personal mountain bike equipment is required when riding a mountain bike:
    a. helmet,
    b. water carrier,
    c. day pack, and
    d. whistle; and
3. the following group mountain bike equipment is required when riding a mountain bike:
    a. reflective vest (worn by person in rear of group),
    b. topographical / trail map of area as required,
    c. compass,
    d. first aid kit,
    e. communication device (eg, cellular phone or hand-held radio),
    f. GPS receiver, and
    g. mountain bike repair kit, to include:
        (1) spare tube,
        (2) tube patch kit,
        (3) tire levers,
        (4) bike multi-tool, to include:
            (a) 2-, 2.5-, 3-, 4-, 5-, 6- and 8-mm hex keys,
            (b) chain tool,
            (c) flat screwdriver,
            (d) Phillips screwdriver,

(e) T-25 Torx spoke key,

(f) spoke wrenches, and

(g) 8- and 10-mm open wrenches; and

h. mini pump with gauge.

Ensure each cadet has a day pack and an ample supply of water when mountain biking.

A mountain bike cleaning kit is comprised of the following items:

1. bucket,
2. hand brush,
3. cleaning cloth,
4. sponge,
5. small brush,
6. stiff brush,
7. dish soap, and
8. lubricant.

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ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 4

EO M426.02c – HIKE ALONG A ROUTE

Total Time: 270 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Every cadet must have a water carrier prior to the start of this lesson.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

The experiential approach was chosen for this activity as it allows the cadet to acquire new knowledge and skills through a direct experience. The cadet experiences hiking on Class 3 terrain during an expedition and defines that experience on a personal level. The cadet will be given the opportunity to reflect on and examine what they saw, felt and thought while hiking and consider how it relates to what they already learned and experienced as well as how it will relate to future experiences.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have hiked 10–15 km along a route with some Class 3 terrain , during an expedition.

IMPORTANCE

It is important for cadets to be able to hike along a route that contains Class 3 terrain so they will be prepared for the technical challenges if / when given the opportunity to participate in more advanced level expeditions. Hiking is not just about walking along a trail or predetermined route; it requires the individual to be aware of their surroundings, their limitations and the limitations of the group they are travelling with. Knowing what to do when an obstacle is on the route is critical for everyone's safety. As well, having a basic knowledge and understanding of techniques such as the "rest step" will make the hike more enjoyable for all members.

Teaching Point 1 **Participate in hiking familiarization.**

Time: 270 min Method: Experiential Learning

BACKGROUND KNOWLEDGE

The TP for this lesson will be presented during hiking familiarization training. Some material may be presented prior to departure, with the remainder being incorporated into teachable moments and breaks throughout the route. Cadets will have been introduced to many of the theoretical concepts; this activity will provide them the opportunity to put into practice what they have already learned.

THE DIFFERENCE BETWEEN HIKING, TREKKING AND BACKPACKING

Hiking is an activity of vigorous walking in the outdoors / wilderness on an unpaved trail, either on a path or navigating along an unmarked route. Usually day hikes consist of travelling cross-country over different terrains, sometimes with inclines and declines. It provides individuals the opportunity to travel to destinations that could not, in many cases, be seen any other way.

The aim of hiking is to learn skills beneficial to physical health. It offers an alternative learning environment and allows participants to explore the outdoor surroundings. For individuals who have never participated in hiking activities, it can be quite challenging. However, it can also offer a challenge to experienced hikers by varying the location / terrain of the hikes.

Trekking is a journey over long distances over several challenging days. Usually trekking involves terrain that requires crossing obstacles.

Hiking becomes backpacking when equipment is carried for an overnight stay.

PERSONAL CLOTHING AND EQUIPMENT FOR HIKING

Clothing

Clothing for the outdoors is slightly different than everyday clothing, yet everyone has clothing at home they can wear outside. When choosing clothing for outdoors, consider clothing that:

- is in good repair,
- breathes: perspiration must be able to escape the body and evaporate (depending on exertion, the body will warm up and become damp, even sweaty),
- is appropriate for the weather conditions and the activity,
- is made of materials that dry easily,
- offers wind and rain protection resistance,
- insulated and padded,
- flexible without drag,
- can be layered as necessary, and
- is comfortable.

Footwear

The most important factor to consider when selecting hiking footwear is fit. The footwear should be sufficiently sturdy to hold together throughout a trip. It should provide protection for the feet, and a firm foundation for walking and scrambling. Today, boots are derived from athletic shoe technology. They are light, comfortable and functional. Common characteristics to look for when selecting a hiking boot are:

Sturdy. The boot should support feet and ankles from twisting on uneven surfaces. Higher boots with stiff ankle support provide lateral rigidity. The boot should also support the foot from overextending when placing too much weight on the toe or heel.

Lightweight. The lighter the boots the easier walking will be. Every extra pound of footwear weight can be compared to five pounds of added backpack weight.

Comfortable fit. When worn, boots shall fit snugly with the heel snug against the wall of the shoe and a small amount of space for the toes to move.

Correct size. Proper fitting boots ensure comfort during hiking. A boot fits correctly when:

- it is wide enough so the boot matches the width of the foot with little extra room,
- the tongue rests comfortably along the top of the toe, and
- the toes have room to wiggle.

Socks

The boot is only part of the footwear system; socks are the first line of defence for the feet. A two-sock system is common in many activities. Unless hiking regularly in hot, damp conditions, consider wearing one pair of heavy socks and one pair of light, inner socks. Always ensure socks are properly sized for the foot.

Inner socks. This is a thin layer that helps wick, or pull moisture away, from the foot. They are usually made of a polypropylene material.

Outer socks. This layer is most often made of wool or a wool blend, which can absorb moisture. This layer cushions the foot and provides insulation.

Pack

There are many devices made to assist in carrying loads on a hike. For day trips, use a small pack which can comfortably hold all required items. In the winter, there may be a requirement for extra capacity.

Fanny pack. The pack for short hikes or treks up to a few hours is a fanny pack. This pack is a small, unobtrusive pack that sits atop the buttocks, with a thin belt that clips around the waist. These are also known as waist, or lumbar, packs. The simplest of these packs consists of a pouch sewn to a piece of flat webbing. More elaborate fanny packs can hold upwards of 10 L, and have padded belts and suspensions. The fanny pack is lightweight, and holds the load close to the spine and a person’s centre of balance. Items carried in a fanny pack should be limited to 4.5 kg (10 lbs).

Figure 1 Fanny Pack

Note. From ABC-of-Hiking, 2007, *Shop Backpacks*, Copyright 2007 by Max Lifestyle.net "Go Hiking Like Max". Retrieved April 19, 2007, from http://www.abc-of-hiking/shopitems/backpacks/prowler5-backpacks.asp

Day pack. Day packs are produced in numerous model types; however, all have shoulder straps and a waist belt. Most day packs have pockets for organizing equipment and basic exterior features (eg, axe loops and daisy chains).

Important qualities of a good day pack include:

- back padding to protect shoulder blades,
- firmly padded shoulder straps,
- adjustment straps for placing weight between shoulders and hips,
- an internal frame (more durable and comfortable to wear),
- padded hip belt; four inches wide around hips and two inches at the buckle, and
- 35–40 L in volume (roughly 9–13 kg [20–30 lbs]).

Figure 2 Day Pack

Note. From ABC-of-Hiking, 2007, *Shop Backpacks*, Copyright 2007 by Max Lifestyle.net "Go Hiking like Max". Retrieved April 17, 2007, from http://www.abc-of-hiking/shopitems/backpacks/team-backpacks.asp

Ten Essential Items

Water carrier. One indispensable item in any wilderness traveller's kit is a water carrier. Carrying water during a hike requires a lightweight water bottle with a tight lid that is easily refillable. Versatile equipment benefits the user. When choosing a bottle it is advisable to choose one that can withstand the temperatures of frozen or hot liquids.

Wide mouth bottles are a practical choice as many water filters are built to twist directly onto the opening of the bottle. This simplifies the water filtering process.

Hydration bags are an excellent water carrying device which allows the user to easily carry between 1 L and 4 L of water at a time. They are built into a pack and consist of a lightweight plastic bladder and a drinking tube that passes over the shoulder of the user and allows for easy hydration while hiking.

Figure 3 Wide Mouth Water Bottle

Note. From "Mountain Equipment Coop", Copyright 2007 by Mountain Equipment Coop. Retrieved March 28, 2007, from http://www.mec.ca/Products/product_detail.jsp?PRODUCT%3C%3Eprd_id=845524442500177&FOLDER%3C%3Efolder_id=2534374302696609&bmUID=1177425692300

Figure 4 Hydration Bag

Note. From "Bionic Sports", Copyright 2007 by Bionic Sports. Retrieved November 16, 2007, from http://www.bionicsports.com/acatalog/Hydration.html

Pocket knife. A knife or multi-purpose tool is essential for repairing equipment and cutting rope, cord or bandages. The key is to find a knife or tool that is small but has all the attachments—blade, scissors, screwdriver—that may be required while out on a hike.

Extra food. It is always advisable to bring extra food on a hike. Snacks such as granola bars, GORP (good old raisins and peanuts), chocolate bars, and dried fruit will provide the hiker with an energy boost. In an emergency situation they may increase chances of survival.

Extra clothing. Extra clothing includes an additional layer of warm clothing and a rain coat. A light down vest, sweater, or fleece jacket will provide insulation should the weather be cooler than expected, and during breaks

when sweat evaporates and the body cools. Just because the sun is shining at the start of a hike does not mean it will be shining at the end. Rain coats may also be used in building a shelter in an emergency situation.

Sunscreen. Sunscreen blocks or prevents the skin's exposure to the sun or ultraviolet light. The skin will burn when the amount of exposure to the sun, or ultraviolet light source, exceeds the ability of the body's protective pigment to protect the skin. According to the *Canadian Dermatology Association* a minimum of SPF 15 with UV-A and UV-B protection should be worn.

Sunglasses. Hikers should always wear sunglasses to protect their eyes against damage from the sun's light (eg, ultraviolet, bright or intense light, and blue light). This is especially important in the winter, as snow blindness is a prevalent injury.

Hat. A wide brimmed hat will protect the back of the neck, ears, and face from burning. A toque in the winter will keep the hiker's ears warm and stop the escape of heat from the head.

Insect repellent. Annoying mosquitoes and black flies can have a negative impact on a hike. Wear loose fitting clothing with closed cuffs and apply insect repellent to ward off unwanted insects. The repellent should be applied to the exposed areas of the body. Many insect repellents rely on chemicals such as DEET to repel insects and have long durations per application.

Headlamp. A headlamp is simply a flashlight that has been attached to an adjustable strap that fits around the user's head. It is beneficial on a hike as it frees up the user's hands to complete tasks when light is low or it is dark.

Figure 5 Headlamp

Note. From "Mountain Equipment Coop", Copyright 2007 by Mountain Equipment Coop. Retrieved November 16, 2007, from http://www.mec.ca/Products/product_detail.jsp?PRODUCT%3C%3Eprd_id=845524442621000&FOLDER%3C%3Efolder_id=2534374302697057&bmUID=1195238790425

Survival kit. Having a survival kit is a must during any wilderness hiking trip. It should include water purification tablets, a light source, waterproof matches, a signalling device and first aid materials.

Notebook and pencil. Having a notebook and pencil will allow hikers to keep a log throughout the hike. Collecting information such as route details, trail condition, trail difficulty, and general observations will provide the individual with beneficial material when planning other hikes. It will also provide a record of the experience.

TERRAIN

Terrain is the physical characteristics of the ground, whether it is a flat, straight trail or an ice-peaked mountain. There are different types of terrain that one can expect to encounter on a route.

IAW with A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*, the CCM uses the Yosemite Decimal System (YDS) to rate trail difficulty levels. YDS has a scale from 1–5 and it rates the hardest / most technical section on a terrain / route. It also provides ratings for travel over flat terrain.

Class 1. Hiking, usually on a trail.

Class 2. Simple scrambling, crossing obstacles with the occasional use of hands, requires route-finding skills, may be backcountry dense bush.

Class 3. Angle is steep enough that hands are required for balance; scrambling on rocks using hands and feet, a rope might be carried.

Class 4. Simple climbing, often with exposure requiring a rope belay. A fall could be serious or fatal. Natural protection can usually be easily found.

Class 5. Technical rock climbing begins. Climbing involves the use of ropes, belays, and the placement of natural or artificial protection for the leader in case of a fall. An open-ended decimal extension to Class 5 exists for rating climbs within this category.

Types of Terrain

Easy terrain. Terrain is flat and footing is secure. Forest roads, trails following streams and rolling hills are generally easy walking.

Moderate terrain. Terrain with a trail that is mostly solid under foot with either one fairly steep hill or a series of small hills or forest floors with light underbrush.

Difficult terrain. Any terrain in which a person ascends or descends over 150 m in 1 km. It can also consist of patches of dense forests, thick vegetation and rocky trails / root covered trails.

Rates of travel will differ, depending on the group, equipment, terrain, elevation above ground, etc. Generally:

- On easy terrain with a pack, a group can be expected to travel 3–5 km / h.
- On difficult terrain with a pack, a group can be expected to travel 1.5–3 km / h.
- In difficult terrain, the rate of travel can drop to a third or even a quarter of what it would be on easy terrain.
- When above 3000 m, the rate of travel will greatly decrease. On average, a person will travel 1 km / h less for every 1000 m gained in elevation.
- When descending on easy terrain, the rate can be up to twice the speed of the ascent.

USING TREKKING POLES WHILE HIKING

Types of Poles and Sticks

There are three types of trekking poles—ski poles, wooden walking sticks and telescoping trekking poles. Depending on the activity, the choice of pole will be different.

Trekking poles provide better balance and reduce the amount of stress on the knees, shoulders and back. They absorb some of the impact the body would otherwise absorb. The poles, rather than the body, absorb shock, reduce arm and leg fatigue and improve endurance.

Ski poles and walking sticks may be used for long walks and easy treks on fairly level surfaces. The walking stick may be an acceptable choice for moderate treks. Telescoping trekking poles are the most versatile choice. They work well for hiking and trekking on rough terrain.

Figure 6 Ski Pole

Note. From Black Diamond, 2005, *Gear*, Copyright 2006 by Black Diamond Equipment Ltd. Retrieved April 12, 2007, from http://www.bdel.com/gear/fixed_length_ski.php

Figure 7 Telescoping Trekking Pole

Note. From Wintergoodies.com, 2007, *Hiking, Trekking & Walking Pole Adjustable*, Copyright 2007 by Wintergoodies.com. Retrieved April 12, 2007, from http://www.winterbrookgoodies.com/pd_swissgear_hiking_trekking_walking_pole.cfm

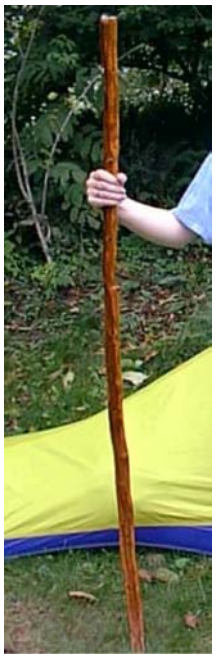

Figure 8 Wooden Walking Stick

Note. From The Walking Stick, 2005, *Hiking Poles & Walking Sticks & Staffs*, Copyright 2005 by The Walking Stick. Retrieved April 12, 2007, from http://www.backpacking.net/walkstik.html

Criteria for Choosing Trekking Poles

To find the right trekking poles or walking stick, one needs to consider the type of activities for which they will be used, the type of terrain and the weight one will carry.

Aluminum telescoping poles are the best option. They are affordable and will last longer.

Telescopic adjustment. Poles with telescopic adjustment may be adjusted to be longer or shorter depending on the type of terrain. Multiple people can use the same set of poles by adjusting the length. The poles are easy to store when not in use.

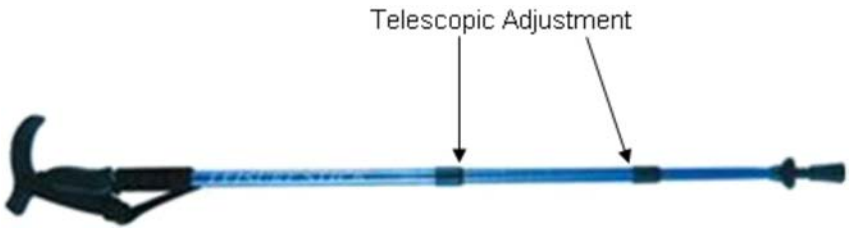

Figure 9 Telescoping Pole

Note. From Alibaba.com, 2007, *Trekking Poles*, Copyright 2007 by Alibaba.com Corporation and Licensors. Retrieved April 17, 2007, from http://aoqida.en.alibaba.com/product/50252655/51316862/Trekking_Poles/Trekking_Pole.html

Grips. Grips that have been shaped to fit the hand are more comfortable to grasp and easier to use over a long period of time. Grips that are hard can get wet with sweat and be uncomfortable to hold. One should try multiple models to find the one that fits the hand the best. An adjustable strap should be attached to the grip to prevent dropping the pole.

Figure 10 Grip With Strap

Note. From Moontrail, Backcountry Equipment Ltd, 2006, *MSR Denali II, Telescoping Trekking Poles*, Copyright 2006 by Backcountry Equipment, Ltd. Retrieved April 17, 2007, from http://moontrail.com/msr-denali2.php

Anti-shock system (shock absorption). The anti-shock system is built into the pole. Some systems are very complex and offer a range of settings depending on the user's preferences and the conditions of the trek. The anti-shock system helps absorb the impact of the pole striking the ground as one walks, easing the strain on the shoulders and arms. A lock system is a must as it allows the user to ensure the settings are locked and will not change during the hike.

Baskets. Baskets are the round rings at the bottom of trekking poles. The basket stops the poles from sinking into the surface (snow, mud or waterlogged ground). There are a variety of baskets. Baskets that are cut out like snowflakes are best used in the snow. Large, solid baskets are best used on soft muddy ground as they prevent sinking. If one is planning to buy trekking poles with baskets, ensure the baskets can easily be changed.

Figure 11 Snowflake Baskets

Note. From Backcountry Edge, 2004, *LEKI Snowflake Baskets*, Copyright 2004 by Backcountry Edge, Inc. Retrieved April 17, 2007, from http://www.backcountryedge.com/products/leki/snowflake_baskets.aspx

Figure 12 Solid Baskets

Note. From Backcountrygear.com, 2007, *Black Diamond Trekking Pole Spare Baskets*. Retrieved April 17, 2007, from http://www.backcountrygear.com/catalog/accessdetail.cfm/BD320

Tips. There are three types of tips—single point, chiselled and rubber tipped. Each of these tips will work well in a certain environment. The best overall tip is the chiselled. It looks like notches have been cut out of the very tip of the pole, leaving several points sticking out. This type of tip offers traction in almost any condition and is durable.

Figure 13 Replaceable Tips

Note. From GoSki-Real Resort Info, 2005, *Poles and Trekking Poles*, Copyright 2005 by RSN. Retrieved April 17, 2007, from http://www.goski.com/gear/product/LifeLink_Replaceable_Flex_Tip_Pair.html

Methods of Use

Using trekking poles may help prevent aches and pains. Poles are useful to help stabilize heavy loads and to negotiate trails. Besides providing better balance, trekking poles reduce the amount of stress on the back, legs and especially the knees. The poles absorb some of the impact the body would have to endure.

As the explanation is given, demonstrate the different techniques for holding trekking poles.

Trekking uphill. When walking on even terrain, arms should be parallel to the ground when holding the grip. When trekking uphill, shorten the trekking poles for comfort and stability. This allows one to gain more power.

Figure 14 Trekking Uphill

Note. From TrekkingPoles.com, 2006, *How to Use Trekking Poles*, Copyright 2006 by NicheRetail, LLC Company. Retrieved April 26, 2007, from http://www.trekkingpoles.com/custserv/custserv.jsp?pageName=How_To_Use

Trekking downhill. Trekking poles will help reduce the shock of each footfall on the joints when going downhill. For comfort and stability it is recommended that the poles be lengthened.

Figure 15 Trekking Downhill

Note. From TrekkingPoles.com, 2006, *How to Use Trekking Poles*, Copyright 2006 by NicheRetail, LLC Company. Retrieved April 26, 2007, from http://www.trekkingpoles.com/custserv/custserv.jsp?pageName=How_To_Use

The following may help while descending on rocky terrain:

- Walk slowly and test each rock before placing body weight on it.
- Lean forward to place body weight on the trekking poles.
- Grip the trekking pole securely.
- Keep the arms bent at 90 degrees.
- When possible, move one pole forward and step through with the opposite leg.

Trekking poles can also be used to:

- probe the depth of puddles or the strength of snow bridges;
- ward off aggressive animals; and
- provide support for a camera.

Some people like to have one hand free and only use one pole. For a greater level of support, two is better.

A solid wooden walking stick can be picked up in nature at any time during an expedition.

PERSONAL HIKING RHYTHM

An average day of hiking will consist of periods of hiking and periods of rest. The combination of a good hiking rhythm, a good hiking speed, and fixed rest intervals separate beginners from experienced hikers. Enthusiasm often tends to cause one to start too fast, get tired quickly, take an early rest, and start off too fast again.

Stride Rhythm and Speed

A steady hiking rhythm is generally more enjoyable as one over exerts themselves less and generally keep the physical strain at comfortable levels. Having a steady rhythm will enable a hiker to stick to a fixed schedule and lessen the strain put on the body. This allows a hiker to travel less fatigued.

Developing a hiking rhythm. A hiking rhythm is very personal and is developed over the course of many hikes. To develop a rhythm there are some guidelines to follow:

- Choose a specific stride rhythm and speed and keep to it. A good rhythm is one that allows a hiker to hike at the same intensity level for at least one hour without having to take a break.
- Adjust rhythm to terrain, weather and weight. The point where a person can no longer carry on a conversation indicates the hiker has gone beyond a comfortable tempo.
- Make the rhythm a full body movement where breathing and swinging of the arms happen in harmony.
- Uneven surfaces like uphill and downhill slopes of varying incline can make it difficult to maintain a steady hiking rhythm.

Controlling Fatigue

The purpose of resting is to slow down the heart rate and breathing, thereby allowing the heart and lungs to rest. Resting gives the body time to get rid of the lactic acids built up in muscles, and to recover from hot spots or sores.

Resting guidelines:

- Rest in regular intervals; try 10 minutes for every hour hiked (make them part of the rhythm).
- Stick to 10-minute rest breaks. Use only lunch and dinner (supper) breaks as extended rest periods.
- 10 minutes is the most effective rest duration for body recovery.
- Ensure to take off backpacks, rest in the shade, and sit down during rests.
- During the extended rest breaks, allow feet to rest and dry by removing shoes, and airing out footwear.

Adjusting Rhythm

Generally, hiking rhythm on a flat surface can be maintained easily; however, when weather and additional weight are included, hiking becomes more difficult. How fast one travels depends on the fitness level of the entire group, the terrain, the altitude and pack weight. One of the best ways to measure and regulate pace is to pay close attention to the tempo of breathing.

If breathing determines pace then, for example, on level ground one takes three steps per inhalation, and three steps per exhalation. Climbing a hill, while maintaining the same breathing rate, the steps per inhalation fall to two. A good rule of thumb to follow is to walk at a pace where one can still carry on a conversation.

When travelling in different conditions one's pace will change, according to:

- **Weather.** Poor weather will reduce pace and force the hiker to reduce step size for safety.
- **Weight.** Weight will affect pace size as the more weight one carries, the more energy must be expelled.
- **Terrain.** Travelling uphill will reduce pace size and distance travelled.

Full Body Synchronization

Hiking rhythm is a full body affair. Just like marching, hiking requires coordinated movements where every action has a reaction. The swinging of arms provides momentum, breathing controls pace, etc. To properly control rhythm, one must first learn what body parts work in unison. To employ full body synchronization during movement, the arms should be in motion at a natural swing, opposite the forward foot.

Resting Intervals

An average day of hiking consists of periods of hiking and resting. Resting intervals should occur once every hour, for a duration of 10 minutes, in an area that is conveniently shaded and possibly near a water source. During the first five to seven minutes of resting, the body flushes out about 30 percent of the lactic acid buildup in the muscles, but only five percent in the next 15 minutes (be cautious rest does not extend beyond 10 minutes).

In addition to lactic acid buildup in the muscles, the body works in unison and other areas may become fatigued. By resting:

- the heart rate slows and beats at a reduced rate,
- the lungs supply less oxygen to the body,
- the body and mind rest, and
- feet and footwear can be aired out, reducing the chance of blisters.

The Rest Step

When trekking, sometimes a hill is so steep that it simply cannot be climbed without taking breaks. In these cases, the rest step can be used. The rest step is also good when hiking in snow and fog.

To employ the rest step:

1. Begin from an upright position. Step forward with the right leg, keeping the weight on the left (back) leg, with the knee locked. Pause before taking the next step, with the weight still on the back leg.
2. Transfer the weight to the right leg. Push up with the right leg and take a step forward with the left leg. Lock the right knee, so that the right leg is bearing all the body weight. Pause before taking the next step, with the weight still on the back leg.

3. Transfer the weight to the left leg. Push up with the left leg and take a step forward with the right leg. Pause before taking the next step, with the weight still on the back leg. Continue moving, walking at a slow and steady pace.

Figure 16 Rest Step

Note. From *Backpacking and Hiking* (p. 143), by K. Berger, 2005, New York, NY: DK Publishing Inc. Copyright 2005 by DK Publishing, Inc.

CLASS 3 TERRAIN HIKING TECHNIQUES

Scrambling

Scrambling is a term used to describe making one's way over rough, uneven terrain and rocks by climbing or crawling. Scrambling usually requires the use of both hands and feet.

The following should be considered when using the scrambling technique:

- Test handholds and footholds before committing body weight.
- Keep the lower body close to the rocks.
- Use the hands to help maintain balance.
- Use large muscles in the legs to support body weight.
- Always maintain three points of contact with the rocks.

Figure 17 Scrambling Technique

Note. From Talisman Newsletter, 2006, *Merry Christmas*, Copyright 2007 by Talisman Mountaineering Activities Scotland. Retrieved April 17, 2007, from http://www.talisman-activities.co.uk/downloads/newsletters/newsletter4/newsletter4.htm

When scrambling and facing difficulty, take a moment to catch your breath. Study your route options and always identify a way back.

Boulder Hopping

Boulder hopping is when one uses speed and momentum to lightly hop from boulder to boulder, using arms or trekking poles to for balance.

The following should be considered when boulder hopping:

- Plan your route. Larger boulders are more stable.
- Use hands for stability.
- Keep knees bent and relaxed.
- Control speed. Lightly hop.
- If one begins to lose balance, move forward, stepping lightly from foot to foot until balance is regained.

Figure 18 Boulder Hopping With Trekking Poles

Note. From Great Outdoor, 2006, *Hiking the Forgotten End of the AT*, Copyright 2006 by Greatoutdoor.com. Retrieved April 12, 2007, from http://www.greatoutdoors.com/go/photos.jsp?title=hikingtheforgottenendoftheat&imag=1

Scree Crossing

A scree is a mass of fine, small rocks that are often found above the tree line on mountain slopes. When dealing with a scree, caution is the first rule.

Figure 19 Scree

Note. From East Riding of Yorkshire Council, *E Riding Media Library-England North*, Copyright 2007 by School Improvement Service, East Riding of Yorkshire Council. Retrieved April 17, 2007,from http://www.eriding.net/media/england_north.shtml

Traversing a Scree

Traversing means walking obliquely or crossing in a sideways movement.

Walking on a scree may be very slippery. When traversing a scree, a planned zig-zag path is the best option. The route should be broken down in small sections. One should keep the pace controlled and remember that speed can only mean greater risk of injury.

Walking sideways. Walking sideways will provide more contact between the long side of the foot and the slope to give better stability.

Climbing a Scree

One should avoid climbing a scree, if possible as it can be very exhausting. If there is no other option, the following tips should be considered:

- Keep to the sides of the scree. The movement of the scree is slower and larger boulders can be found there.
- Aim to keep feet horizontal. If the scree is small enough, kick the toes into the slope (like in snow).
- Climbing with the feet spread-eagled will help put weight on the instep of each boot.
- Take small steps to reduce the strain on the legs. This also reduces the chances of slipping.
- Legs should be bent at the knee to support the body.

Descending a Scree

When descending a scree, one should keep the weight on the heels and take short steps. One's back should be straight and the knees should be slightly bent to absorb stress and improve balance.

The following should be considered when descending a scree:

- Dig the heels into the slope.
- Use the hands to stay steady.
- Relax the knees and keep moving.

CROSSING WATER OBSTACLES

Rivers

Crossing rivers can be very challenging depending on the time of the year (eg, spring when snow melts into streams and rivers). A plan should be established before crossing a river.

Choose a place to cross. The safest place to cross is where the water is calm and no deeper than the height of one's hips. Such conditions can be found around rivers bends, where the stream widens and slows to make the turn. The darker (and greener) the water, the deeper it is.

The following should be avoided:

- turbulence that causes white water;
- dark water; and
- a powerful current.

If conditions appear dangerous, walk upstream in search of a safer option. Always cross with caution.

Best time to cross. Early in the morning is the best time to cross. Rivers run slower in the morning because the water is colder at night.

Wading across a river. Wading across a river is the safest option. When crossing, always face upstream, diagonal to the current.

If crossing in a group, link arms, with the strongest people at the end. The group should move slowly in a line, diagonal to the current.

Trekking poles can be used to wade across a river. They will help with the balance.

When crossing a river, to keep boots dry, take them off and wear sport sandals. If one does not have sport sandals, remove socks and boot liners, put boots back on and cross the river.

Hopping. Hopping is a technique used with rocks and will help one cross a river and stay dry. The following should be considered when hopping:

- Plan the route. Evaluate the steps to take.
- Decide which rocks are stable.
- Test steps before committing.
- If a step is unstable, move quickly to the next one.

Stepping in the water is an option. It is better to step into the water and get wet feet than to fall into it.

Crossing rivers using a wooden bridge or ropes. Wooden bridges range from constructed bridges to logs placed across a stream. Always test a bridge first to see if it is fixed and stable. Crossing a log should be done one person at a time since weight can dislodge the log. If a bridge or a log is too narrow, unstable or high, shuffle across in a sitting position.

Unless trained in river rescue, hand-held rope should not be used. If a rope is fixed in place, it can be used to hold on to. Avoid getting tangled in the rope. Carabiners shall not be used to attach a person to the rope.

Waterlogged Ground

Avoid crossing waterlogged ground if possible. If there is no other way around, one should plan a route through it. Footsteps of previous trekkers can tell how deep and hard the soil is.

Natural hard spots. When planning a route, aiming for hard spots in the ground can save time. Trees and shrubs might indicate a solid piece of ground. Large rocks and clumps of hard grass are also good indicators.

Trails. Sometimes, trails go across waterlogged ground. Frequently used trails will often have small wooden pathways (looking like short bridges) built to help facilitate the crossing. Bridges made of fallen logs may also be used.

When crossing waterlogged grounds, boots should be tightly laced. Suction of mud may pull at the boots.

Crossing Snow and Ice

Reading the snow for a safe route. When planning a route, it is best to avoid rocky places. Rocks absorb heat causing the snow near them to melt faster. The soft snow may not be firm enough to hold someone's weight. Before using a path, test the snow with trekking poles to prevent injuries. It is best to cross a large snowfield early in the morning when the snow is harder. As the sun rises and becomes more powerful, snow melts unevenly and creates soft spots.

Ascending on snow. When walking on snow, the conditions will govern the route. A new route may be created to ascend safely. Zig-zags may also be an option. If it is easier to go straight up, one should kick the snow several times to make solid steps to stand on. Before standing on these steps, one should always test body weight.

Trekking uphill through snow can be very exhausting. It is recommended to plan twice as much time to complete this kind of trek. Take breaks as required.

Crossing ice. Crossing ice requires caution. When crossing ice, one should use trekking poles to probe for holes or test the snow. On ice, do not rely on old footsteps. The route may not be safe if they are a few days old. Always test before advancing.

Ice is thinner in early winter and spring. During these seasons, one should try to go around.

ACTIVITY

Time: 270 min

OBJECTIVE

The objective of this activity is to have the cadets, in teams of no more than six, hike along a route with some Class 3 terrain, for a distance of 10–15 km.

RESOURCES

- Expedition field pack,
- Personal equipment,
- Hiking equipment, to include:
  - hiking boots (one pair per cadet),
  - day pack (one per cadet),
  - water carrier (one per cadet), and
  - trekking poles (two poles per cadet);
- Topographical / trail map of the area (two per team),
- Compass (one per team),
- Whistle (one per cadet),
- Communication device (two per team),

- GPS Receiver (one per team),
- Batteries (spares for hand-held radio and GPS), and
- First aid kit (one per team).

ACTIVITY LAYOUT

Designate a hiking route with some Class 3 terrain.

ACTIVITY INSTRUCTIONS

1. Conduct a briefing, to include an explanation of:
    a. the objectives and importance of the activity;
    b. the resources that may be required to perform the activity; and
    c. any safety guidelines that must be followed while performing the activity.
2. Have the cadets, in teams of no more than six, hike along a route with some Class 3 terrain, for a distance of 10–15 km during an expedition to practice:
    a. executing the "rest step"; and
    b. employing proper techniques to:
        (1) hop boulders (as applicable),
        (2) cross scree (as applicable), and
        (3) cross a water obstacle (as applicable).
3. Conduct a debriefing by asking the cadets:
    a. how they felt about the activity,
    b. how they felt their team worked together;
    c. what portion of the activity challenged them the most;
    d. how their teammates assisted them when they were challenged;
    e. if there are any specific examples of when their team bonded;
    f. how the team made decisions;
    g. whether or not all team members ideas / suggestions were considered; and
    h. what they would do as a leader of this type of activity to ensure their subordinates enjoyed the experience.

SAFETY

- The cadets will respect the predetermined boundaries for this activity.
- Teams will travel in single file.
- Teams will not pass another teams / groups unless directed to do so by their team instructor.

- All the cadets must carry 1 L of water.
- A water supply will be available along the route.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in hiking along a route will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

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

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-704/PG-001, Gold Star *Qualification Standard and Plan*, Chapter 3, Annex B, 426 PC.

CLOSING STATEMENT

Hiking is one of three dynamic modes of transport that can be used during expedition training. It is critical that the cadets are given the opportunity to hike on routes which include some Class 3 terrain to prepare them for more advanced expedition experiences. Being aware of pacing and implementing the "rest step" while hiking will ensure a more enjoyable hiking experience for the individual and the team / group. When travelling on advanced hiking terrain, the possibility of encountering obstacles is quite great, therefore it is important that all members understand how to safely cross them.

INSTRUCTOR NOTES / REMARKS

Expedition centres are required to select two dynamic modes of travel from EO M426.02a (Paddle a Canoe), EO M426.02b (Ride a Mountain Bike), and EO M426.02c (Hike Along a Route) EO M426.02d (Snowshoe Along a Route) and EO M426.02e (Ski Along a Route) to incorporate into the expedition training.

This EO has been allocated nine periods in the overall course period allocation. Each expedition centre may adjust this allocation to reflect the choice of activities, facilities and available resources at the expedition centre.

Upon arrival at the expedition centre, cadets will be broken into teams. These teams will remain the same for the duration of the expedition.

IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*:

1. hiking equipment includes:
    - hiking boots, and
    - trekking poles; and

2. the following group hiking equipment is required when hiking:
    - topographical / trail map of area as required,
    - compass,
    - GPS receiver.
    - first aid kit, and
    - communication device (eg, cellular phone or hand-held radio).

The intensity level of the activity shall follow the progression matrix outlined in A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*.

Ensure that each cadet has an ample supply of water when hiking.

REFERENCES

A2-001 A-CR-CCP-951/PT-002 Director Cadets 3. (2006). *Royal Canadian Army Cadets adventure training safety standards*. Ottawa, ON: Department of National Defence.

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C2-051 ISBN 978-0-7153-2254-3 Bagshaw, C. (Ed.). (2006). *The ultimate hiking skills manual*. Cincinnati, OH: David & Charles.

C2-103 ISBN 0-89886-427-5 Graydon, D., & Hanson, K. (Eds.). (2001). *Mountaineering: The freedom of the hills* (6th ed.). Seattle, WA: The Mountaineers.

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ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 5

EO M426.02d – SNOWSHOE ALONG A ROUTE

Total Time: 270 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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

Nil.

APPROACH

An interactive lecture was chosen for TP 1 to introduce and give direction on the types of snow that may be encountered when snowshoeing.

A demonstration and performance was chosen for TPs 2 and 3 as it allows the instructor to explain and demonstrate the procedure for fitting snowshoes and executing snowshoe techniques while providing an opportunity for the cadet to practice the skills.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have practiced snowshoe techniques along a route.

IMPORTANCE

It is important for cadets to snowshoe along a route by using different snowshoe techniques so they will be prepared for the technical challenges, when given the opportunity to participate in more advanced level expeditions. Snowshoeing along a trail or predetermined route requires the individual to be aware of their surroundings, their limitations and the limitations of the group they are travelling with. Knowing different types of snow conditions provides the snowshoer with the information to make a decision as to whether the snow conditions are safe enough to continue.

Teaching Point 1 **Discuss types of snow.**

Time: 10 min Method: Interactive Lecture

Cadets will be expected to snowshoe for a distance of 8–10 km. While travelling, it is possible to travel across many different types of snow. Being aware of what type of snow one is travelling on will help to increase awareness of how their footing will react to the condition of the snow.

If cross-country skiing was chosen as a mode of travel and was instructed prior to this EO, types of snow have already been discussed. If that is the case, conduct a quick review bringing attention to how snow can affect snowshoeing.

Point out examples of different types of snow that exist in the surrounding environment.

TYPES OF SNOW

Snow and ice conditions change with heating and cooling, and are largely affected by the weather. With a change in conditions speed of travel may be affected.

New fallen snow. Very loose and light. The snowflakes still have multiple branches. If new snow is dry, it is feathery; if damp, it quickly consolidates into a stage of settled snow. When this snow is damp, it can be difficult to snowshoe on. When dry and fluffy, this snow is easy to snowshoe on.

Powder snow. New, untouched freshly fallen soft snow. It can give the feeling of floating in a weightless environment. Powder snow can be packed in thick layers that form a natural pillow. Powder snow has a low moisture content, as almost 97 percent of it is air. In coastal regions, where there is higher humidity, the snow is heavier than in a continental region. Powder snow compacts easily, supporting the weight of the snowshoer. This is a good type of snow to snowshoe on.

Wind-packed snow. Snow blown from one direction, compacted by the force of the wind. Wind-packed snow is created by the pressure exerted by wind, causing a form of cold-heat hardening. In some areas, the snow surface is strong enough to hold the weight of a person on snowshoes. This snow is good to snowshoe on.

Sun crust snow. Snow that has had the upper layer melt and then refreeze. Usually on top of powder snow, sun crust snow is stronger than the powder snow below it due to the refreezing. This snow can be dangerous to snowshoe on if on a slope; the crust may give and a person may lose their footing. Snowshoeing on a flat surface over sun crust snow can be difficult as the snowshoe breaks through the crust and can hook into the crust on the return. The constant hooking and breaking in sun crusted snow can tire the snowshoer.

Sun crust snow is not very stable on a slope and can be dangerous when weighted. The snow will give way causing a fall or a slide.

Corn snow. After thawing, corn snow occurs. The structure of the snow is very grainy at this point. Corn snow usually occurs in the spring, and can be strong enough to carry weight but it also can indicate the presence of rotten snow, which is very dangerous. Corn snow is produced during the cycle of melting and refreezing in the accumulated snow. Caution should be taken when snowshoeing on this type of snow, especially in mountainous or hilly terrain.

A layer of snow that has been sun crusted will become corn snow.

Rotten snow. Caused by repeated melting and freezing and is found mostly on the south side of hills, or in lower levels of snow. Water will seep to the lower layers and will not freeze because it is insulated from the weather by the covering snow layer. Rotten snow can resemble very small icicles, or candle ice. This snow is dangerous. Sudden drops may exists and holes develop under the surface of the snow. Falling and injury are highly possible.

Slush snow. When the air temperature becomes warmer than the freezing point, the snow begins to melt and the water content becomes high. Slush snow absorbs water from melting snow. Slush snow is recognizable by depressions in the snow with darker or bluish snow areas. These areas show holes in the ice or an accumulation of water on the surface of the ice. Snowshoeing on this type of snow can be dangerous since the chance of stepping into a large puddle or slipping by loss of traction exists.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS:

Q1. What type of snow is loose and light?

Q2. Describe wind-packed snow.

Q3. What is rotten snow?

ANTICIPATED ANSWERS:

A1. New fallen snow is loose and light.

A2. Snow blown from one direction, compacted by the force of the wind. Wind-packed snow is created by the pressure exerted by wind, causing a form of cold-heat hardening. In some areas, the snow surface is strong enough to hold the weight of a person on snowshoes. This snow is good to snowshoe on.

A3. Rotten snow is snow found on the south side of hills, or in lower levels of snow. It is caused by repeated melting and freezing.

Teaching Point 2 **Explain, demonstrate and have the cadets fit personal snowshoe equipment.**

Time: 15 min Method: Demonstration and Performance

For this TP it is recommended that instruction take the following format:

1. Explain the importance of selecting and properly fitting snowshoe equipment.
2. Explain and demonstrate the selection of snowshoe size and how size affects carrying capacity.
3. Have cadets select and size snowshoes.
4. Explain, demonstrate and have the cadets fit snowshoe bindings.
5. Explain, demonstrate and have the cadets select and properly size poles.
6. Once each cadet has selected snowshoe equipment, label all equipment with masking tape.

Note: Assistant instructors may be used to monitor the cadets' performance.

The standard snowshoe may vary between expedition centres. Check the manufacturers' specifications for sizing and holding capacity.

SNOWSHOES

Snowshoe size is dictated by a person's total weight including body, pack, boots, and clothing.

Parts of a Snowshoe

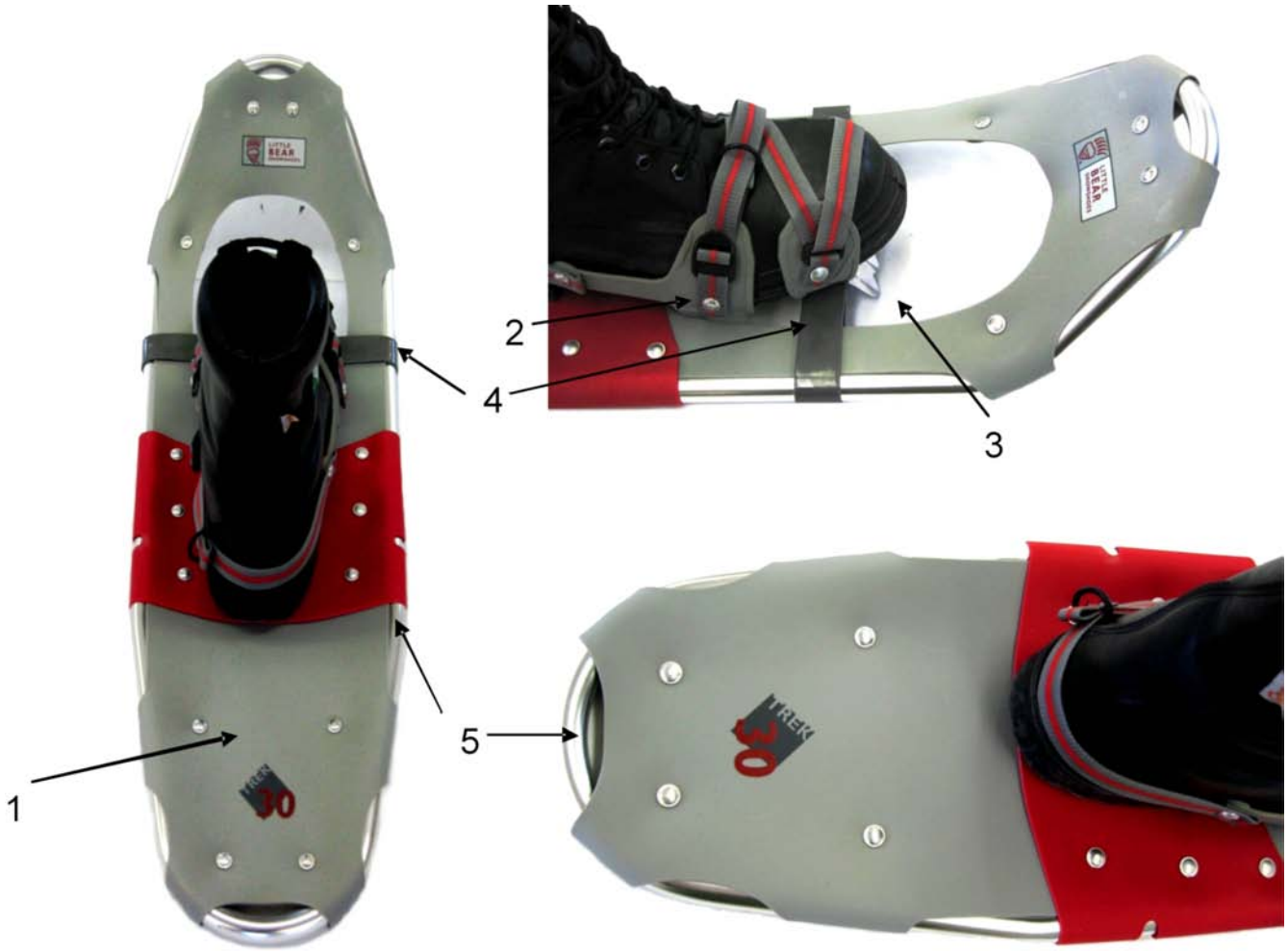


Figure 1 Parts of a Snowshoe

Note. Created by Director Cadets 3, 2009, Ottawa, ON: Department of National Defence.

1. **Deck.** The part of the snowshoe that supports a person's weight on the snow. It can be webbed or solid and is made from a variety of materials depending on the manufacture.

2. **Binding.** Connects the boot to the snowshoe. When worn, the bindings should be secure but comfortable.

3. **Crampon.** Attached below the pivot point. When weighted, the crampon digs into the surface below it and provides traction to the snowshoer.

4. **Pivot point.** Allows the foot to rotate with a natural arc when walking. To engage the crampon, rotate the pivot point forward with pressure from the ball of the foot—this provides more traction when digging into the surface below.

5. **Frame.** This is the part of the snowshoe that makes up the skeletal shape. It can be made of metal or wood and functions as the seat for the bindings and crampons. A snowshoe with a strong frame will last a long time.

Selecting Snowshoes

The chart below is a rough guide to follow when in a standard condition of wet powder snow.

If in between weight categories:

- Select the smaller snowshoe if expecting to encounter heavy snow.
- Select the larger snowshoe if travelling through deep backcountry powder.

Snowshoe Size	Carrying Capacity
20 cm by 56 cm (8 inch by 22 inch)	68 kg (150 lbs)
20 cm by 63 cm (8 inch by 25 inch)	90 kg (200 lbs)
22 cm by 43 cm (9 inch by 34 inch)	113 kg (250 lbs)
24 cm by 86 cm (9.5 inch by 36 inch)	136 kg (300 lbs)

The smaller the snowshoe, the better it will be for climbing over blow downs (fallen trees and bushes) and through brush. The larger the snowshoe, the better flotation on top of snow.

BINDINGS

The binding attaches the foot to the snowshoe securely, preventing the heel from sliding from side to side, even when travelling across a slope. Bindings most often fit a wide range of boots sizes. In any category of snowshoe, the binding should be made of hardy, flexible rubberized nylon straps, with buckles that do not loosen or freeze and are easily manipulated even when wearing mittens. The bindings must not be fastened too tightly where circulation may be cut off, as the chances of frostbite will increase.

During rest breaks, bindings should be checked for fit and possible readjustment.

Types of bindings include:

Fixed rotation. Lifts the snowshoe tail up with the foot. These tend to throw snow onto the snowshoer's back, but are better when climbing over forest obstacles.

Free rotation. Will not lift the snowshoe tail up with the foot. The extended tails may get hung up in vegetation or downed trees. Military issue snowshoes have free rotation bindings.

The binding on most snowshoes connects to the pivot point.

Snowshoe bindings may be different at each expedition centre. The following guide to fit bindings is a description on how military issued bindings are fitted. When using civilian bindings, check the manufacturers' specifications and present those instructions to the cadets.

It is much easier to make binding adjustments when not wearing the snowshoes.

Adjusting the Binding (Harness)

Snowshoe bindings (harnesses) need to be adjusted to fit the boot / mukluks. Improper fit can result in a snowshoe falling off on the trail and poor foot placement on the snowshoes. Bindings (harnesses) should hinge freely up and down, with the toe of the boot / mukluk fitting through the toe hole in the snowshoe and the ball of the foot directly over the toe cord.

Adjust the Bindings (Harnesses) to the Boot / Mukluk

1. Resize the toe strap by undoing the tie down strap from the tie down buckle.
2. Reweave the tie down strap through the webbing on the snowshoe to either loosen or tighten the toe strap to the size of the mukluk.
3. Fasten the tie down strap through the tie down buckle.

To prevent the toe strap from slipping up over the toe of the mukluk, the toe strap should be tied down to the front mesh of the snowshoe using a 20-cm piece of heavy duty twine.

Attaching the Snowshoe to the Boot / Mukluk

1. Position the boot / mukluk in the toe strap, with the cross strap under the instep.
2. Bring the inside part of the side strap back diagonally up over the heel and around the outside of the boot / mukluk (as illustrated in Figure 2).

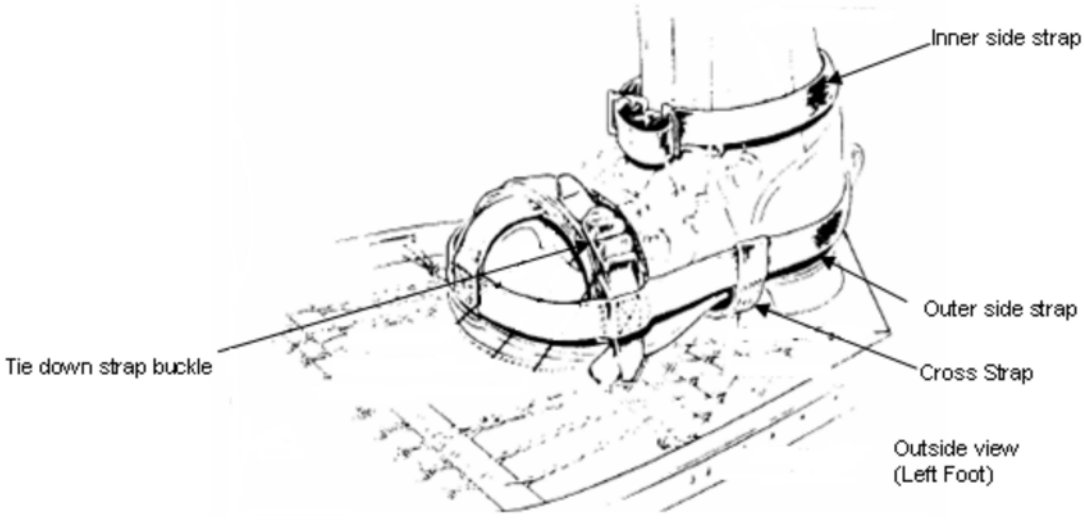


Figure 2 Attaching Harness to the Boot / Muckluk

Note. From *Artic and Sub Artic Operations Volume 2 Basic Cold Weather Training* (p. 5-44), by Chief of the Defence Staff, 1974, Ottawa, ON: Department of National Defence. Copyright 1975 by Department of National Defence.

3. Bring the outside part of the side strap back and around the lower part of the heel, around the inside of the boot / mukluk, crossing over the inner side strap, with the buckle located over the boot / mukluk laces, as illustrated in Figure 3.

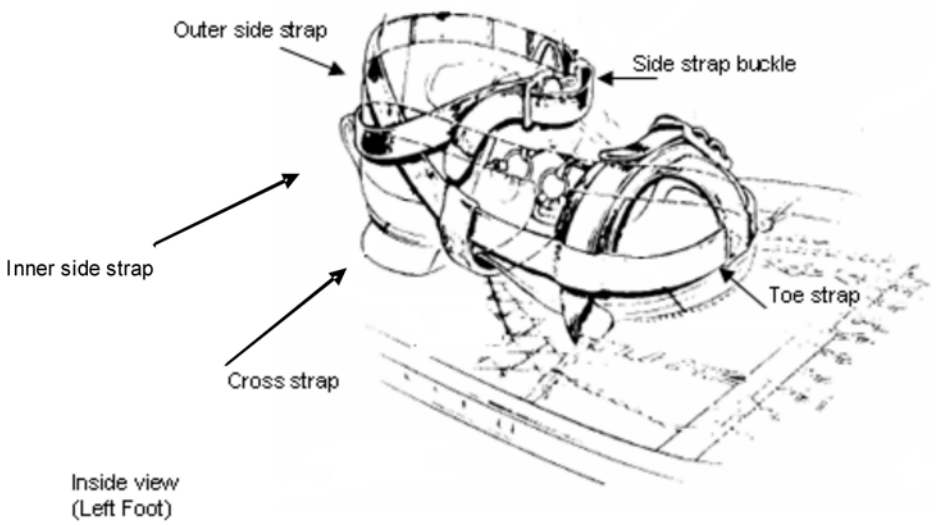


Figure 3 Attaching Harness to a Boot

Note. From *Artic and Sub Artic Operations Volume 2 Basic Cold Weather Training* (p. 5-45), by Chief of the Defence Staff, 1974, Ottawa, ON: Department of National Defence. Copyright 1975 by Department of National Defence.

POLES

Telescoping trekking poles are the most versatile choice for snowshoeing. These poles provide better balance and reduce the amount of stress on the knees, shoulders and back. They absorb some of the impact the body would otherwise absorb. The poles, rather than the body, absorb shock, reduce arm and leg fatigue and improve endurance. While snowshoeing, they help a person keep balance while climbing inclines or when backing out of an area in deep snow. Although trekking poles are generally not required when snowshoeing, they are a helpful accessory.

Figure 4 Telescoping Trekking Pole

Note. From Wintergoodies.com, 2007, *Hiking, Trekking & Walking Pole Adjustable*, Copyright 2007 by Wintergoodies.com. Retrieved April 12, 2007, from http://www.winterbrookgoodies.com/pd_swissgear_hiking_trekking_walking_pole.cfm

Sizing a Pole

Sizing poles to fit a snowshoer requires the user to stand up straight and hold the pole close to the body. The pole when held upright should come to a height in-between the middle of the chest and slightly below the armpit. Adjust the trekking pole accordingly until it is sized to the snowshoer.

CONFIRMATION OF TEACHING POINT 2

The cadets' fitting of personal snowshoe equipment will serve as the confirmation of this TP.

Teaching Point 3 **Explain, demonstrate and have the cadets practice snowshoe techniques along a route.**

Time: 235 min Method: Demonstration and Performance

Cadets shall be given detailed instruction on how to complete each snowshoe technique.

For each technique explain, demonstrate and have the cadets practice the movement.

Cadets shall perform each technique at a level of proficiency that will allow successful completion of the route to be travelled prior to departing.

SNOWSHOE TECHNIQUES

Snowshoeing is a very easy skill to learn. People can immediately walk on snowshoes even if they have never worn them before. However, there are techniques that will greatly improve these abilities while snowshoeing over snow-covered terrain.

Striding

To conserve energy when snowshoeing on soft snow, lift the snowshoe to clear the snow and thrust forward to complete each pace.

The rest step allows for momentary pauses between steps. With practice, one can adjust the length of the pause to the state of fatigue. As one steps forward, thrust the front snowshoe out and let it plop down, or stamp it firmly into place. Straighten and lock the rear knee joint so the tendons and cartilage are holding weight and pause and relax the thigh muscles, using the poles to maintain balance. Bring the rear leg ahead, thrust the snowshoe out, place it, lock what is now the rear leg, relax momentarily and repeat.

The effect is to rest the legs during the time they are actually working hard. A couple of seconds of work with a couple of seconds of rest make it possible to keep going steadily without long stops.

Novice snowshoers have a tendency to look down at the snowshoes when they walk. They will adapt more quickly to snowshoeing if they keep their head and eyes up, and look forward, down the trail.

Executing Kick Turns

Kick turns are performed when conditions exist where there is not enough room to perform a normal 180-degree stepping turn. Remind cadets to always assess the area and perform a normal 180-degree steeping turn when they can; it is safer and less accidental falls and twists will occur.

Kick turns are performed when a change in direction is required. It is commonly used in an enclosed area along the trail. The steps in performing a kick turn are:

1. Lift one leg and swing it back, and then kick it forward and upward.
2. At the top of the kick, just as the tail of the snowshoe clears the snow, turn the foot 180 degrees.
3. Lower and plant the foot in the snow, with the front of the foot facing to the rear.
4. Shift the body weight to the foot facing 180 degrees to the rear and then lift the other foot.
5. Bring the foot over the trailing edge of the planted snowshoe and face the new direction.

Crossing Obstacles

Obstacles such as fallen trees, logs, tree stumps, ditches and small streams can be stepped over. Care must be taken not to place too much strain on the snowshoe ends by bridging a gap, since the frame may break. In shallow snow, there is a danger of catching and tearing the webbing on tree stumps or snags that are only slightly covered.

Never bridge two obstacles together with the snowshoes. When jumping over obstacles do not let the tails of the snowshoes fall downward. If the tail of the snowshoe is vertical upon landing, it will strike the snow first and may result in a fall. When possible, find an alternate route around the obstacle.

Bridging. When the toe and tail of the snowshoe are placed on two elevated objects and the entire weight of the snowshoer is fitted on the webbing of the snowshoe.

Figure 5 Bridging

Note. From *Snowshoeing: From Novice to Master* (p. 46), by G. Prater, 2002, Seattle, WA: The Mountaineers Books. Copyright 2002 by The Mountaineers Books.

Ascending Hills

The method chosen to walk uphill will depend on the angle of the incline and the condition of the snow. The following techniques can be used when navigating uphill.

Step kick. When going straight up a hill, this is the most efficient method on firm or hard packed snow where traction is not a concern. Kick the toe of the snowshoe in the snow ensuring that it is firmly planted before shifting weight to the snowshoe.

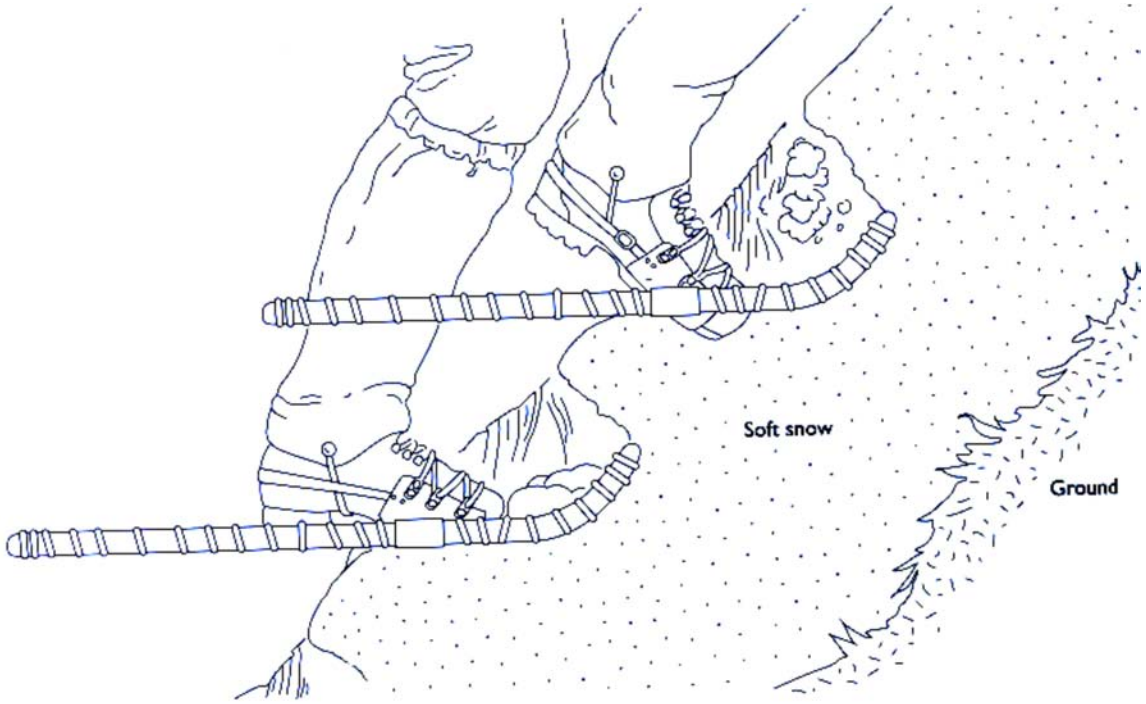


Figure 6 Step Kick

Note. From *Snowshoeing: From Novice to Master* (p. 114), by G. Prater, 2002, Seattle, WA: The Mountaineers Books. Copyright 2002 by The Mountaineers Books.

Edging. Performed by simply kicking the snowshoe sideways into the slope, or moving the boot heel as far toward the uphill side of the slope as possible. Stamp the snowshoe down, forcing the outside edge of the snowshoe into the slope. When edging, the body will be perpendicular to the slope. It is used when walking up a steep slope.

Figure 7 Edging

Note. From *Snowshoeing: From Novice to Master* (p. 113), by G. Prater, 2002, Seattle, WA: The Mountaineers Books. Copyright 2002 by The Mountaineers Books.

Switchbacking. Used to travel a slope that is fairly steep and is covered in deep powder snow. Ascend the hill by walking across the slope at an angle that is comfortable and not steep enough to allow the snowshoes to slip. To turn back (switchback) to the right, firmly stamp the left snowshoe in the snow and make sure it will hold. Shift the weight to the left foot, face the slope, and then swing the right snowshoe around to point it in the direction of the next switchback and firmly stamp it into the snow. Ensure that the tail of the right snowshoe is not placed on the left snowshoe. Stamp the right web into the snow and gently shift the body weight and step on it. To make a left turn, reverse the procedure.

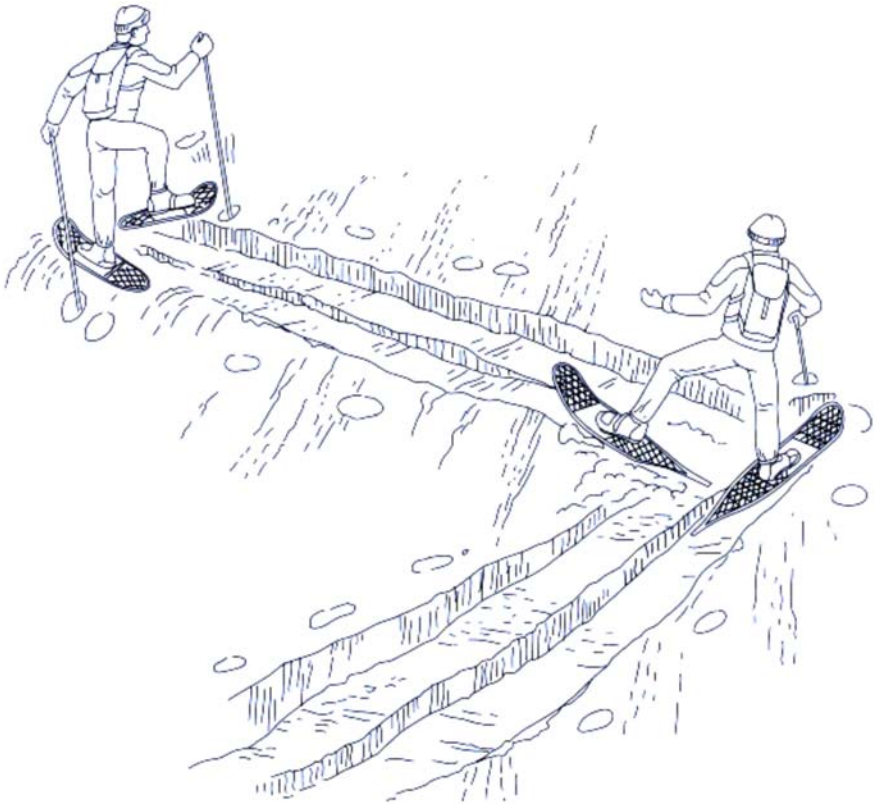


Figure 8 Switchbacking

Note. From *Snowshoeing: From Novice to Master* (p. 110), by G. Prater, 2002, Seattle, WA: The Mountaineers Books. Copyright 2002 by The Mountaineers Books.

Descending Hills

The method that is chosen to walk downhill will depend on the angle of the incline and the condition of the snow. The same techniques for ascending hills are used to descend. When descending a hill a person should follow the following guidelines:

- Do not lean forward by bending at the waist. This is a normal tendency for beginners and will increase the chance of falling forward.
- Avoid leaning back on the snowshoes, as if digging in the heels. This will increase the chance of the snowshoes sliding out from under the snowshoer.
- To assume a safe posture, stand straight up; balance the body straight over the foot; and slightly bend the knees to compensate for changes, and then relax.

Breaking Snow

In loose snow, the trailbreaker may have several extra pounds of snow on the snowshoes. The snow falls on top of the webbing when walking and sinking in deep snow. This extra weight will exhaust the trailbreaker at a faster rate than the followers. When the trailbreaker feels they can no longer move forward at a progressive pace, they should step to the side and drop to the rear as the rest of the party moves past.

Trailbreakers, depending on the depth of the snow and the terrain being covered should only break trail for 2–5 minutes.

ACTIVITY

Time: 200 min

OBJECTIVE

The objective of this activity is to have the cadets, in teams of no more than six, snowshoe along a route for 8–10 km with an expedition field pack, to include:

- adjusting stride;
- performing a kick-turn;
- crossing obstacles applicable to the terrain;
- ascending a hill;
- descending a hill; and
- breaking snow.

RESOURCES

- Personal expedition equipment,
- Personal snowshoe equipment,
- Group snowshoe equipment, and
- Water carrier (one per cadet).

ACTIVITY LAYOUT

Nil.

ACTIVITY INSTRUCTIONS

1. Conduct a briefing to include an explanation of:
   a. the objectives and importance of the activity,
   b. the resources that may be required to perform the activity, and
   c. any safety guidelines that must be followed while performing the activity.
2. Have the cadets retrieve their snowshoes and packs.
3. Have the cadets put on their snowshoes and packs.

4. Have the cadets, in teams of no more than six, snowshoe with an expedition field pack, following the designated route for a distance of 8–10 km during an expedition to practice:
   a. adjusting stride;
   b. performing a kick-turn;
   c. crossing obstacles applicable to the terrain;
   d. ascending a hill;
   e. descending a hill; and
   f. breaking snow.
5. Upon arrival at the end point, have the cadets remove, clean and inspect snowshoes for damage and then properly store / return all equipment.
6. Conduct a debriefing by asking the cadets:
   a. how they felt about the activity;
   b. how they felt their team worked together;
   c. what portion of the activity challenged them the most;
   d. how their teammates assisted them when they were challenged;
   e. if there are any specific examples of when their team bonded;
   f. how the team made decisions;
   g. whether or not all team members ideas / suggestions were considered; and
   h. what they would do as a leader of this type of activity to ensure their subordinates enjoyed the experience.

SAFETY

- Each team will be led by the assigned team leader.
- The Team Instructor(s) (TI) must be in sight or sound of the team at all times.
- In areas of complex / technical terrain TI(s) will demonstrate requisite skills as required.
- Teams will travel separately on the same trail.
- There will be a minimum of 500 m between teams at all times.
- Cadets must travel in single file at all times.
- Cadets must have at least 1 L of water.
- Water resupply points will be located along the route.
- Meals will be provided at a predetermined location(s) and detailed in the route instructions.

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 snowshoeing along a route will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, Chapter 3, Annex B, 426 PC.

CLOSING STATEMENT

Snowshoeing is one of the dynamic modes of transport that can be used during expedition training. It is critical that the cadets are given the opportunity to practice snowshoe techniques along designated routes to prepare them for more advanced snowshoeing experiences. Being aware of sharing the trailbreaking task and implementing the rest step while snowshoeing will ensure a more enjoyable snowshoeing experience for the individual and the team / group. When travelling the possibility of encountering obstacles is quite great, so it is important that all members understand how to safely cross them.

INSTRUCTOR NOTES / REMARKS

Expedition centres are required to select two dynamic modes of travel from EO M426.02a (Paddle a Canoe), EO M426.02b (Ride a Mountain Bike), EO M426.02c (Hike Along a Route), EO M426.02d (Snowshoe Along a Route) and EO M426.02e (Ski Along a Route) to incorporate into the expedition training.

This EO has been allocated nine periods in the overall course period allocation. Each expedition centre may adjust this allocation to reflect the choice of activities, facilities and available resources at the expedition centre.

Upon arrival at the expedition centre, cadets will be divided into teams. Cadets will be given an opportunity to navigate and lead peers. These teams will remain the same for the duration of the weekend.

Total distance for the snowshoe route can be adjusted depending on terrain and level of skill of participants.

The following equipment is required when snowshoeing:

1. personal snowshoe equipment, to include:
    a. snowshoes,
    b. bindings,
    c. poles,
    d. whistle, and
    e. appropriate cold-weather clothing; and
2. group snowshoe equipment, to include:
    a. topographical / trail map of area as required,
    b. compass,

c. first aid kit,

d. communication device (eg, cellular phone or hand-held radio),

e. GPS receiver, and

f. cold weather emergency kit appropriate to the activity.

IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards* weather must be continuously assessed. Training should cease and cadets must be brought inside if the temperature gets too low (consider wind chill).

REFERENCES

C2-004 ISBN 1-896713-00-9 Tawrell, P. (1996). *Camping and wilderness survival: The ultimate outdoors book*. Green Valley, ON: Author.

C2-248 ISBN 978-0-89886-891-3 Prater, G. (2002). *Snowshoeing: From novice to master*. Seattle, WA: The Mountaineers Books.

ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 6

EO M426.02e – SKI ALONG A ROUTE

Total Time: 270 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Organize all cross-country ski equipment into three groups—skis, boots, and poles. Within each group organize the equipment by size / height.

Photocopy one Cross-Country Ski Equipment Sizing Information Form located at Attachment A and cut it into four separate forms.

Assistant instructors will be required for this lesson.

PRE-LESSON ASSIGNMENT

Distribute to the cadet the Cross-Country Ski Equipment Sizing Information Form located at Attachment A to cadets when they arrive at the expedition centre on the Friday evening. Cadets must complete the form prior to the commencement of this EO.

Cadets must arrive wearing appropriate cold weather clothing. They must have the socks on that they will be wearing during the expedition, to ensure proper fit of ski boots.

APPROACH

An interactive lecture was chosen for TP 1 to introduce and give the cadet direction on types of snow and how they can affect a cross-country skier.

A demonstration and performance was chosen for TPs 2 and 3 as it allows the instructor to explain and demonstrate the procedures for fitting personal cross-country ski equipment and executing classic cross-country ski techniques while providing an opportunity for the cadet to practice the skill.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have classic cross-country skied along a route for 6–10 km, during an expedition.

IMPORTANCE

It is important for cadets to classic cross-country ski along a route, as it is a mode of travel used during winter expedition training. Cadets are required to work as a member of a team to travel a significant distance during the expedition. Performing classic cross-country ski techniques assists them in keeping up with their team.

Teaching Point 1 **Discuss types of snow.**

Time: 10 min Method: Interactive Lecture

The purpose of this TP is to introduce the cadets to the different types of snow they may encounter when cross-country skiing.

If snowshoeing was chosen as a mode of travel and was instructed prior to this EO, types of snow have already been discussed. If that is the case, conduct a quick review bringing attention to how the different types of snow can affect the slide and grip of skis.

Point out examples of different types of snow that exist in the surrounding environment.

Being aware of what type of snow or ice one is travelling on increases awareness of how skis perform in different conditions.

TYPES OF SNOW

Skis do not slide on the snow; they slide on a thin layer of moisture (2) that is between the snow (3) and the ski surface (1). The thin layer of moisture is created by the pressure of the ski upon the snow and by the friction caused by the motion of the skis across the snow. Heat created by the pressure and the friction melts some of the snow.

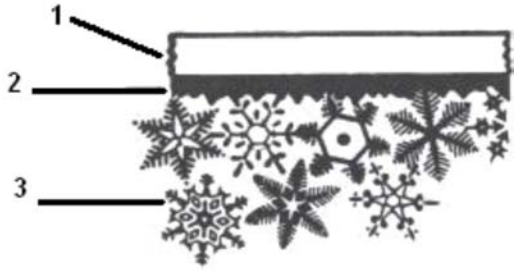


Figure 1 Relationship Between Snow, Moisture and the Cross-Country Ski

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 164), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

Skis also have to grip the snow to allow the skier to push and move forward while going uphill or on flat terrain. This grip is influenced by the type of snow crystals (flakes).

New snow crystals (flakes), with their numerous points and arms, dig into the uneven surface of the waxed ski when there is weight pushing down on them.

Figure 2 New Snow Crystals (Flakes)

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.) (p. 164), by W.J. Lederer & J.P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

Old snow crystals (flakes), 24–36 hours old, begin to wear away, making them smoother and less able to grip into the ski. Once snow crystals (flakes) begin to melt, or melt and then re-freeze, the points and arms become virtually non-existent, severely affecting how the skis slide on and grip the snow.

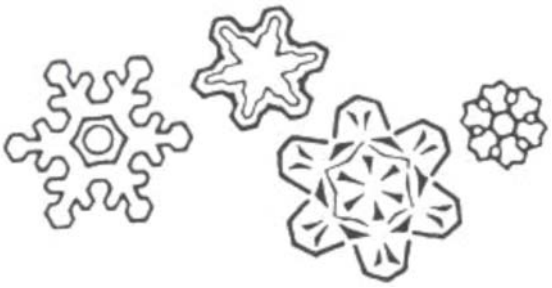


Figure 3 Old Snow Crystals (Flakes)

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.) (p. 166), by W.J. Lederer & J.P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

The action of skis both sliding and gripping the snow is made possible by wax. Wax selection is influenced by:

- the moisture content in the snow,
- the temperature of the air,
- the shape of the snow crystals (flakes), and
- the age / type of snow.

In new snow, the layer of wax should be smooth and thin. In older snow, the layer of wax should be sticky and thick.

Being able to identify different types of snow is very important for cross-country skiers. The type of snow dictates the type / level of wax required for optimum skiing.

Cadets are not required to wax their own skis. This will be completed by an experienced staff member. They should, however, be able to tell the staff member what type of snow they will be skiing on.

New fallen snow. Very loose and light. The snowflakes still have multiple points / arms. If new snow is dry, it is feathery; if damp, it quickly consolidates into a stage of settled snow.

Powder snow. New, untouched freshly fallen soft snow. It can give the feeling of floating in a weightless environment. Powder snow can be packed in thick layers that form a natural pillow. Powder snow has a low moisture content, as almost 97 percent of it is air. Powder snow compacts easily.

Wind-packed snow. Snow blown from one direction, compacted by the force of the wind. Wind-packed snow is created by the pressure exerted by wind, causing a form of cold-heat hardening. In some areas the snow surface is strong enough to hold the weight of a person on skis.

Sun crust snow. Snow that has had the upper layer melt and then refreeze. Usually on top of powder snow, sun crust snow is stronger than the powder snow below it due to the refreezing. This snow can be dangerous as the crust may give away causing the skier to lose their grip.

Sun crust snow is not very stable on a slope and can be dangerous when weighted. The snow will give way causing a fall or a slide.

Corn snow. After thawing, corn snow occurs. The structure of the snow is very grainy at this point. Corn snow usually occurs in the spring, and can be strong enough to carry weight but it also can indicate the presence of rotten snow, which is very dangerous. Corn snow is produced during the cycle of melting and refreezing in the accumulated snow.

A layer of snow that has been sun crusted will become corn snow.

Rotten snow. Caused by repeated melting and freezing and is found mostly on the south side of hills, or in lower levels of snow. Water will seep to the lower layers and will not freeze because it is insulated from the weather by the covering snow layer. Rotten snow can resemble very small icicles, or candle ice. This snow is dangerous. Sudden drops may exists and holes develop under the surface of the snow. Falling and injury are highly possible.

Slush snow. When the air temperature becomes warmer than the freezing point, the snow begins to melt and the water content becomes high. Slush snow absorbs water from melting snow. Slush snow is recognizable by depressions in the snow with darker or bluish snow areas. These areas show holes in the ice or an accumulation of water on the surface of the ice. Skiing on this type of snow is not advisable.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS:

Q1. What do skis slide on?

Q2. What do new snow crystals (flakes) look like?

Q3. What type of snow has the lowest moisture content?

ANTICIPATED ANSWERS:

A1. Skis slide on the thin layer of moisture that is between the snow and the ski surface.

A2. New snow crystals (flakes) have many points and arms.

A3. Powder snow has the lowest moisture content.

Teaching Point 2 **Explain, demonstrate and have the cadets select and fit cross-country ski equipment.**

Time: 30 min Method: Demonstration and Performance

For this TP it is recommended that instruction take the following format:

1. Introduce the parts and characteristics of cross-country skis.
2. Demonstrate selection and sizing of cross country ski equipment.
3. Have assistant instructors issue the cadets cross-country ski equipment, using the sizing information recorded on the cadet's Cross-Country Ski Equipment Sizing Information Form. Have the cadets form a line to receive the items in the following order:
   a. cross-country skis,
   b. ski boots, and
   c. ski poles.
4. Monitor the cadets and check sizing as they practice the steps to fitting cross-country ski equipment.
5. Conduct equipment exchanges as required.
6. Label each cadet's cross-country ski equipment with gear or masking tape.

Note: Assistant instructors will be required to distribute cross-country ski equipment and monitor the cadets' performance.

Cadets have no option in the type of skis / bindings / boots that are used. Type will depend on expedition centre stores.

Cross-country skiing is a fun and challenging sport with origins dating back hundreds of years. Norwegian and Scandinavian immigrants brought the sport of cross-country skiing to North America in the late 1800s. While it was initially used as a mode of transportation for hunters, miners, and mail carriers, it has progressed into a winter sport that can be enjoyed by all ages and all fitness levels.

Cross-country skiing can be grouped into three categories:

- ski touring,
- track skiing, and
- backcountry skiing.

Ski touring. The broadest and most versatile category of cross-country skiing. Ski touring does not require groomed trails—skiers can walk out their 'backdoor' and enjoy nature in a park, through a forest, or along a country road.

SELECT CLASSIC CROSS-COUNTRY SKIS

Cross-country skiing is a sport that can be conducted with little or no training, which is what makes it so popular. It is critical that skiers have properly fitted equipment. Properly fitted equipment increases overall skiing efficiency, staves off injuries and increases personal enjoyment.

Parts of a Ski

1. **Tip.** The front of the ski.
2. **Tail.** The back of the ski.
3. **Waist.** The middle of the ski.
4. **Ski base.** The underside of the ski.
5. **Topsheet.** The upper surface of the ski.
6. **Sidewalls.** The sides of the ski.
7. **Edge.** Where the sidewall meets the ski base.

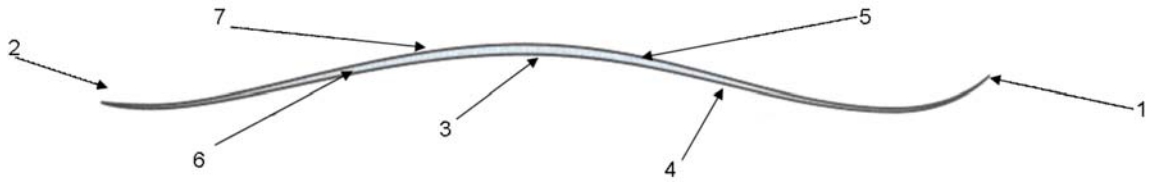


Figure 4 Parts of a Ski

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 59), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

Characteristics of Cross-Country Skis

1. **Camber.** The arch of a ski from tip to tail as it lies ski base down on a flat surface. Camber allows a ski to be thin and light but still support the skier's weight. Camber of a ski can be manipulated to control where and how much pressure is applied to the snow along the length of the ski.

Camber can be explained by thinking about an arched bridge versus a flat bridge. The weight and pressure of an arched bridge is transferred from the middle of each span to the support piers—allowing for lighter materials to be used and the space below the arch not requiring much support. To carry the same amount of weight, a flat bridge needs to be constructed from stronger materials and supported by piers along its entire length.

2. **Width.** The width of a ski depends on the type of snow the individual is skiing on. The softer the snow, the wider the ski should be. Likewise, if skiing on machine-groomed, hard-packed trails, a narrower ski is recommended.

3. **Length.** Classic cross-country skis are typically longer than skating skis. This is because skating skis are usually used on machine-groomed, hard-packed trails and do not require the ski to float to the surface of deep snow.

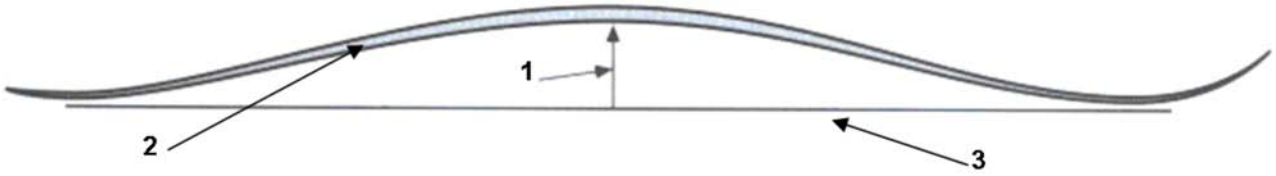


Figure 5 Characteristics of Skis

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 59), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

Selecting Skis

The chart below is a rough guide to follow when selecting a ski length. When selecting a ski length, it is always recommended that the manufacturer's sizing chart be consulted.

Ski Length	Carrying Capacity
168 cm	90–130 lbs
168, 178 cm	130–150 lbs
178, 188 cm	150–180 lbs
188 cm	180–220 lbs

The most common types of bindings used when cross-country skiing are:

- three-pin (75 mm), and
- system.

Three-pin bindings. Three-pin bindings work with boot soles and are shaped like a duckbill at the toe. The three pins at the front of the binding fit into three holes in the toe of the boot. A bar called a bail levers down from the upturned sides of the binding to clamp the toe of the boot sole to the ski and is held in place by a catch at the front. The duckbill that mates with the binding is 75 mm wide.

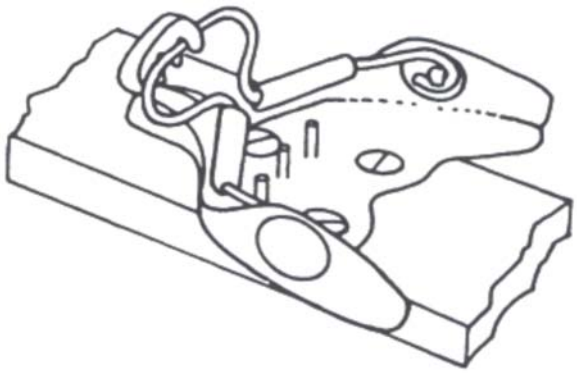


Figure 6 Three-Pin Binding

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 20), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

System bindings. There are two types of system bindings—Salomon Nordic System (SNS) and New Nordic Norm (NNN). They are not interchangeable. In both models, the ski boots have a deep channel in the sole and a bar beneath the toe that clips into the binding. A wide ridge mounted on the ski extends to the rear from the point where the bar mates with the binding. This ridge fits into the channel in the boot to provide side-to-side control.

Figure 7 NNN System Binding

Note. From *Back Country Ski Bindings* by In My View…Things as I see Them, 2009. Retrieved May 1, 2009, from http://1.bp.blogspot.com/_UFDhrGObeFc/SWWjkvg_8KI/AAAAAAAAArM/qmVXzDiE1ek/s400/nnnBCbindings.jpg

SELECT SKI BOOTS

Skis are guided and controlled through the boots, so it is important that they fit well. Boots are made from a variety of materials from all leather, to modelled plastic to a combination of materials. Lighter boots provide more freedom but offer less support. Heavier boots provide more support but usually restrict movement and are harder to fit. Boots that are too tight / loose may cause the skier incredible discomfort—resulting in blisters, frost bite, a twisted ankle, etc.

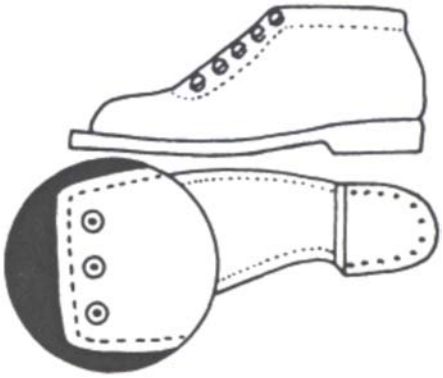


Figure 8 Three-Pin Binding Boots

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.) (p. 23), by W.J. Lederer & J.P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

Figure 9 NNN Binding Boots

Note. From *Back Country Ski Bindings* by In My View… Things as I see Them, 2009. Retrieved May 1, 2009, from http://1.bp.blogspot.com/_UFDhrGObeFc/SWWjkvg_8KI/AAAAAAAAArM/qmVXzDiE1ek/s400/nnnBCbindings.jpg

To check the fit of boots, slide the foot as far forward as it will go when standing up. With the toes just touching the front of the boot, there should be just enough room to slide the forefinger behind the heel.

SELECT SKI POLES

Ski poles are an integral part of cross-country skiing. Most techniques in cross-country skiing require the skier to not only use their skis, but their arms (poles) as well. Ski poles help the skier maintain balance while climbing inclines, when going downhill and when going forward.

Telescopic poles allow for adjustments for all sizes of skiers.

Parts of a Ski Pole

Ski poles have a variety of parts, they are:

1. **Basket.** Keeps the shaft of the ski pole from becoming fully submersed in the snow.
2. **Tip.** Allows the pole to dig into snow, ice and dirt so the skier gets a strong push.
3. **Shaft.** Is the main part of the pole—should be made from a strong material so it does not bend under pressure.
4. **Handle.** The handle is ergonomically designed for the comfort the skier.
5. **Strap.** Ensures that the pole moves with the skier.

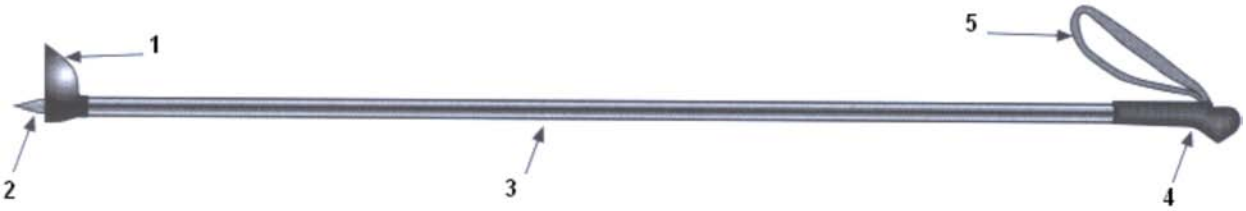


Figure 10 Parts of a Ski Pole

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 73), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

Characteristics of Ski Poles

A good ski pole should have the following characteristics:

- a medium-sized basket (the deeper the snow, the larger the basket should be),
- an adjustable strap,
- a weight distribution that concentrates the weight near the handle, and
- minimal bend when pressure is placed on it.

Sizing Ski Poles

Sizing ski poles to fit a cross-country skier requires the skier to stand up straight and hold the pole close to the body. The pole, when held upright, should come to a height in-between the top of the chest and the armpit.

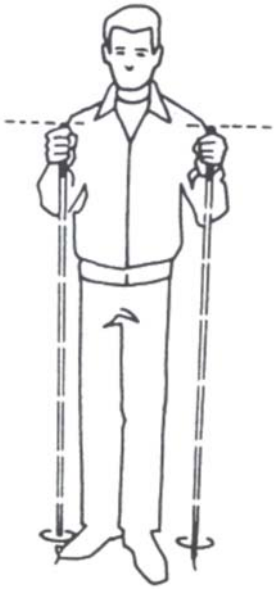


Figure 11 Sizing Ski Poles

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 26), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

FIT CROSS-COUNTRY SKI EQUIPMENT

The following process should be used to fit cross-country ski equipment:

1. Put on ski boots.
2. Adjust poles to proper size.
3. Find a flat spot where the snow is firm.
4. Place the skis on the snow side by side (about 30 cm [1 foot] apart).
5. Place poles into the snow, within reach, one on each side of the skis.
6. Identify the type of binding being used (three-pin or system).

Tell cadets what bindings are being used.

7. Attach the ski boot to the ski with:
   a. a three-pin binding by:
      (1) opening the bail (the bar that levers down from the upturned sides of the binding to clamp the toe of the boot sole to the ski);
      (2) brushing the snow off the bottom of the right (left) ski boot and the right (left) ski binding;
      (3) sliding the square toe of the boot into the toe piece of the binding beneath the open bail;
      (4) pressing down with the ball of the foot to push the three pins of the binding into the ski boot (ensure that the pins are aligned before pressing down);
      (5) closing the bail by pushing down and clamping it to the plate; and
      (6) completing the process again for the other ski; and

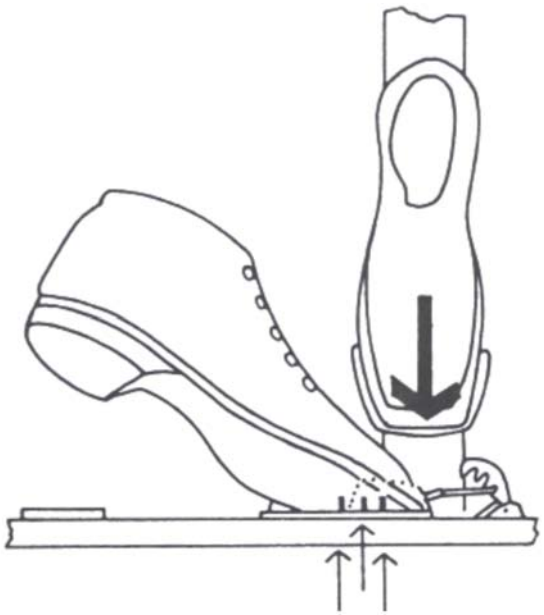


Figure 12 Attaching a Ski Boot to a Three-Pin Binding

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.) (p. 36), by W.J. Lederer & J.P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

There is a left and a right ski when using three-pin bindings. The part of the binding which flares out is always on the outside.

b. a system binding by:

(1) pulling up on the toe piece to open the binding;

Some system bindings are automatic and do not require the binding to be opened. If the toe piece does not pull up, then it is automatic.

(2) brushing the snow off the bottom of the right (left) ski boot and the right (left) ski binding;

(3) placing the bar located on the bottom of the toe piece of the ski boot into the slot on the binding;

(4) pushing down with the ball of the foot to force the bar into the slot;

(5) closing the toe piece if manual bindings are being used or listening for the click of the binding locking if automatic bindings are being used; and

(6) completing the process again for the other ski.

8. Grasp the ski poles by moving each hand up the shaft of the pole and into the strap from the bottom so that the thumb rests over the strap.

Figure 13 Grasping the Ski Pole

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 41), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

CONFIRMATION OF TEACHING POINT 2

The cadets' fitting of cross-country ski equipment will serve as the confirmation of this TP.

Teaching Point 3 **Explain, demonstrate and have the cadets practice classic cross-country ski techniques along a route.**

Time: 220 min Method: Demonstration and Performance

The purpose of this TP is to provide cadets instruction on cross-country ski techniques and once a level of proficiency has been established in each skill, for the cadets to travel a designated route for 6–10 km.

For this skill TP it is recommended that instruction take the following format:

1. Explain and demonstrate each skill while the cadets observe.
2. Explain and demonstrate the steps to complete each skill while the cadets observe. Monitor the cadets as they practice each step.
3. Monitor the cadets' performance as they practice each skill.

Assistant instructors will be required to monitor the cadets' performance.

The ideal area for learning cross-country ski techniques is relatively flat, with a gentle hill in close proximity. It is better to have packed snow, rather than deep snow or ice.

CROSS-COUNTRY SKI TECHNIQUES

Cross-country skiing is a sport that requires very little skill. Anybody can put on a pair of skis and play in the snow. Understanding stroke mechanics and techniques will, however, make skiing more efficient and enjoyable.

Having the correct body position when cross-country skiing is very important. When in the proper cross-country ski position, the skier is in a relaxed half-sitting position. The feet are flat, knees slightly bent, the head should be up, and the poles lightly grasped.

Falling Down

No matter how good a cross-country skier a person is, there is always a chance that they will fall down. It is not the falling that is difficult when cross-country skiing. Getting up after the fall is what most people struggle with.

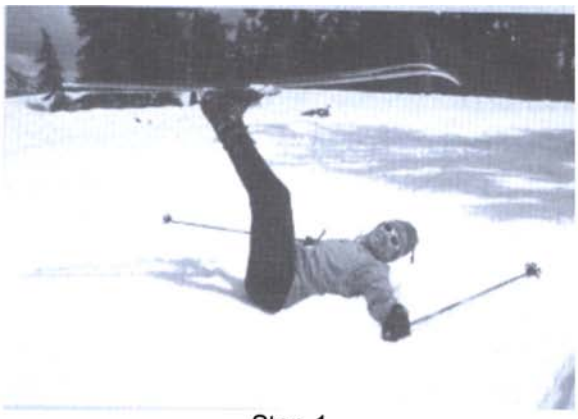
If a skier feels like they have lost their balance / they are going to fall:

1. Check the area for rocks or tree stumps to avoid, if possible.
2. Sit down to one side or the other of the skis.
3. Keep legs below the rest of the body.
4. Dig the skis into the snow to stop any forward momentum.

It is dangerous for a skier to fall forward onto their knees. This could injure the skier's knees / ankles. As well, when falling forward, a person generally sticks their arms out to break the fall—this could result in an injury.

To get up after a fall:

1. Roll onto their back and stick their limbs, skis and poles into the air to untangle them.
2. Place skis below the body.
3. Keep legs extended.
4. Slide hips towards the tips of the skis (if on a hill stop just beside the skis, if on flat ground place chest on skis).
5. Come to one knee (plant poles to assist with coming to one knee).
6. Stand up.



Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Figure 14 Steps to Getting Up After Falling Down

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (pp. 36–37), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

Stopping

For their own safety and for the safety of those around them, it is extremely important that cross-country skiers are able to slow down and stop themselves on flat ground and on hills. The principles for both are the same and require the skier have constant control of their body and their skis. A cross-country ski glides most effectively when it is flat on the ski base. A ski begins to loose forward momentum as soon as it is tipped to either edge. Therefore to stop, the skier must tip the ski to the edge—this is called edging.

Edging can be done when the skis are parallel or when they are in a wedge position—tips together, tails spread apart to form an 'A'.

The wedge position is also sometimes referred to as the snowplow position. Some may be more familiar with this term as it is also used in downhill skiing.

There are two types of wedging:

- the half wedge, and
- the full wedge.

To slow down / stop using the half wedge:

1. Decide which ski they are going to move into the half wedge position.
2. Keep one ski parallel.
3. Move into the half wedge position by:
    a. bringing the knees together;
    b. keeping the tips of the skis together; and
    c. moving the tail of the desired ski outward by pushing the heel out and the toes inward.
4. Angle the inside edge of the wedged ski into the snow by rolling the ankle inward (the more the edge is angled into the snow, the faster the skier will slow down / stop).

Figure 15 Half Wedge

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 50), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

To slow down / stop using the full wedge:

1. Sink into a crouch.
2. Bring the knees together and point them toward the tips of the skis.
3. Keep the tips of the skis together (but not touching).
4. Move the tails of the skis outward by pushing the heels outward and the toes inward.
5. Angle the inside edges of the wedged skis into the snow by rolling the ankles inwards (the more the edge is angled into the snow, the faster the skier will slow down / stop).

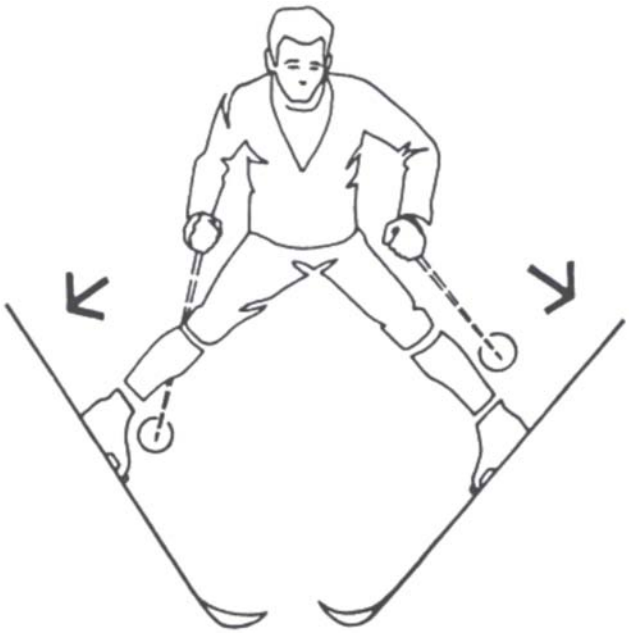


Figure 16 Full Wedge

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 52), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

Changing Direction

Whenever on cross-country skis there is always a requirement for the skier to change direction of travel. It is a fairly simple process that requires practice in order to perfect it.

For new cross-country skiers, it is recommended that they stop before attempting to change direction. Once they become more proficient, they may employ these skills while moving.

Changing direction can be carried out by picking up the tip, the tail or the entire ski, one at a time, and moving it toward the new direction of travel—then repeating the process with the other ski. Depending on the degree of the turn, the skier may need to complete this process a number of times before reaching the desired direction.

To change direction:

1. Assume the half-sitting position.

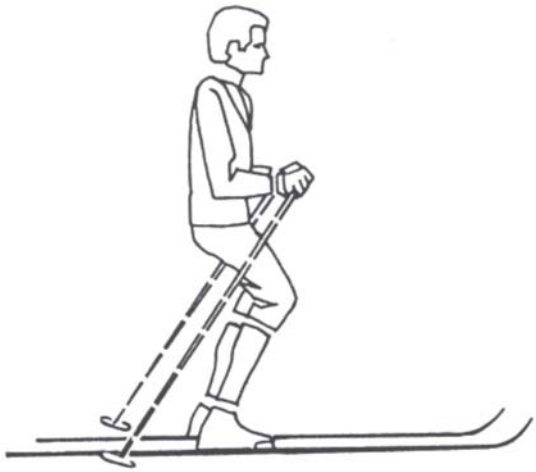


Figure 17 Half Sitting Position

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 40), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

2. Move the left (right) ski forward until left (right) boot toe is just ahead of the right (left) boot toe.
3. Lift the tip of the left (right) ski about 30 cm (1 foot) off the ground.
4. Move the lifted ski slightly to the left (right), about an arc of 30 degrees.
5. Place the left (right) ski on the ground and transfer the weight to it.
6. Bring the right ski around, in the same manner, to meet the left ski.
7. Repeat Steps 2–6 until facing the desired direction.

Figure 18 Changing Direction

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (pp. 42–43), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

Figure 19 Ski Tracks When Changing Direction

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (pp. 42–43), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

To pick up the tip of the ski, the skier has to:

1. lift their toes so they come up to the top of the ski boot;
2. flex their foot up to their shin; and
3. lift their knee toward their chest.

To pick up the tail of the ski, the skier has to:

1. curl their toes down against the sole of their ski boot;
2. bring their heel to their butt; and
3. keep their knees close together.

Moving forward when cross-country skiing requires the skier to incorporate balance, glide, grip, rhythm, and poling.

Balance. To maintain balance, skiers have to constantly adjust their centre of gravity with their hips and upper body centred over their skis as they glide.

Glide. Moving the body forward from the ankles puts the body in motion and allows the skier to 'keep up' with their feet and glide more with each stride.

Grip. Glide can not occur without good grip. Cross-country skis have a grip zone centred beneath the ball of the foot in the middle of the ski. This grip zone makes the ski stick to the snow when pressure is applied by the skiers foot during the push of each stride.

Rhythm. Skiers must develop a slow and steady rhythm to their stride, moving effortlessly from one ski to the next. For some, this is a difficult concept, but can be developed with practice.

Poling

There are two different poling techniques that a cross-country skier can use, to include:

- **Diagonal poling.** Uses the pole opposite of the gliding ski to create additional forward motion of the skier. The skier plants and pushes with only one pole at a time; and
- **Double poling.** Simultaneously uses both poles to propel the skis and skier forward. Used to go down gentle slopes in order to gain speed and on flats when the skier is not using the diagonal stride.

The following poling principles should be considered:

- Poles can not push forward unless they are angled to the rear.
- The skier gets a stronger push when their arms are bent rather than straight.
- Pushing the pole back rather than down converts more of the skiers energy into forward motion at the end of a stroke.
- The skier should use their body weight, not just their arms—pull with their core, to move forward.
- The skier should concentrate on pushing with their poles rather than bringing them forward.

To diagonal pole:

1. Assume the half-sitting position.
2. Move the left ski so that it is forward of the right ski.
3. Lean forward.
4. Transfer the weight to the left ski.
5. Plant the right pole just ahead of the left ski boot (to the right of the path that the right ski will take) with the handle ahead of the basket.
6. Simultaneously push off with the left ski and push the right pole back (ensure that core strength is used, not just the arms).
7. Recover by lifting the left pole.
8. Repeat the process with the other pole.

Figure 20 Diagonal Poling / Diagonal Stride

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 146), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

To double pole:

1. Assume the half-sitting position.
2. Keep the elbows close into the body.
3. Round the back;
4. Lean forward.
5. Plant the poles just ahead of the ski boots (handles should be ahead of the baskets).

6. Contract the stomach muscles.
7. Push forward and extend the arms back.
8. Stand up.
9. Allow the arms and poles to swing forward.
10. Prepare for the next pole plant.

Figure 21 Double Poling

Note. From *Cross-Country Skiing: Building Skills for Fun and Fitness* (p. 43), by S. Hindman, 2006, Seattle, WA: The Mountaineers Books. Copyright 2005 by The Mountaineers Books.

Executing the Diagonal Stride

When cross-country skiing, the most frequently used way to move forward is by executing the diagonal stride. It is called the diagonal stride because the right leg and the left pole (and vice versa) work together to move the skier forward. The diagonal stride technique makes for greater forward thrust and easy balance.

The body movement when executing the diagonal stride is the same as marching.

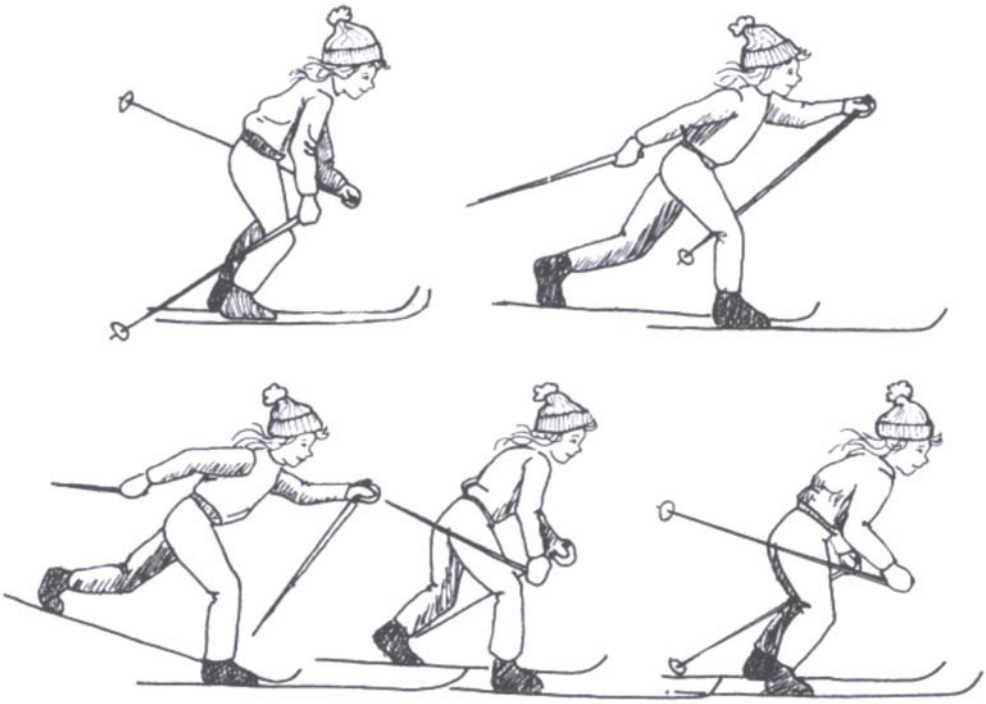


Figure 22 Diagonal Stride Technique

Note. From *Ski Games: A Fun-Filled Approach to Teaching Nordic and Alpine Skiing* (p. 92), by L. Gullion, 1990, Champaign, IL: Leisure Press. Copyright 1990 by Laurie Gullion.

The steps to execute the diagonal stride are the same as those to diagonal pole.

Ascending Hills

The biggest factor that affects a skier's ability to traverse up a hill is grip. Grip comes from the skier staying over their feet and pushing their skies straight down into the snow. There are two different techniques that can be used to ascend hills:

Herringbone. A technique used to climb straight up a hill on the inside edges of the skis with the tips farther apart than the tails. A skier using the herringbone technique to ascend a hill leaves an imprint that resembles the skeleton of a fish.

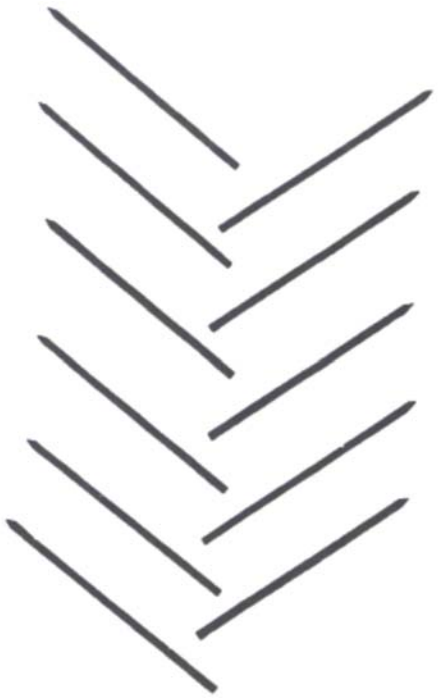


Figure 23 Herringbone Tracks

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 90), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

To use the herringbone technique to ascend a hill:

1. Place skis into a 'V' formation (the tails should be close together).
2. Turn the legs out.
3. Transfer the weight onto the left (right) foot.
4. Lift up the right (left) ski and move it forward.
5. Plant the left (right) pole behind the left (right) ski.
6. Repeat until reaching the top of the hill.

Figure 24 Herringbone Technique

Note. From *Complete Cross-Country Skiing and Ski Touring* (2nd ed.), (p. 91), by W. J. Lederer & J. P. Wilson, 1970, Toronto, ON: George J. McLeod Ltd. Copyright 1970 by William J. Lederer and Joe Pete Wilson.

On steep hills, the skier has to dig in the edges of their skis to maintain grip and position.

Side step. Is a technique where the skier places their skis horizontal to the hill and moves upward using short side steps. A skier uses the side step when a hill gets too steep, the snow becomes too deep, or the herringbone becomes too tiring.

To use the side step technique to ascend a hill:

1. Place the skis horizontal to the hill to be ascended.
2. Keep the body upright and centred over the skis.
3. Move the torso sideways and up the hill.
4. Plant the pole ahead of them.
5. Lift and move the ski up.
6. Dig the edge of the ski into the snow.
7. Repeat until the top of the hill is reached.

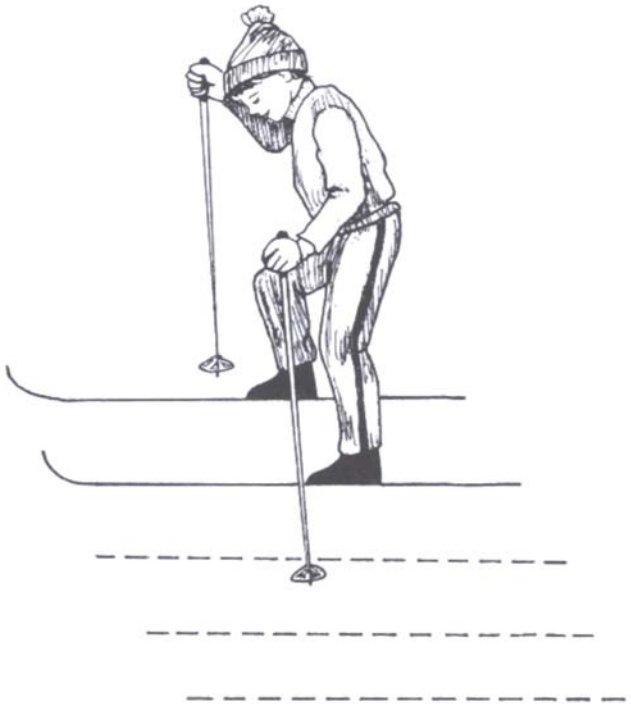


Figure 25 Side Step Technique

Note. From *Ski Games: A Fun-Filled Approach to Teaching Nordic and Alpine Skiing* (p. 100), by L. Gullion, 1990, Champaign, IL: Leisure Press. Copyright 1990 by Laurie Gullion.

Descend a Hill

The most important factors to descending a hill safely are balance and control. A skier should never just turn their skis downhill and go—the descent must always be controlled. In other words, the skier must always be ready to slow down or stop.

When descending a hill:

1. Adopt the half-sitting position.
2. Keep the head up and look forward.
3. Move the skis so that they are just under shoulder width apart.
4. Ensure the feet are flat on the skis.
5. Look down the slope to make sure there are no obstacles.
6. Drop the hands to thigh level.
7. Hold the pole shafts toward the back, keeping the baskets off the snow.
8. Glide down the hill.
9. Slow down / stop by executing a full wedge.

ACTIVITY

Time: 120 min

OBJECTIVE

The objective of this activity is to have the cadets, in teams of no more than six, ski along a route for 6–10 km with an expedition field pack to practice cross-country ski techniques.

RESOURCES

- Personal expedition equipment,
- Personal cross-country ski equipment,
- Group cross-country ski equipment, and
- Water carrier (one per cadet).

ACTIVITY LAYOUT

Nil.

ACTIVITY INSTRUCTIONS

1. Conduct a briefing to include an explanation of:
    a. the objectives and importance of the activity,
    b. the resources that may be required to perform the activity, and
    c. any safety guidelines that must be followed while performing the activity.
2. Have the cadets retrieve their cross-country ski equipment and expedition field packs.
3. Have the cadets, in teams of no more than six, cross-country ski with an expedition field pack, following the designated route for a distance of 6–10 km during an expedition to practice:
    a. falling;
    b. stopping using:
        (1) the half wedge, and
        (2) the full wedge;
    c. changing direction;
    d. poling by:
        (1) diagonal poling, and
        (2) double poling;
    e. executing the diagonal stride;

f. ascending hills by:

(1) employing the herringbone technique; and

(2) employing the side stepping technique; and

g. descending hills.

4. Upon arrival at the end point, have the cadets remove, clean and inspect their cross-country ski equipment for damage and then store / return all equipment.

5. Conduct a debriefing by asking the cadets:

a. how they felt about the activity;

b. how they felt their team worked together;

c. what portion of the activity challenged them the most;

d. how their teammates assisted them when they were challenged;

e. if there are any specific examples of when their team bonded;

f. how the team made decisions;

g. whether or not all team members ideas / suggestions were considered; and

h. what they would do as a leader of this type of activity to ensure their subordinates enjoyed the experience.

SAFETY

- The Team Instructor(s) (TI) must be in sight or sound of the team at all times.
- In areas of complex / technical terrain, TI(s) will demonstrate requisite skills as required.
- Teams will travel separately on the same trail.
- There will be a minimum of 500 m between teams at all times.
- Cadets must travel in single file at all times.
- Cadets must have at least 1 L of water.
- Water resupply points will be located along the route.
- Meals will be provided at a predetermined location(s) and detailed in the route instructions.

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 cross-country skiing along a route will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

This lesson is assessed IAW A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, Chapter 3, Annex B, 426 PC.

CLOSING STATEMENT

Skiing is a fun and challenging mode of travel that can be used during winter expeditions. Being aware of the different types and characteristics of snow and ice helps ensure the safety of all expedition participants. Possessing the ability to execute classic cross-country ski techniques makes the experience more enjoyable and the expedition more efficient.

INSTRUCTOR NOTES / REMARKS

Expedition centres are required to select two dynamic modes of travel from EO M426.02a (Paddle a Canoe), EO M426.02b (Ride a Mountain Bike), EO M426.02c (Hike Along a Route), EO M426.02d (Snowshoe Along a Route) and EO M426.02e (Ski Along a Route) to incorporate into the expedition training.

This EO has been allocated nine periods in the overall course period allocation. Each expedition centre may adjust this allocation to reflect the choice of activities, facilities and available resources at the expedition centre.

Upon arrival at the expedition centre, cadets will be divided into teams. Cadets will be given an opportunity to navigate and lead peers. These teams will remain the same for the duration of the weekend.

Total distance for the cross-country ski route may be adjusted depending on trail availability and skill level of participants.

IAW A-CR-CCP-951/PT-002, *Royal Canadian Army Cadets Adventure Training Safety Standards*:

1. the following personal cross-country ski equipment is required when cross-country skiing:
    a. ski boots,
    b. skis,
    c. poles,
    d. appropriate cold-weather clothing, and
    e. a whistle;
2. the following group cross-country ski equipment is required when cross-country skiing:
    a. topographical / trail map of area as required,
    b. compass,
    c. first aid kit,
    d. communication device (eg, cellular phone or hand-held radio),

e. GPS receiver, and

f. cold weather emergency kit appropriate to the activity; and

3. weather must be continuously assessed. If the temperature falls below -20°C (with the wind-chill factor calculated in), cadets must be brought inside.

REFERENCES

C2-004 ISBN 1-896713-00-9 Tawrell, P. (1996). *Camping and wilderness survival*: The ultimate outdoors book. Green Valley, ON: Author.

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C2-247 ISBN 978-0-393-08734-5 Lederer, W. J., & Wilson, J. P. (1970). *Complete cross-country skiing and ski touring*. (2nd ed.). Toronto, ON: George J. McLeod Ltd.

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CROSS-COUNTRY SKI EQUIPMENT SIZING INFORMATION FORM

Name: _____ **Team:** _____ **Height:** _____ **Weight:** _____ **Shoe Size:** _____	**Name:** _____ **Team:** _____ **Height:** _____ **Weight:** _____ **Shoe Size:** _____
Name: _____ **Team:** _____ **Height:** _____ **Weight:** _____ **Shoe Size:** _____	**Name:** _____ **Team:** _____ **Height:** _____ **Weight:** _____ **Shoe Size:** _____

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