ROYAL CANADIAN ARMY CADETS

SILVER STAR

INSTRUCTIONAL GUIDE

SECTION 4

EO C321.02 – IDENTIFY SAFETY CONSIDERATIONS WHEN TRAVELLING OVER SNOW AND ICE

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-703/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

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

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson, as it introduces travelling over snow and ice and generates interest in being outside in the winter.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have identified safety considerations when travelling over snow and ice.

IMPORTANCE

It is important for cadets to understand the safety implications when travelling over snow and ice in order to remain safe when on a winter FTX or while enjoying winter sports.

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Teaching point 1 **Describe Types of Snow and Ice**

Time: 20 min Method: Interactive Lecture



Snow and ice change with heating and cooling, and are largely affected by weather. This TP is intended to introduce cadets to the different types of snow and ice.

SNOW

Snow. A type of precipitation in the form of crystalline water ice (snowflake). Snow is granular with an open soft structure and will remain on the ground until it melts into water.

Snow Pack. The accumulation of snow in an area.

TYPES OF SNOW

New Fallen Snow. Very loose and light. The snowflakes still have their multiple branches. This type of snow is excellent insulation.

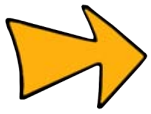
Powder Snow. New, untouched freshly fallen soft snow. It can give the feeling of floating in a weightless environment. Powder can be packed in thick layers that form a natural pillow. Powder snow has low moisture content almost 97 percent of it being air and is favoured among skiers to perfect skills. In coastal regions, where there is higher humidity, the snow is heavier than in a continental region.

Wind-Packed Snow. Snow blown from one direction, compacted by the force of the wind. Wind packed snow is caused by the pressure exerted by wind causing a form of cold-heat hardening. In some areas, the snow surface is strong enough to hold weight and snowshoes are particularly useful.



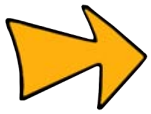
Wind-packed snow is great for cutting blocks for igloos and other snow structures.

Sun Crust. Snow that had the upper layer melted and then refrozen. Usually on top of powder snow, sun crust snow is stronger than the powder snow below it due to the refreezing.



Sun crust is not very stable on a slope and can be dangerous when weighted.

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. 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 repeat 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

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by the covering snow layer. Rotten snow can resemble very small icicles, or candle ice. This snow is dangerous due to a risk of falling through.

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.

ICE

As water cools, it contracts in volume, reaching greatest density at 4 degrees Celsius (39 degrees Fahrenheit) where it begins the freezing process. Ice is a densely packed material formed from snow without air bubbles, or a crystalline solid which is brittle and transparent.

Ice can be frozen water or cold-heat packed snow like that of glaciers and icebergs.

TYPES OF ICE

Surface Ice. Found on land, over different surfaces, including man-made materials.

Candle Ice. Suspended vertical needles of ice that do not have a solid structure. Stepping on candle ice is like stepping on slush.

Lake Ice. The layer of frozen water that forms on the surface of the lake. Often the ice strength is dependent upon the conditions under which it was formed.



Lake ice 10 cm (4 inches) in thickness is generally considered safe to walk on. However, caution should always be used, as this is still dependent on the type of ice, how it was formed and how many layers there are. Ice thickness can also change depending on where one is on the lake, this is especially true where water is running into the lake, eg, from a stream, river, or man made discharge.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is rotten snow?

Q2. What is the best snow for building snow structures?

Q3. What are the three kinds of ice?

ANTICIPATED ANSWERS

A1. Rotten snow is snow found on the south side of hills, or lower levels of snow. It is caused by repeated melting and freezing.

A2. Wind packed snow.

A3. Surface ice, candle ice and lake ice.

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Teaching point 2 **Discuss Characteristics of Snow and Ice**

Time: 5 min Method: Interactive Lecture

CHARACTERISTICS OF SNOW AND ICE

Weight-Carrying Capacity

Weight-carrying capacity is defined as the capacity of weight that can be supported by the snow. When the snow is packed hard, weight-carrying capacity is greater and movement is easier. Ice is often stronger, but movement is more difficult due to the slippery surface.

Sliding Characteristics

Important to skiers and snowboarders, sliding characteristics are how a material glides over the snow. The sliding characteristic varies greatly due to the type of snow.

Holding Capacity

Holding capacity is the ability to act upon ski wax to avoid backslapping. Backslapping is when the ski does not slide on the snow, but lifts from the snow causing a slapping noise. Holding capacity changes greatly with different types of snow, making different versions of wax a necessity.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is weight-carrying capacity?

Q2. Explain sliding characteristics.

Q3. Define holding capacity.

ANTICIPATED ANSWERS

A1. Weight-carrying capacity is defined as the capacity of weight that can be supported by the snow.

A2. Sliding characteristics are how a material glides over snow.

A3. Holding capacity is the ability to act upon ski wax to avoid backslapping.

Teaching point 3 **Discuss Water Dangers**

Time: 10 min Method: Interactive Lecture



This TP is designed to introduce cadets to the dangers of travelling over ice and snow in winter. This introduction does not provide cadets with skills or training to effectively select a route for a group.

WATER DANGERS

In the winter, hiking can be enjoyable, but like all outdoor activities there are dangers that need to be considered.

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Frozen Waterway Travel

Frozen bodies of water including lakes, rivers and creeks are the most suitable routes for trails. Frozen waterway travel is an advantage as they are relatively flat and have little snow accumulation due to blowing wind.

The primary disadvantage of travelling on waterways is that the route can become unstable with sudden temperature changes.

Ice Route Selection

When travelling on ice, the most experienced person in the group should select the travel route.

Ice conditions can change quickly and should always be treated with suspicion, as there may be water under the snow surface (rotten snow). Areas where rotten snow is found should be bypassed.

Rivers with a stronger current will continue to flow below the ice cover even through the coldest temperatures.

Weak Ice

The strength of the ice varies with its structure and temperature. Snow cover or a warm period will weaken the ice. A sudden thaw can create cracks in the ice and weaken it more.



Weak ice should be avoided at all times.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is the primary disadvantage when travelling over frozen waterways?

Q2. What should be remembered when travelling on an ice route?

Q3. When should weak ice be avoided?

ANTICIPATED ANSWERS

A1. The route may become unstable.

A2. There could be flowing water under the surface.

A3. Weak ice should be avoided at all times.

Teaching point 4 **Discuss Winter Travel**

Time: 20 min Method: Interactive Lecture



This TP is designed to introduce cadets to the dangers to consider when travelling in winter conditions.

Instructors should present the information emphasizing the importance of safe travel.

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WINTER TRAVEL

Winter travel is more complicated and more difficult than summer travel. Snow pack affects mobility in a variety of ways, and winter requires cold weather equipment.

Planning for the cold and preparing for a winter trip does not just mean planning for what will happen. It is important to pack extra equipment (eg, an extra pair of socks, emergency blanket, or fire starter) that will be beneficial should something unexpected arise.

Heavy snow cover impedes movement, both cross-country and on road. A route which was passable during the day may become impassable at night due to falling temperatures re-freezing the surroundings.

Basic Rules for Winter Travel

There are some basic rules everyone travelling outdoors in the winter should follow:

- Plot the route on a map and highlight key landmarks.
- Ensure all members of the group are fully prepared and aware of the route and possible difficulties.
- Have a trail breaking rotation so the lead person does not get tired.
- Travel in single file.
- Ensure equipment is checked and evenly distributed.
- Dress consistent with the weather to reduce sweating.
- Stop 15 minutes into the hike to adjust equipment.
- Use the buddy system in northern climates.
- Watch carefully for signs of frostbite.

Use of Snowshoes or Skis

Snowshoes and skis both provide floatation (ability to stay on the top layer) on snow. They are often useful for cross-country travel and have gained popularity with those travelling in winter. Depth and type of snow will determine the level of support and the speed of movement.

Snowshoes are particularly useful in confined areas. Carrying and transporting snowshoes is simple due to their size and weight. On steep slopes however, snowshoes have limited traction and the snowshoe will often slide, causing the wearer to lose their footing.

Skiing is often harder in deeper snow, and the trail breaker must be switched often. Skiing is versatile in most terrains, particularly in areas with hills as skiers are able to gain speed on the downward slope.

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WINTER TRAVEL TIME

	Unbroken Trail	Broken Trail
On Foot:		
• Up to 1 foot of snow	1–2 mph	1.5–2 mph
• Over 1 foot of snow	0.24–0.75 mph	1.25–2 mph
Snowshoeing	1–2 mph	2–2.5 mph
Skiing	1–3.5 mph	3–3.5 mph

Tripping and Falling in the Snow

Snow cover blankets many terrain features and hides obstacles, such as stumps, brush, rocks, and ditches, that may cause tripping and falling.

A long pole or hiking stick should be carried and used to find obstacles. Any obstacles, including the smallest ones, should be avoided to prevent injury.

Best Time to Travel

In winter, travel time will vary from hour to hour. Generally the best time to travel is early in the morning after a cold night. This is when snow and ice are most stable.

Some travel guidelines include:

- Travel in shaded areas to avoid disturbing the stability of the snow in sunny spots.
- Days are shorter in winter, so timings should be adjusted to avoid overnight stays in dangerous areas.
- Avoid travel in snow higher than calf deep. Travelling in deep snow wastes energy and it is very difficult to see potential obstacles.
- Travelling in late winter should be given special consideration as the snow pack may be more unstable because of the warmer temperatures.

Trail Selection

Forest travel provides protection from wind. It is particularly important to plan routes in the winter to ensure a safe and protected route is followed. Special attention should be given to trail markings and signs.

Dangers of Winter Travel

Winter travel is more difficult than summer travel, and snow conditions will dictate when and how far a group moves.

Deep snow could hide trail markers and be prone to avalanches and ice patches.



If travelling in mountain areas, an avalanche course should be completed and the necessary equipment, such as an avalanche beacon, should be taken on all trips.

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CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is the purpose of snowshoes?

Q2. When is the best time of day to travel in winter?

Q3. What are the basic rules for winter travel?

ANTICIPATED ANSWERS

A1. Snowshoes provide floatation (ability to stay on the top layer of snow) in the snow.

A2. Early in the morning after a cold night is the best time to travel.

A3. The basic rules of winter travel are:

- Plot the route on a map and highlight key landmarks.
- Ensure all members of the group are fully prepared and aware of the route and possible difficulties.
- Have a trail breaking rotation so the lead person does not get overly tired.
- Travel in single file.
- Ensure equipment is checked and evenly distributed.
- Dress consistent with the weather to reduce sweating.
- Stop 15 minutes into hike to adjust equipment.
- Use the buddy system in northern climates.
- Watch carefully for signs of frostbite.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is powder snow?

Q2. What are the considerations for ice route selection?

Q3. What causes falling or tripping in the snow?

ANTICIPATED ANSWERS

A1. Powder is new, untouched freshly fallen soft snow.

A2. Ice conditions can change easily and should always be treated with suspicion, as there may be water under the snow surface. Areas where rotten snow is found should be bypassed.

A3. Snow cover blankets many terrain features and hides obstacles to movement. Stumps, brush, rocks, ditches are all covered, obscuring potential obstacles.

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CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Travelling on snow and ice can be hazardous to both personnel and equipment. Knowing the different types of snow and ice as well as the dangers inherent with winter travel, will assist cadets in making decisions on winter travel.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-004 (ISBN 1-896713-00-9) Tawrell, P. (1996). *Camping and Wilderness Survival: The Ultimate Outdoors Book*. Green Valley, ON: Paul Tawrell.

C2-012 (ISBN 0-89886-643-X) Weiss, H. (1988). *Secrets of Warmth for Comfort or Survival*. Seattle, WA: The Mountaineers.

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