

Message from the Assistant Deputy Minister

I am pleased to announce the distribution of a revised Field Safety Guide for the Earth Sciences Sector. This Guide is complementary to Part II of the Canada Labour Code and Treasury Board Guidelines and Directives pertaining to occupational health and safety matters. It serves to provide a more comprehensive package of information to managers and field personnel alike on a wide range of health and safety issues applicable in our diverse work environments.

Our people are our greatest resource. The health and safety of each individual are of paramount importance to us. Senior management is committed to ensuring that our staff has the training, equipment and all necessary support materials to ensure adequate protection from dangers and hazards that may arise in the course of doing their work. It should be recognized, however, that health and safety is a shared responsibility between employer and employee. Please familiarize yourself with the contents of this Guide and ensure that you are carrying out your duties with due regard for personal safety.



Dr. Irwin Itzkovitch
Assistant Deputy Minister

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PART 1

GENERAL

1 INTRODUCTION

Field operations expose personnel to a variety of occupational risks and hazards. Although the responsibility of providing adequate information, instruction on safety issues and enforcing the basic rules lies with the employer, it is up to the individual to become as self-reliant as possible in terms of safety awareness. The purpose of this manual is to identify major areas of concern regarding safety in the field and provide an outline of basic occupational health and safety practices.

The Canada Labour Code requires active participation by both management and employees in promoting occupational safety and health. It calls for active participation at the local level through occupational safety and health committees and representatives. The Code also expands employee rights in the workplace. It is to everyone's advantage that all employees know and understand their roles and responsibilities in maintaining a safe and healthy work environment (Canada Labour Code, R.S., 1985, C.26 (4th Supp.), s.3; 2000, c.20, s.12)

This manual brings together many policies and guidelines from a wide array of sources including excerpts from various reference manuals. Its purpose is to help the Earth Sciences Sector (ESS) managers and field personnel to ensure that the health and safety of all field staff are protected, in accordance with Part II of the Canada Labour Code and Treasury Board Policies/Directives. The guidelines are intended to remind all field personnel of their responsibility to consider all of the relevant health and safety policies and procedures applicable to their field operations. For the purpose of this guide, field personnel are defined as any person employed by the employer (i.e. students, interns, volunteers, contractors, emeritus scientists, visiting scientists and all others who are required to work in field conditions).

The manual covers a wide spectrum of situations in the field. Its purpose is to identify both general and specific hazards associated with particular field operations. Where applicable, procedural guidelines for minimizing risk such as use of personal protective equipment, accompany many sections.

This Guide is not a substitute for proper training. Field personnel should already have the appropriate training, licences and certificates for various situations; where required, line managers must ensure that field staff have all the appropriate training necessary before going out to the field. The manual does indicate some training requirements.

Field personnel may occasionally have to make decisions based on particular local conditions and arrangements. In all such cases, the safety and health of all employees should be of paramount consideration.

Throughout the manual, the term "should" implies that the safety procedures or health precautions mentioned are necessary to protect employees from an occupational accident, injury or illness, even though such measures may exceed regulatory standards or requirements. Where any conflict exists between this manual and any legislation or regulation having jurisdiction, the latter shall take precedence.

Sections of this Guide have been reproduced with permission from Environment Canada's Hydrometric Field Operations Safety and Health Manual, 1995. For further information regarding any section, please contact the Earth Sciences Sector Health, Safety & Environment Office at (613) 992-2892.

2 LEGISLATION, ROLES AND RESPONSIBILITIES

2.1 THE CANADA LABOUR CODE

Federal departments and agencies are subject to the regulatory provisions of the Canada Labour Code. Regulations promulgated under the Code include the Canada Occupational Safety and Health Regulations, the Workplace Hazardous Materials Information System (WHMIS) and the Safety and Health Committees and Representatives

Regulations. The Labour Program of Human Resources Development Canada (HRDC) enforces the provisions of the Code and its regulations through monitoring and enforcement and compliance programs that include inspections, investigations and the issuing of directives. Under the Code, employers and employees can be held legally accountable for non-compliance. (CLC, R.S. 1985, c.C-46)

2.2 TREASURY BOARD POLICY ON OCCUPATIONAL SAFETY AND HEALTH

The Treasury Board Manual component entitled “Personnel Management” contains a volume on Occupational Safety and Health which outlines policies, directives, standards and procedures to ensure that federal departments comply with the intent and provisions of the Canada Labour Code and its regulations (Occupational Safety and Health Handbook, Fifth Edition, Treasury Board of Canada Secretariat, Government of Canada). In some cases, the Treasury Board requirements are more stringent than the Code. See Appendix A for further reference.

All field personnel should familiarize themselves with the following Treasury Board directives, standards and guidelines before field duty:

Directive 2-5	First-Aid Safety and Health Directive
Directive 2-9	Tools and Machinery Directive
Directive 2-11	Motor Vehicle Operations Directive
Standard 2-13	Occupational Health Evaluation Standard
Directive 2-14	Personal Protective Equipment Directive
Guide 5-3	Safety Guide for Operations over Ice
Guide 5-4	Safety Guide for Field Operations
Advisory 6-3	The Effects of Extreme Cold

2.3 OTHER LEGISLATION

In addition to the Canada Labour Code, one should also be aware of provincial and territorial occupational safety and health legislation, as mentioned above, and municipal safety and health laws, by-laws and other regulations that govern local jurisdictions. All employees should understand that they must always comply with provincial and local legislation. If one becomes uncertain about the applicability of any laws, statutes or regulations, consult a supervisor, a local safety and health committees or representative or the appropriate governing authority.

2.4 ROLES AND RESPONSIBILITIES

The responsibility for the safety and health of ESS employees is shared among Treasury Board, Natural Resources Canada and each individual employee. The roles and responsibilities of each of these parties are summarized as follows:

Treasury Board’s Role

Treasury Board provides guidance to departments by developing occupational safety and health policies, standards, guidelines and procedures. As a minimum, these must meet the requirements of the Canada Labour Code. Treasury Board also monitors safety and health in the public service and helps departments disseminate safety and health information by convening an interdepartmental occupational safety and health committee.

NRCan-ESS Employer’s Role

Under the Canada Labour Code, the general duty of the employer is to “ensure that the safety and health at work of every person employed by the employer is protected.” The specific duties of ESS management in relation to field operations and field safety are set out in Section 125 of the Canada Labour Code, Part II. A copy of Part II of the Code should be displayed in every workplace and every manager/supervisor should familiarize themselves with this section (CLC, R.S., c.26 (4th Supp.), s.3; 2000, c.20, s.12).

ESS Employees' Role

Employees have their own responsibilities outlined under Section 126 of the Canada Labour Code. It is strongly recommended that every employee consult a copy of the Canada Labour Code (CLC, R.S. 1985, c.C-46, s.126)

In general, employees are responsible for:

- learning and applying safe work practices;
- using safety equipment, materials, devices and clothing furnished by the Employer;
- following all safety procedures;
- taking all reasonable and necessary precautions to ensure the safety and health of the employee, other employees or any person likely to be affected by the employee's acts or omissions;
- complying with all safety instructions from the Employer;
- cooperating with persons exercising a duty imposed by the Canada Labour Code;
- cooperating with the safety and health committee or the safety and health representative;
- reporting hazards to the Employer;
- reporting accidents, injuries and unsafe conditions to the Employer; and
- complying with directions of safety officers concerning the safety and health of employees.

2.5 EMPLOYEES' RIGHTS UNDER THE CANADA LABOUR CODE

Employees have three rights under the Canada Labour Code. These rights are:

The Right to Know

The Code gives employees the right to know about known or foreseeable hazards in the workplace and to be provided with the information, instruction, training and supervision necessary to protect their safety and health.

The Right to Participate

As safety and health representatives or committee members, employees have the right - as well as the responsibility - to participate in identifying and correcting job-related safety and health problems.

The Right to Refuse Dangerous Work

If an employee, while on the job, has reasonable cause to believe that:

- the use or operation of a machine or thing presents a danger to the employee or a co-worker, or
- a condition exists at work that puts him or her in danger, then that employee may refuse to work.

To be protected by the Canada Labour Code when exercising the right to refuse dangerous work, one must follow the proper procedures and familiarize oneself with the procedures as outlined in section 128 of the Code so that one can comprehend the limitations of the right to refuse dangerous work (CLC, R.S., 1985, c. C-46, s. 128). The right to refuse dangerous work is in the Code to protect the employee.

3 POLICIES, PROCEDURES AND MONITORING CONTROLS

3.1 NATURAL RESOURCES CANADA POLICIES, PROCEDURES AND GUIDELINES

NRCan has established a number of safety and health policies, procedures and guidelines that are consistent with Treasury Board requirements and the Canada Labour Code.

The Field Safety Guide is an expansion of some of the Treasury Board requirements and is to be used in conjunction with the requirements. Ultimately, the responsibility for avoiding dangerous situations rests with the employee.

3.2 OCCUPATIONAL SAFETY AND HEALTH POLICY

Natural Resources Canada developed an Occupational Safety and Health Policy that puts the health and safety of its employees above all. In the Earth Sciences Sector, the safety and well-being of employees are of the utmost

importance and all personnel should regard safety and well-being as a priority in day to day operations.

3.3 MEDICAL HEALTH EVALUATIONS

Essentially, health evaluation means any specific screening, assessment, or examination of an employee by a health professional to determine or monitor the occupational health status and includes simple interventions, such as immunizations (Occupational Health Assessment Guide (November 2002 - Revised Edition), Health Canada).

The medical requirements for federal public servant health evaluations is described in Volume 1, Chapter 2-13 of the Treasury Board Manual entitled "Occupational Safety and Health" and in the Occupational Health Evaluation Standard (TB STD 2-13) found in Appendix A.

ESS Guidelines for Medical Health Evaluations (January 2000) may be obtained from the Sector Health, Safety and Environment Office. The guidelines list the activities or occupations for which an employee is required to undergo health evaluations and the frequency in which every evaluation should be reviewed.

4 HAZARDOUS OCCURRENCE INVESTIGATION AND REPORTING

Despite the best of intentions and efforts of every employee, accidents and other hazardous events/incidents can still occur. All such events **must** be reported, investigated and recorded. Below are the specific responsibilities of both supervisors and employees.

4.1 EMPLOYEES' RESPONSIBILITIES:

- Report all incidents or accidents as soon as possible to the supervisor in charge (or Field Officer in remote areas);
- Assist management in the completion of all required forms by providing necessary information.

4.2 SUPERVISOR/RESPONSIBLE MANAGER'S RESPONSIBILITIES:

- ensure that first-aid is provided (if necessary, transportation to a medical facility);
- investigate or appoint a qualified person to investigate the occurrence;
- notify the Sector Health, Safety and Environment Office at (613) 992-2892;
- take immediate measures to prevent a recurrence of the event;
- in the event of a fatality or serious accident, immediately notify the Sector Health, Safety and Environment Office at the above number as it must be reported to the Labour Program of Human Resources Development Canada (HRDC);
- complete a "Hazardous Occurrence Investigation Report" (HOIR, LAB-1070). This report is available from the Sector Health, Safety and Environmental Office or on INFOFORM.
- where applicable, ensure that all forms (Form 7 and Form 6) required by the appropriate provincial Workers' Compensation Boards are completed and submitted to the Sector Health, Safety and Environment Office.

NOTE: HRDC may decide to follow-up and investigate the circumstances that led to the hazardous occurrence.

4.3 DOCUMENTATION

After any accident, the responsible supervisor/manager must complete the HOIR (LAB-1070) form and if required, a provincial Worker's Compensation Board Claim Form - Employer's Report of Injury. Where there is time lost or a serious accident has occurred, the compensation form **must** reach HRDC within two weeks. Therefore, the report must be completed quickly and forwarded to the ESS Health, Safety and Environment Office for verification before it is sent to HRDC.

A Worker's Compensation form is required whenever there has been time lost because of an injury or when medical

attention beyond first aid has been performed. One must keep in mind that the requirements may differ from province to province and that they may be the only documentary evidence of injury if there are future claims for compensation. Accident documentation forms must be completed as soon as possible following the hazardous occurrence to ensure that they are received by the appropriate Worker's Compensation Office in due time.

4.4 INVESTIGATION

If one is involved in a hazardous occurrence, the first concern should be to survey the environment and secure the area to prevent further injury. Once the area has been secured and marked, first aid should then be rendered. Priority can be placed on assisting the injured and conducting an investigation as the main reason for investigating accidents is to prevent reoccurrence. One must keep in mind that investigations are never intended to lay blame or find faults.

The potential benefits of investigation and the probability of a hazard, incident or accident recurring will dictate the extent and depth of the investigation. In general, the investigator must:

- visit the scene of the hazard, incident or accident;
- conduct interviews;
- gather and record evidence; and
- evaluate the evidence and draw conclusions based on facts and make recommendations.

PART 2

PLANNING & COMMUNICATIONS

5 PLANNING FOR FIELD OPERATIONS

5.1 GENERAL PLANNING INFORMATION

The following checklist is meant to be used as a guide for planning field activities:

- ✓ What is the project?
- ✓ Have all hazards/risks been considered?
- ✓ Is there a need for required equipment/trained personnel?
- ✓ Are there emergency/contingency plans?
- ✓ Are safe procedures outlined for all work operations to be carried out?
- ✓ Have provisions for emergency equipment (survival kit, first-aid kit) been taken care of?
- ✓ Have arrangements been made with local authorities for emergency evacuation of injured personnel?
- ✓ Has Health Canada been contacted with regard to medical requirements (training/supplies).

5.2 WORKING ALONE

Working alone is always riskier than working with others, and whenever possible, field work should be conducted in teams. NRCan's Working Alone Policy details the occupations that are to refrain from working alone and the specific circumstances with which working alone is not permitted. Please consult the policy when in doubt.

In accordance with the Canada Occupational Safety and Health Regulations (COSHR) and the Treasury Board Manual on Occupational Safety and Health, employees must not work alone or be required to work alone when carrying out any of the following operations:

- operations where a job hazard analysis indicates that there is a hazard of drowning;
- operations requiring entry into or work within a confined space; and
- operations involving work on or near live electrical equipment or other high energy systems.

Natural Resources Canada employees must not work alone or be required to work alone when carrying out any of the following operations:

- operations involving underwater diving;
- operations involving the climbing of towers, ship masts, process stacks or other high-rise structures without fixed ladders;
- operations involving technical climbing (use of mountain climbing equipment);
- extended field operations which involve living accommodations such as tents and other non-permanent shelters located in remote or wilderness areas; and
- operations involving the use of heavy mechanical equipment.

All situations where employees work alone will be evaluated and reviewed on an ongoing basis, by the manager and the employee to determine what measures are needed to ensure:

- that employee safety has been considered fully;
- all necessary precautions needed to protect the employee are documented, understood and followed;
- adequate monitoring and emergency response measures are in place and understood by the employee.

When involved in field work, it is extremely important to take every reasonable safety precaution. Important precautions may include such safety steps:

- Leave an itinerary with the Director's office and program manager in your division, preferably including phone numbers and times when people may exchange messages (if possible).
- Talk to someone who has worked in the designated area before to obtain helpful information to adequately prepare for the work.
- Inform local officials of your work plan, maps, time of return, planned routes and alternate route.
- Carry special equipment such as mobile radios and taking emergency/survival/first-aid supplies as required.

6 FIRST AID FOR FIELD OPERATIONS

6.1 TREASURY BOARD REQUIREMENTS FOR FIRST-AID KIT

Technical Field Support Services (TFSS) administers and supplies the majority of the Sector's field first aid kits and stocks them according to Treasury Board requirements.

First-aid kits should be inspected monthly by the first-aid attendants assigned to the kit. A copy of the first-aid record book entries must be available upon request.

Consult Health Canada's Occupational Health Assessment Guide (November 2002) if conducting work that requires protection against infectious diseases. Protection against infectious diseases should be considered for one's own safety and health and for the people who may be required to travel or work with the field team. Remember: ensure that all first-aid kits are fully stocked before leaving for the field.

6.2 FIRST-AID RECORDS

The first-aid attendant assigned to the kit is required to keep first-aid records. Records could become important later when trying to substantiate worker compensation claims or a history of prior injuries. It is mandatory for all injuries requiring first aid to be recorded in the book which accompanies the kits.

For field operations, at least two first-aid attendants should be included in each main party and at least one attendant for the members of each branch party. The Earth Sciences Sector recommends that everyone working in the field has current and up to date first aid training before heading out to the work location.

6.3 DEFINITION OF A REMOTE SITE

Generally, a "remote" site or an isolated workplace refers to a location that is more than two hours travel time from a hospital or medical facility under normal travelling conditions using the fastest available means of transportation.

In field work where there is the possibility that local weather conditions or transportation facilities may delay or hinder the arrival of medical assistance, ESS field workers should consider the field site to be remote.

7 COMMUNICATIONS

7.1 GENERAL

Thorough and clear communications are essential for the safe and efficient operation of any field project. In addition to the two following sections (telephones and radios), TFSS supplies satellite phones on hand to meet the needs of its clients.

7.2 TELEPHONES

In most remote field situations conventional telephones are not available. Cellular phones are becoming more common, less expensive and they may eventually replace high frequency (HF) radios. Check with local retailers for cellular phone coverage maps and to determine what type of communication device is best.

7.3 RADIOS

Radios are used in remote field situations to maintain communications between a base station and field camp or when boating to field sites. The type of radio used will depend on the local environmental factors. HF radios have the longest transmission range and are recommended for remote northern areas.

The proper antennae to transmit the frequencies are issued with the radios. One must keep in mind that it is important to set up antennae as high as possible and perpendicular to the direction of communication. Field parties should pack enough radio batteries to allow for at least two transmissions daily. Walkie-talkies are also handy for maintaining local contact between field workers and their camp.

7.4 SATELLITE PHONES

Satellite telephones are becoming increasingly popular in telecommunications and are sometimes a mandatory requirement for field camps. Some satellite telephones that are available on the market are only slightly larger than traditional cellular phones and are designed to work just like traditional cellular phones. When used in an area with cellular coverage and when communications are required from outside the area covered by ground-based systems, the phones are able to switch to satellite mode.

7.5 COMMUNICATION PROCEDURES

In the field, it is vital that one be able to communicate any emergency that may arise, to receive or report weather information needed for air support operations, to communicate changes in plans by either the field camp or the base station and to call for needed supplies. An alternate method of communication other than radio should be coordinated before going out to the field should contact be cut off. Members of field teams must be familiar with the daily routine of communications with their base station. Messages must be kept as brief and concise as possible.

Field party members need to communicate well with one another, not only to ensure safe and efficient operation of the camp but also to maintain morale. The following points should be considered:

- All team members must be informed of any illness or allergy that other members may have. Every member should know where the first-aid kit is and what it contains.
- Team members should discuss what they plan to do every day at a morning meeting. Tell someone where you are going even if it's just for a short hike. Stick with the schedule as much as possible; deviate only if necessary.
- Agree in advance about who will take what action in an emergency. Consider various scenarios. For example: the person who has the most first-aid training should be in charge in a medical emergency. Discuss who will be responsible for the firearms should a bear appear and how the situation will be handled.

If there are project teams operating away from base camp, a notice board with details of all journeys by field crews away from the base camp should be maintained. The following information should be included:

- party members;
- time of departure;
- destination;
- expected time of arrival at destination/return to camp;
- method of travel; and
- any other relevant details.

If your team wishes to extend its time away from the base camp, it is extremely important to notify the base camp as soon as possible.

For itinerant projects where there is no base camp, the field party should contact the base station and give the following information before making any move:

- itinerary to the next contact point; and
- expected time of next contact.

When travelling by boat, it is best to establish a contingency plan so that if an injury occurs, there is an equipment failure or bad weather, someone knows where to look for the missing party. When breaking up a camp, the radio should be the last thing to be dismantled, especially if being flown out by air. It is a safety requirement to remain on radio standby when pilots are flying in, especially if the weather is ever changing or there is fog or low cloud.

7.6 EMERGENCY AND RESCUE COMMUNICATIONS

It is extremely important to notify someone of the field party's location, time of arrival and what to do if there is no communication. If there has been a change of plans, all contacts need to be notified immediately.

PART 3

GENERAL SAFETY & HEALTH

8 GENERAL SAFETY IN THE FIELD

8.1 BUSH TRAVEL

When working or travelling in the bush, always leave a contact person with an itinerary of the planned trip. If travelling for any considerable distance, it is important to carry emergency rations, waterproof matches or a disposal butane lighter, basic first-aid supplies (bandages), a compass and an axe or a knife. One should carry a map, flares and if possible, a Global Positioning System (GPS) to help familiarize oneself with the terrain.

IF LOST:

- Keep calm.
- Do not walk around aimlessly; conserve energy.
- Depending on the circumstances, for example, weather conditions, it may be better to stay in the same location, light a fire and make markings to note the location.

The following points are provided for information purposes. It is important to note that these suggestions may lead the field party away from the original travel plan and searchers may not be able to distinguish the new location.

- Climb a high hill or large tree to orient oneself with the surrounding area and see if there are any signs of human habitation.
- Game trails can provide an easy path through bush country. Main game trails follow ridges and river flats. Always check the direction being travelled as trails have a tendency to meander.
- One can follow streams to larger rivers or lakes, along the shores of which one may find human habitation. Generally it is better to follow a drainage system than to cross it.
- Ridges offer drier and freer travel than bottom land. There usually will be less underbrush and as a result, it will be easier to see and be seen.
- Avoid travelling through dead fall and muskeg.
- Try to travel on a trail or down a river to a cabin or settlement. Use the terrain to one's best advantage and avoid unnecessary climbing.
- If a road or a telephone line is discovered, follow it.
- If lost, stop and prepare camp before dark. If possible, try to locate an area that is sheltered, near water, easy to spot from the air and as near as possible to a flat, even landing surface. Try to mark this area.

8.2 SURVIVAL IN THE FIELD

First thing to do when planning to go out in the field is to plan ahead. There are no two identical survival situations, however, there are some basic tips that should be kept in mind. If found in a survival situation, sit down and stay calm. The main goal is to keep dry and warm as an unexpected overnight stay in the field does not have to be a matter between life and death.

Remember these rules:

- Don't panic. Think and decide on a plan of action. If in a group, stay together. Try to conserve energy and warmth.
- Check food. Carry dehydrated emergency rations.
- Melt clean snow to quench any thirst as one can survive a long time on water alone.
- Make shelter. Use a snowmobile (if available), snow, evergreen boughs or birch bark.
- Build a fire using available materials.
- Make a signal. Use fire, smoke, a whistle, flares (a snowmobile and its parts) or signs in the snow. Tramp out a signal 33 metres long in the snow. Use upright boughs for casting shadows so the sign can be seen from a plane.
- Avoid hypothermia. Keep dry and wear lots of warm clothing. Wear a hat and mitts to protect extremities. Be aware of numb areas on the body and warn companions there is evidence of whitish areas on exposed skin which could be a sign of frostbite.

8.2.1 MAP AND COMPASS

Getting lost can lead to tragedy. When out in the field, carry a compass, a good map of the area and any other aids that are available. When travelling, pay attention for blaze marks, cabins, rivers and other landmarks. However, do not rely on this technique as when darkness or fog covers landmarks, it may be difficult to know which way to go without a map and compass.

Topographic maps are best because they show the land in three dimensions: north-south, east-west and elevation.

8.2.2 SEVEN COMMON THREATS OF SURVIVAL

The threats associated with survival are pain, cold, thirst, hunger, fatigue, boredom and loneliness. The more one knows about them and the effects they have on the human body, the better one can control them. The following information is referred to in Down but not Out (National Defense, Government of Canada Publications, B-GA-217-001/PT-001).

Pain

Pain is nature's way of making one pay attention to something that is wrong. Nature also has ways of holding off pain if one is too busy to pay attention to the injury. Pain may go unnoticed if the mind is occupied with plans for survival. On the other hand, if one gives in, pain will weaken the drive to survive.

Cold

Cold is a much greater threat to survival than one may realize. It lowers the ability to think and also tends to reduce determination to do anything but get warm again. Cold not only numbs the mind, but it also numbs the will.

Thirst

Even when thirst is not extreme, it can dull the mind. As with pain and cold, thirst can be almost forgotten if the will to survive is strong enough. It is also important to remember not to deprive oneself of water unnecessarily. One can become seriously dehydrated in a survival situation even when there is plenty of water available. Dehydration is the process in which the body loses water and the body can lose water in several ways (e.g., through perspiration, evaporation and breathing). People who are put out a lot of effort are particularly prone to dehydration. Signs of dehydration include parched throat, dry lips and darkened urine.

Hunger

Hunger is dangerous because of the effects it can have on the mind, particularly in lessening the capacity for rational thought. Both thirst and hunger increases a person's susceptibility to the weakening affects of cold, pain and fear. Although the body can go without food for about 30 days, the psychological effect of not eating three meals a day can affect a person's rationality if not controlled. The best survival rations are high in fats and carbohydrates; e.g., chocolate, sugar, raisins and nuts. Fat foods produce the most heat calories. Thus, peanuts make an ideal survival food. "Trail mix" which contains coconut, raisins and nuts - or carbohydrates, protein and fats - is a well-balanced survival food.

Fatigue

Even moderate fatigue can significantly reduce one's mental ability and can make one careless. When tired, one will become increasingly apathetic. This is one of the biggest dangers in survival. The notion that fatigue and energy expenditure are directly related may be responsible for many deaths in survival situations. Certainly there is a real danger of over-exertion but fatigue may actually arise from hopelessness, lack of a goal, dissatisfaction, frustration or boredom. The key to minimizing fatigue is to pace oneself. This will help to preserve energy and body heat.

Boredom and loneliness

Boredom and loneliness are two of the toughest enemies of survival because they are mental and emotional barriers as there are no hard and fast way to deal with them.

8.3 SURVIVAL KITS

Every employee should carry a personal survival kit in the field. Having a survival kit acknowledges that something could go wrong and that one is prepared to endure it. The kit should be compact and light enough to carry comfortably at all times. The type survival kit one may carry will depend on the location.

8.4 SAFETY IN BEAR COUNTRY

8.4.1 HUMAN-BEAR CONTACT

Problems can occur whenever bears and people occupy the same area. Overnight camps, trappers' cabins, seasonal camps, large industrial sites and communities in bear habitats have all been the sites of bear problems.

Problems can result when a bear is:

- startled by the approach of a person;
- attracted to a camp by odours from improperly stored food or garbage that has been carelessly discarded;
- attracted to humans because it has learned from experience to associate people with snacks (has developed into an aggressive scavenger) often seeks food from aggressive sources;
- weak or sick and willing to take any risk for food.

The best defence against bears is to avoid encountering them. Although chance encounters will always happen, there are steps that ESS field staff should take to reduce the chances of attracting a bear to their camp. These steps are detailed in the following sections.

Precautions to Take While Travelling to or from Camp

Know the areas and habitats bears use at different times of the year. This information should be available from the local Ranger office or Natural Resources Canada. If flying into such an area look for bears from the air before landing.

If in a bear habitat, there is always the chance to encounter a bear. If a bear is at a distance, do what one can to avoid surprising the animal. In open terrain, use binoculars to scan the landscape for bears in the areas where there is intent to travel or carry out a project.

Watch for bear signs, such as:

- fresh tracks;
- droppings containing vegetation, berries or hair, or with a tar-like appearance;
- animal carcasses which may be covered with dirt;
- seal kills;
- torn up stumps or rotten logs;
- signs of digging, especially near ground squirrel holes;
- matted vegetation in berry patches; or
- claw marks on trees.

Pay attention to the behaviour of other animals. A flock of ravens may indicate the presence of an animal carcass, and possibly a bear. Alarm calls from birds or squirrels could mean a bear is near.

Travel in daylight and avoid areas where one cannot see well. Travelling in a group reduces the chances of meeting a bear as groups tend to make a lot of noise. Nevertheless, singing, shouting, loud talking or the use of noisemakers such as air horns, bells and cans with rocks in them should not make any person over confident; some bears, particularly in very remote areas have actually been attracted to such noises out of curiosity.

Make sure one can get to a firearm and/or deterrent items quickly and that one is properly trained & certified to use these items.

Precautions when Working Away from Camp

If possible, carry odourless food or keep food in bear-resistant containers. Carry all garbage back to camp and dispose of it properly. It is important to take every precaution to avoid bears while travelling or working away from camp. Always keep a good watch on the horizon. If there is a bear in the distance, leave the area even if it means temporarily postponing some part of the field project.

8.4.2 SETTING UP CAMP

Camp Location

Choose a camp location carefully. One can reduce the risk of bear visits by avoiding the following areas when setting up:

- bear feeding areas;
- bear travel lanes and trails;
- den sites: it's especially important to know polar bear or grizzly bear denning areas;
- polar bear summer retreats: coastlines and off-shore islands;
- locations where bear problems have been reported before;
- locations where there are bear signs (e.g., tracks, fresh droppings); and
- locations where loud noise (e.g., a river) would drown out the sound of an approaching bear.

Camp Layout

Proper arrangement of tents, buildings and other facilities can make a camp safer for field workers if a bear does come to investigate.

Some guidelines should be followed when setting up camp:

- A few big tents/buildings are better than several small ones. Keep tents well-spaced but not scattered. Place them in a line or semi- circle, not a full circle as this will give a bear an avenue of escape and will allow one to use deterrents or firearms more safely.
- Sleeping and cooking/eating facilities should be kept separate so that sleeping tents do not acquire a food odour. The sleeping area should be at least 50 m from cooking and latrine facilities and no food should ever be stored in the sleeping area. Sleeping quarters should be upwind from the cooking, latrine and waste disposal sites.
- Garbage should be burned at least 200 m away from the camp but in an area visible from the camp. Empty

food cans should be burned before disposing of them by other means.

Food Preparation and Storage

Take special care when preparing or storing food:

- Keep a clean camp.
- Store all food in sealed (preferably airtight), bear-proof containers.
- Try to minimize food wastes.
- Eliminate or reduce food odours.
- Use up leftovers as soon as possible. If you must store them for a while, use sealed, airtight containers.
- Grease is especially attractive to bears. Cook non-greasy foods as much as possible. Burn excess grease in a hot fire or re-use it right away. Store grease in an airtight container.

Other Bear Attractants

Bears are often attracted to synthetic materials and have been known to eat or chew on inflatable boats, plastic gas cans, rubber gas lines, sleeping bags, snowmobile seats, nylon tents, motor oil and insulation on wires. If possible, such objects should be stored in a bear-proof location when not in use.

Waste Disposal

Careless handling of garbage is a major cause of bear problems because bears are initially attracted by odours, eliminate them:

- Burn all garbage daily; or pack it in a garbage bag and send it out by supply vehicle.
- Dump greasy dishwater in a pit away from camp and treat it with a disinfectant or lye.
- Cover latrine facilities with lime and earth regularly. Burn tampons and sanitary napkins.

Camp Security

Develop and inform people about the bear emergency plans for each particular camp and make sure everyone understands the plan thoroughly. One person should be responsible for maintaining firearms and deterrents (see below).

Every camp should have:

- a dependable flashlight or spotlight;
- an appropriate detection method;
- an appropriate deterrent technique; and
- one or more firearms, powerful enough to kill a bear.

Alarm Systems

Sleeping tents and the cooking/eating area should be surrounded by trip-wires that will trigger some form of alarm system, such as a siren. Two separate enclosures are preferable; otherwise it is hard to set up a large enough trip-wire and still keep the sleeping tents far enough away from the food. In an area where bears are common, it is best to have a rigid structure for sleeping (such as a plywood hut, tent). If there is a strong structure (a cabin for instance) for sleeping, an alarm system is not necessary.

Firearms and Scaring Devices

Rifles (30-36 or similar), pump-action 12-gauge shotguns with rifled slugs or heavy-calibre revolvers (.45 magnum) can all stop bears. Because plastic 12-gauge slugs are available for scaring, the shotgun is probably the most useful type of gun. While you are in camp keep the firearm unloaded. The magazine and chamber should be loaded only when a bear has been spotted. Make sure the chamber is unloaded as soon as the alarm is over. It is imperative that all persons in camp know where the firearms and deterrents are kept ([Firearms Equipment Survival: Glossary of Firearm Terminology](#), Hunter's Guide).

Various kinds of noise-makers (screamers, bombs) fired from .22 calibre pistols or revolvers can also be used. These are not always effective and one should remember that the projectiles which are large are greatly affected by wind. Capsaicin (pepper) sprays are easy to carry and quicker to deploy than rifles in close-range emergencies. Generally, they have been designed as a last-resort deterrent for the protection of people in tents in temporary camps. Although they have been effective in deterring grizzly bears, black bears and polar bears, they are generally not reliable in sub-zero temperatures. Capsaicin must be sprayed in the bear's eyes in order to be effective.

8.4.3 HOW TO REACT TO A BEAR ENCOUNTER

General Recommendations

According to the guide, Safety in Bear Country: A Reference Manual, produced by the Northwest Territories, it is best to take some general recommendations to heart before an encounter can occur; "If a bear detects a person in time, it will usually flee to avoid an encounter. Most bears are shy of people. However, some show no fear. Most of this minority can be scared off by loud noises but those who are particularly hungry and are not permanently deterred by scaring tactics may eventually have to be killed to defend human lives or property. The best way to avoid such an unfortunate outcome is to minimize encounters with bears. However, even with precautions, there is always a chance one may surprise a bear at close range or come into contact with a bear that is not afraid of humans (Graf, L.H.(1992), pg.21)".

There is no standard procedure for reacting to a bear encounter because every encounter is unique. Most guidelines are based on good judgment, common sense and a familiarity with bear behaviour.

The following information is provided by the Northwest Territories Renewable Resources Department;

In all instances:

- assess the situation and think about the surroundings;
- try to stay calm, even though it may be difficult;
- try to keep the bear in sight at all times; even a polar bear can hide in what appears to be open habitat;
- if travelling within a group, move close together; and
- do not run unless you are sure you can reach a safe place before the bear catches up. Running away may encourage a pursuit.

Dealing with a Bear in Camp

A bear is sighted at a distance, approaching camp.

- Walk to the nearest safe shelter.
- Make sure everyone in the area knows about the bear.
- Try to drive the bear away using an appropriate deterrent method. Load a firearm and keep it ready as a back-up. Continue using the deterrent until the bear is out of sight.
- If the bear continues to approach and time permits, try a different deterrent. Fire warning shots.
- Give the bear a chance as it may leave after its curiosity has been satisfied. Having to shoot the bear should be considered a last resort.

If a bear is in camp:

- If the camp's occupants are not in immediate danger, try to scare the bear away with deterrents.
- One may have to act quickly if the bear attempts to enter an occupied tent or building. If people are in immediate danger, shooting the bear may be the only option.
- Flashing a strong light back and forth across a window may coax a polar bear out of an unoccupied cabin or building at night. The bear can then be scared off with deterrents or if necessary, shot.

Afterward, try to determine why the bear came into or near the camp. Was it attracted to something or was it just curious or hungry? Make sure to remove any possible attractants.

SHOOTING A BEAR

When to Shoot:

The decision to shoot a bear is a personal one and has to be made quickly. The right moment for one to squeeze the trigger depends on one's experience and confidence with a gun, how fast the bear is approaching and the state of one's nerves.

People often shoot too soon - a charging bear can appear bigger and closer than it actually appears. It is good to set personal limits before the bear charges to avoid shooting in a panic. Many experts recommend waiting until the bear is within 20 m before shooting and depending on the circumstances, as close as 3-10 m if you are using a 12-gauge shotgun. Some people may feel confident waiting to see if the charge is a bluff. Remember that an accurate shot fired at close range has a greater chance of killing a bear than one fired from farther away.

Where to Shoot:

Try to kill the bear cleanly and quickly. The first shot is the most important. Avoid head shots as they often fail to kill a bear. Do not stop to check the results of your shot. If the bear goes down, keep shooting vital areas until it is still. Make sure it is dead.

If One Wounds a Bear:

A wounded bear is dangerous. If one injures the bear, it is the responsibility of that individual to find and kill it or to report the incident to the nearest police office. At least two armed and organized individuals are needed to track a bear. Stay together, keep guns ready and communicate. Be prepared for a close encounter with an angry bear.

Regulations

In most provinces and territories, it is legal to shoot a bear to protect yourself or another person's life, or to protect property. Shooting a bear should be a last resort. Afterward, you must report the kill to the nearest police office.

Playing Dead

Playing dead may save a person from serious injury if a surprise encounter brings on an attack and one cannot kill the bear. Playing dead may reduce the threat to the bear. If one appears harmless, the bear may decide to leave. However, do not play dead too early (i.e., only play dead if an attack is imminent). Rather than leave, a curious bear may approach and investigate if one suddenly falls to the ground. Do NOT play dead if the bear appears to consider potential field team members as prey.

Body position should minimize exposure of vital areas (neck, face, abdomen). Lie sideways, curled into a ball with legs drawn to the chest with the head buried between the knees (fetal position). Clasp the hands behind the neck and keep elbows in to protect the face as best as possible. Keep legs tightly together. Try to stay in this position, even if the bear has moved. Try not to resist, struggle or call out as it may intensify the attack. Look out cautiously and be sure the bear is gone before moving.

Responding to a Bear Attack

Bear attacks are rare but some prudence could save a life. When a bear attacks one member of a group, the actions of other members may help determine the outcome of the incident. Do not hesitate to use deterrent devices or weapons if an attack occurs. The risk of injury to a victim from a deterrent or misplaced shot are less at this point, than the risk of injury or death from being mauled or carried off by a bear.

If in a close group and a bear attacks, do not scatter. Increase the distance between the attacking bear. Slowly back away from the bear. Do not run. Move toward a safe location such as a large tree, the interior of a building or vehicle if one can do so without drawing attention to yourself. A second person shouting at a bear may cause it to break off its attack on a victim but usually serves to redirect the attack to the other person. Ideally, one should attempt to draw the attention of an attacking bear only if in a safe location. In the case of polar bear attacks, once a mauling has begun, the bear is extremely difficult to deter. Chasing the polar bear with a vehicle or buzzing it with a helicopter may induce it to leave its victim.

8.5 SAFETY IN COUGAR COUNTRY

It is a possibility that ESS field workers may encounter a cougar, particularly if they are working in British Columbia. The following information is provided by the Province of British Columbia, Ministry of Environment, Lands and Parks. Conflict between cougars and humans is extremely rare, however, it always pays to be prepared. Information and awareness are the best defences as the cougar is Canada's largest cat. These animals have long tails which may be one-third of their total body length. Cougars are most active at dusk and dawn. However, they will roam and hunt at any time of the day or night and in all seasons. During late spring and summer, one to two-year old cougars become independent of their mothers. While attempting to find a home range, these young cougars may roam widely in search of unoccupied territory. This is when cougars are most likely to conflict with humans.

Cougar tracks have four toes with three distinct lobes present at the base of the pad. Claws are retractable, so they usually do not leave imprints. Generally, cougars are solitary. If tracks show two or more cougars travelling together, it probably indicates a female with kittens.

Cougars are predators - the top of the food chain - and their actions are often unpredictable. There is little understanding about what might trigger an attack, but following a few general guidelines will reduce the risk of cougar conflict and prepare you in the unlikely event of an attack.

Hiking or working in cougar country

- Hike in groups of two or more. Make enough noise to prevent surprising a cougar.
- Carry a sturdy walking stick to be used as a weapon if necessary.
- Watch for cougar tracks and signs. Cougars cover unconsumed portions of their kills with soil and leaf litter. Avoid these food caches.

If one comes into contact with a cougar

- Never approach a cougar. All cougars are unpredictable
- Always give a cougar an avenue of escape
- Stay calm and talk to the cougar in a confident voice
- Do not run. Try to back away from the cougar
- Do not turn your back on the cougar. Face the cougar and remain upright
- Do all you can to enlarge your image. Don't crouch down or try to hide. Pick up sticks or branches and wave them about.

If a cougar behaves aggressively

- Arm oneself with a large stick, throw rocks, speak loudly and firmly. Convince the cougar that you are a threat, not prey.
- If a cougar attacks, fight back! Many people have survived cougar attacks by fighting back with anything, including rocks, sticks, bare fists, and fishing poles.

Cougars are a vital part of Canada's diverse wildlife. If one experiences a confrontation with a cougar or feels threatened by one, inform the nearest Conservation Office.

8.6 ALPINE TERRAIN

Before each field season, the division chief and project leader should review each field party member's skills and experience to establish whether every employee is competent to carry out the upcoming field work safely and efficiently. If it is decided that an employee needs further instruction, professional training should be organized.

8.6.1 SAFETY GUIDELINES IN ALPINE TERRAIN

All field party members, regardless of experience, must follow safety procedures established by their division or field party chief. The field party must carry appropriate safety equipment, rescue equipment and maintain the equipment as needed at base camp.

All party members must treat each venture, in fact every vertical metre of travel as virgin territory. It is vital that all members assess hazards objectively using their skills, experiences and knowledge gathered from their environment. Members of field parties should not, under any circumstances, cross or work on or from snow-covered glaciers unless cleared to do so by the party chief.

The necessary skills and experience for avoiding hazards should be continuously reviewed and updated. Ultimately, skills and experience must govern what is attempted during an alpine field operation, when it is conducted and by whom. The designated base facility must maintain radio contact with any mobile parties operating from this facility.

The availability of rescue aircraft and specialized mountain rescue personnel should not be used as an excuse for considering any particular action or procedure as less hazardous. The key is self-reliance; one must be prepared to rescue oneself.

9 GENERAL HEALTH GUIDELINES FOR FIELD OPERATIONS

9.1 WEATHER CONDITIONS

The following table represents particular weather conditions which may be encountered and precautions that should be taken.

CONDITION	POTENTIAL HAZARDS	PRECAUTIONS
Inclement weather	Severe weather conditions can present a significant safety risk for outdoor field activities.	Unless there is suitable shelter or clothing that would allow you to safely carry out field activities, postpone outdoor activities: <ul style="list-style-type: none"> • when the ambient temperature is less than -30oC including wind-chill or greater than 30oC • during electrical storms; • in sleet, hail or freezing rain.
Heat Stress	Heat stress can affect you very quickly when you are working in the sun or near any heat sources.	To guard against heat stress: <ul style="list-style-type: none"> • schedule rest breaks, as needed, out of the sun or away from radiant heat sources; • drink enough fluids to replace what you lose through sweating; • as much as possible, avoid work in the sun, sunburn can increase dehydration; • choose clothing that is lightweight and loose-fitting (if not working with equipment where clothing would get caught).
Cold	Working in extreme cold can stress/impair your mental and physical ability, and lead to frostbite and hypothermia.	To guard against the cold: <ul style="list-style-type: none"> • wear appropriate clothing that is layered to trap warm air and prevent conductive heat loss; • wear waterproof clothes in wet weather and minimize sweating by shedding layers and opening closures at neck and wrists; • where possible, have a warm shelter available; • where possible, alternate indoor and outdoor work; • follow all recommendations regarding work in bad weather; • always keep a survival kit and an ample food supply near by.

9.1.1 PROTECTION AGAINST UV RADIATION

All employees who must work outdoors require extra protection from the hazardous effects of the sun's ultraviolet (UV) rays.

Sunglasses: Wear sunglasses with a minimum of 90% UV protection. If working on the water or driving long distances in sunlight, wear sunglasses with an anti-glare finish.

Clothing: Wear tightly woven clothing that will block out UV rays.

If possible:

- on hot days, try to schedule work in the shade as much as possible, provide shelter from the sun;
- have potable water available to prevent dehydration and heat-related illnesses.

To protect oneself from UV rays:

- be aware of the hazards of working outdoors;
- wear appropriate clothing (hats, sun screen, long-sleeved shirts, skirts, long pants and sunglasses);
- when working outdoors during peak UV periods (10:00 am to 3:00 pm) wear sun screen and sunglasses.

9.1.2 HEAT STRESS

Some outdoor work sites can be uncomfortably hot. One may become dizzy, irritable and inattentive which can make one more susceptible to injuries accidents.

The combination of high temperature and high humidity can lead to more serious heat-related problems. Anyone who has previously suffered from heat stroke, a chronic disease, obesity, pregnancy or drinks alcohol will usually develop problems from heat exposure more quickly than others.

You can reduce the effects of severe heat by:

- screening the heat source (e.g., using movable or permanent heat-reflecting screens);
- lowering the humidity.

Make sure you drink plenty of fluids - frequently. Drink water (cool, hot-cold), diluted fruit juice, tea or lemon tea.

It is important to replace the amount of fluid lost through perspiration. Each pound of weight loss requires 500 ml of fluid replacement. Make sure to drink at a rate no faster than two cups per hour to avoid abdominal cramps.

The normal salt content of food plus salt used on food is usually sufficient to replace any salt lost through perspiration. Take salt tablets or drinks only on the advice of a physician. If one has high blood pressure or kidney problems, it is best to avoid extra salt.

Clothing should be light in weight, colour and loose-fitting (if is not working with or around machinery). The fabric should allow perspiration to evaporate (like cotton). In some jobs, one may have to wear protective clothing, goggles, gloves and boots as a screen from a heat source.

Take rest breaks in a cooler area.. If there is a potential hazard from excessive heat, try to schedule rest breaks or postpone activities until conditions improve.

9.1.3 LIGHTNING STORMS

The following guidelines will help one prepare for a lightning storm depending upon your location.

If there's a lightning storm while conducting doing field work, stop all activity out in the open.

Choose shelter in the following order:

- enclosed motor vehicle;
- large metal or metal-frame building;
- buildings with lightning protection;
- large unprotected buildings; or
- small unprotected buildings .

Get within a metal shield such as:

- the cab of a rubber-tired vehicle; or
- under a steel bridge (**never touch the steel and never sit or stand on damp ground).

If such shelter isn't available, look for a dense grove of trees, a cave, a depression in the ground, a deep valley or at the foot of a steep cliff.

If in open country:

- Sit or lie down.
- Avoid huddling together.
- Avoid large or lone trees.
- Get away from horses and other livestock.
- Avoid tops of ridges, hilltops, wide-open spaces, ledges, outcrops of rocks and sheds or shelters in exposed locations.
- Keep away from:
 - wire fences;
 - telephone lines;
 - metal tools;
 - rivers and lakes.

While in a lookout tower or other building:

- Stay inside the building and away from all metal objects and the walls.
- Never use the telephone or radio when the storm is overhead.
- Disconnect the incoming telephone line from the lookout tower and ground the instrument by pulling the rope attached to the switch handle of the combination arrester disconnect switch.
- Close and keep away from windows, doors and fireplaces (lightning follows air currents).

First Aid for Lightning Victims

If someone in the field party is hit by lightning:

- Give mouth-to-mouth resuscitation if not breathing.
- Treat the victim for shock. Symptoms of shock include pale, cold, and clammy skin, a fast and weak pulse, and fast and shallow breathing.
- Seek medical attention.

9.2 DRINKING WATER IN THE WILDERNESS

9.2.1 IS THE WATER SAFE TO DRINK?

Canadian wilderness waters are generally of excellent quality, but to ensure an enjoyable outdoor experience, be prepared to boil, chemically treat or filter all water. No surface water can be considered safe for human consumption without treatment. Even the cleanest-looking spring water could be polluted. Untreated water may be contaminated with bacteria, viruses, fungi, protozoan cysts, worm eggs and an assortment of other parasites.

9.2.2 WHERE DO I GET DRINKING WATER?

Choose a water source carefully to reduce the risk of disease. On a short trip, use water from home or another safe source. Runoff water from streams below glaciers is often cloudy with silt and should be filtered. Hot spring water usually contains numerous microorganisms. Well water, fast-moving rivers and deep of lakes are the best places to get water. Avoid stagnant water, shoreline water and water close to human habitations and campsites. During the

winter, it is best to use an open water source or obtain water through a hole in the ice. Check the safety of the ice first. Melting ice and snow consumes fuel and takes extra time. Eating snow or ice directly can lead to chilling, hypothermia and could also cause stomach cramps or headaches. Beware of coloured snow as it indicates the presence of algae that could cause diarrhea if ingested. Even in the winter, all water should be purified. Purification methods include boiling the water, using chlorine, chlorine bleach, chlorine tablets, iodine tablets and filtration.

REMEMBER:

Some water-borne diseases are difficult to diagnose. If one ingests wilderness water and has not been feeling well, inform a doctor.

9.3 HANTAVIRUS PROTECTION

Hantaviruses are a family of viruses found in rodents. They are occasionally transmitted to humans. These viruses have caused serious illness in people in many parts of the world, but infection in humans is rare and poses little threat to the general population.

Hantaviruses have been found in many parts of the world, including Ontario and Western Canada (British Columbia and Alberta).

The diagnosis of hantavirus infection requires special testing and takes more than a week. People infected with hantavirus usually show symptoms similar to the flu: high fever, muscle aches, chills, cough and headaches, but this illness progresses rapidly. Most patients experience shortness of breath and a rapid heart rate, and their lungs rapidly fill with fluid. This is Hantavirus pulmonary syndrome (HPS). After exposure, it typically takes two to four weeks for symptoms to develop, but it may take as long as six weeks.

Anybody with the symptoms described above should see a physician. Tell the doctor if exposed to rodents or their droppings over the past six weeks. Victims require immediate treatment in an intensive-care unit.

9.4 LYME DISEASE

Health Canada offers the following measures to reduce your risk of contracting Lyme Disease:

- Stay in the middle of hiking trails, if possible;
- Wear light-coloured clothing to be able to spot dark-coloured ticks more easily;
- Spray clothes with repellent particularly around the cuffs and the waistlines;
- Pull your socks over your pant legs and tuck your shirt into your trousers;
- Apply tick repellent such as diethyltoluamide (deet);
- Use tweezers, not a match, to remove embedded ticks; and
- Educate yourself regarding other means of prevention, symptoms and treatment.

9.5 BACK CARE AND LIFTING

Worker's compensation boards across Canada have identified back injuries and other musculoskeletal disorders as the greatest workplace health problem facing Canadian workers in the 1990s. The largest single category of new claims for worker's compensation relates to back problems. Back injuries can be very painful and can result in long-term disability.

If one experiences a back injury or if one has had a history of back problems, notify a supervisor; ask a physician for a list of restricted work activities and enroll in a safe lifting course.

9.5.1 PRECAUTIONS

Lifting

When preparing to lift:

- make sure shoes or boots provide a solid footing;
- make sure the path is clear of all obstacles;
- if one is wearing gloves, make sure that one is able to grasp the object securely;
- never reach over an obstacle to lift a load - to lift safely, one needs to be as close to the object as possible;

and cautiously check the weight of the object.

When lifting the object:

- stand as close to the object as possible - face it squarely;
- maintain solid footing and balance; stand with feet slightly apart;
- if one has to squat, always bend the knees and keep the back straight and upright;
- make sure there is a firm grip on the object; and
- use the leg muscles to bring oneself back to a standing position.

When carrying and lowering the object:

- continue to grip the object securely in order to hold it as close to the body as possible;
- keep the back straight;
- never twist your body;
- when lowering the object, always bend at the knees; and
- ensure the object is resting securely on a level surface before you release your grip.

Using a shovel:

- choose the right shovel for the job;
- make sure that one's footing is solid and that one's grip is secure; if carrying a shovel load, make sure the path is free of obstacles and there are no slippery patches;
- keep the shovel close to the body;
- tighten the abdomen as one begins to lift;
- always bend the knees and not the back;
- use leg muscles to return to a standing position;
- keep your bottom hand low and near the shovel blade; this will increase leverage and will transfer the weight from the back to the arms and shoulders; and
- when carrying the shovel don't twist the body.

More Safety Tips:

- Whenever possible, ask a co-worker for help when lifting heavy objects.
- If required to lift objects over a long period of time, always pace oneself.
- Do not twist. Move the feet to turn the body.
- Vary activities and take scheduled breaks.
- If required to drive, ensure that the lower back is well supported. On long trips, be sure to take regular breaks to rest and stretch.
- If available, use a pushcart or other materials handling device to transport objects.

10 PERSONAL PROTECTIVE EQUIPMENT

10.1 DEFINITIONS

“Personal protective equipment” means any clothing, equipment or device worn or used by a person to protect that person from injury or illness.

“Qualified person” means a person who, because of knowledge, training and experience is qualified to perform safely and properly a specified job.

10.2 GENERAL REQUIREMENTS FOR PERSONAL PROTECTIVE EQUIPMENT

All personal protective equipment (PPE):

- must be designed to protect the person wearing the equipment from the hazard for which it is provided;
- must not in itself create a hazard;
- must meet or exceed the standards prescribed in this Section;
- must be regularly inspected and tested by a qualified person; and
- must be kept in a clean and sanitary condition.

Training

All ESS employees and contract personnel required to wear PPE:

- must be instructed and trained by a qualified person in the operation and maintenance of the PPE; and
- must be given written instructions on the use, operation and maintenance of the PPE.

Records

A record of all PPE must be kept by a qualified person containing:

- a description of the equipment and the date of its purchase or acquisition;
- the date and result of each inspection and test of the equipment; and
- the date and nature of any maintenance work performed on the equipment since its purchase or acquisition.

Safety Precautions

Remember to always:

- conduct a visual inspection of the equipment to check for defects before it is put on;
- ensure that loose clothing, long hair, jewellery or other accessories are tied, covered or otherwise secured to prevent any hazards.

Decontamination and Cleaning

Where there is a possibility that PPE, tools or materials have been contaminated, they must be decontaminated, cleaned or disposed. **Remember:** Hazardous waste must be disposed of in accordance with provincial procedures.

Defective Equipment

- If there is a defect found in the PPE equipment that could make it unsafe for use, report the defect to a supervisor immediately; do NOT use the equipment.
- All defective equipment must be tagged or marked as "UNSAFE" and removed from service by the manager or supervisor responsible for the equipment.

10.3 DROWNING PROTECTION

For all field operations where there is a hazard of drowning:

- The use of a life jacket or buoyancy device that is approved by Transport Canada or that meets one of the standards below is mandatory:
 - ▶ Canadian General Standards Board Standard;
 - ▶ CAN/CGSB 65-GP-14M (Life Jackets, Inherently Buoyant Type);
 - ▶ 65-GP-11 (Standard for Personal Flotation Devices).
- Where applicable, all federally regulated sites must have a safety net or fall-protection system available (see below).
- Emergency equipment must be provided and held in readiness.
- If appropriate, a powered boat must be held in readiness.
- There must be a qualified person available to operate all of the emergency equipment (including the powered boat). See also Section 14.
- Where the work site is a federal wharf, dock, pier or quay, regulations require that there be a ladder constructed every 60 m along its length; the ladder must extend 2 rungs below water level.

(See Small Vessel Regulations S-9 – C.R.C., C. 1487)

10.4 FALL-PROTECTION SYSTEMS AND SAFETY RESTRAINING DEVICES

Fall protection equipment must be used whenever work is conducted from:

- an unguarded structure that is:
 - ▶ more than 2.4 m above the nearest permanent safe level;
 - ▶ above any moving parts of machinery or other surface or thing that could cause injury to an employee on contact.
- a temporary structure more than 6 m above a permanent safe level;
- a ladder at a height of more than 2.4 m above the nearest permanent safe level where, because of the nature of the work, one cannot use one hand to hold onto the ladder.

It cannot be stressed enough that care must be taken to select appropriate equipment and that employees be trained on the appropriate care and maintenance of the equipment. Equipment inspections should also be included.

10.5 RESPIRATORY EQUIPMENT

Requirements

Respiratory protection is required at all work sites when:

- required by internal policy or procedures;
- there is a hazard of an airborne hazardous substance; or
- there is an oxygen-deficient atmosphere.

Selection, Fitting, Use, Care and Maintenance of Respiratory Equipment

General specifications:

- All respirators must be NIOSH-approved (National Institute for Occupational Health and Safety).
- All respirators must be selected, fitted, cared for, used and maintained in accordance with CSA standard Z94.4-02, "Selection, Care and Use of Respirators."
- Where air or oxygen is provided in connection with any respirator, the air and the system that supplies the air must conform to CSA standard CAN3-Z180.1-00, "Compressed Breathing Air and Systems."
- If a steel or aluminum self-contained breathing apparatus (SCBA) cylinder has a dent deeper than 1.5 mm and greater than 50 mm in major dimensions or shows evidence of deep isolated pitting, cracks or splits, remove the cylinder from service until it passes a hydrostatic pressure test.

Respirator Hygiene

- Keep the respirator clean and sanitized.
- Never borrow another person's respirator and never lend the respirator to another person

11 FIRE PROTECTION EQUIPMENT

Basic Fire Extinguisher Classifications:

- A Ordinary Combustibles (e.g., wood, paper)
- B Flammable liquids (gasoline, oil)
- C Electrical fires
- D Burning metals

11.1 VEHICLES

All departmental vehicles must be equipped with fire extinguishers. Extinguishers in vehicles must be secured by

approved, specially designed mounting brackets and must be located so that they are accessible to the operator in case of fire.

11.2 BOATS

Vessels up to 5.5 m long must have one Class B-I fire extinguisher if they have an inboard motor or fixed fuel tank, or a heating or cooking appliance that burns liquid or gaseous fuel.

Vessels between 5.5 m and 8 m long must have one Class B-I fire extinguisher if they are power-driven or have a cooking or heating appliance that burns liquid or gaseous fuel.

Vessels between 8 m and 12 m long must have one Class B-II fire extinguisher if they are power-driven, or have a cooking or heating appliance that burns liquid or gaseous fuel.

12 TRANSPORTATION OF DANGEROUS GOODS

12.1 INTRODUCTION

In 1985, laws came into effect governing the transportation of dangerous goods across Canada. These laws protect the public whenever dangerous goods are being transported by road, rail, sea or air and were written so that people who come into contact with dangerous goods get the information they need (Transportation of Dangerous Goods Act, R.S., 1992, C. 34).

In an accident, safety marks, such as placards on vehicles or labels on packages, help police and firefighters determine the type of hazard they are dealing with. Shipping documents provide more detailed information about the type and quantity of goods involved. Reporting accidents, spills or loss of dangerous goods shipments is important in protecting human safety and health, as well as the environment.

Shippers, carriers and emergency response personnel must know how to deal with dangerous goods. Proper training ensures that safety marks are correctly used and easily recognized, that the shipping document is complete and accessible, and that the right people are promptly notified of incidents involving dangerous goods.

Courses, including refresher courses, on handling and transportation of dangerous goods are offered by the department's Health & Safety Offices.

12.2 TRANSPORTATION OF DANGEROUS GOODS ACT

Under the Transportation of Dangerous Goods Act, ESS employees must not handle dangerous goods unless they:

- have adequate training and certification or
- are in the presence of a supervisor who has been certified to handle and transport dangerous goods.

All storage facilities, containers, packages and such must be designed and built according to the regulations contained in the Transportation of Dangerous Goods Act (R.S., 1992, C. 34).

No hazardous goods can be transported by a driver who is not qualified to do so. The driver must have undergone adequate training and certification in the handling and the transportation of dangerous goods. The vehicle and the packaging must be in accordance with the Transportation of Dangerous Goods Act and the Explosives Act (R.S., 1985, c. E-17).

12.3 RE-CERTIFICATION

When the training course certificates on the handling and the transportation of dangerous goods issued by the Department's Health & Safety Offices expire (three years for road and two years for air from the date of issue),

employees can get departmental re-certification by passing a mandatory one-day refresher course on handling and transportation of dangerous goods.

PART 4

SPECIFIC FIELD OPERATIONS

13 WINTER FIELD OPERATIONS

Extra care must be taken to combat the risks associated with winter field operations.

13.1 WEATHER

Use a radio to get up-to-date information on the weather one can expect at the work site. Be aware of the cooling power of the wind as it can cause a dramatic increase in the chill factor and may result in immediate frostbite to exposed skin.

When working on the ice or snow in bright sunshine, use glacier sunglasses or goggles. During a whiteout, stay in the current location until one can see well enough to safely return to your vehicle. Thaws may weaken the ice cover at work sites. Be aware of springs, incoming or outgoing streams or other areas where the ice thickness could deteriorate quickly. Ice will stay strongest on old snowmobile trails.

13.2 WIND CHILL FACTOR

See Appendix B for calculating wind chill.

Weather is a prime consideration when one plans to work outside during the winter. The speed at which air passes by makes it feel colder than it really is - a phenomenon known as "wind chill". Dress appropriately for the weather and for the mode of transportation being used, remember the wind chill factor and pay special attention to exposed skin.

With an increasing wind chill factor:

- exposed flesh freezes at a quicker rate;
- the ability of an engine block heater to keep a vehicle engine warm decreases;
- the length of time a vehicle can be left turned off, before it reaches the surrounding air temperature, decreases;
- water will freeze more quickly; and
- one will need more fuel to heat a building, particularly when the structure is poorly insulated.

(Department of the Environment. (2003). Wind Chill Charts and Tables.)

13.3 HYPOTHERMIA AND ITS TREATMENT

Hypothermia is a drop in core body temperature below the normal level. It usually occurs as a result of immersion in cold water or long exposure to cold. It puts the body into a state of shock, which in turn depresses normal functions. Hypothermia can be fatal if the body's internal temperature is allowed to fall too low (Treasury Board Secretariat of Canada, OSH Advisory Notice, Chapter 6-3).

The best way to prevent hypothermia is to avoid heat drain from the body by reducing or ending exposure to the cold, especially by dressing warmly and staying dry. (Wet clothing loses about 90% of its insulating value.) If immersed in water, move around to try to generate heat as no movement merely exposes one to more cold water and uses up one's personal fuel supply faster. In water, an average person wearing light clothing and a life jacket may expect to survive for 2.5 to 3 hours in 10°C (50°F) water.

The best course of action if one falls into cold water is to get out of the water as soon as possible. Never leave an overturned boat, unless to swim to a distant shore. Get on top of the boat as far out of the water as possible. If this is not possible, assume a fetal position and if you are in the water with others, huddle together. Some Personal Floatation Devices (PFD's) such as cruiser suits, immersion suits and floater coats - offer greater protection against hypothermia than life jackets (Survival in Cold Waters: Staying Alive, Transport Canada, Government of Canada Publications, January 2003).

Symptoms of hypothermia range from slurred speech and shivering to shallow respiration and weak pulse to unconsciousness or death.

The treatment for hypothermia is slow warming. The rescuer must blanket, immobilize and transport the victim:

- Handle the casualty gently and with few movements as possible.
- Remove all wet clothing and place the person in something warm like a blanket, sleeping bag or a heated vehicle.
- Apply body heat to the areas where heat loss is greatest - the neck, groin, chest and armpits. Never apply hot or warm water, or try alcohol rubs or massage.
- Monitor the person's breathing and circulation carefully. Give artificial respiration or cardiopulmonary resuscitation (CPR) (if you're trained to do so) if the victim has trouble breathing or goes into cardiac arrest.
- Get the person medical help as soon as possible. If you must move the victim, do it gently.

If hypothermia is suspected, take the victim's carotid pulse (at the throat) for a full two minutes before beginning CPR. This is because the pulse is much slower and weaker in a hypothermia victim. Where there is any sign of a pulse, however weak, do not start CPR.

13.4 FROSTBITE

Frostbite, the most common type of cold injury is caused by exposure to extreme cold (usually below -13oC) or contact with very cold objects. In cases of frostbite, tissue temperature falls below the freezing point with the potential for serious damage to blood vessels and stoppage of blood circulation in the affected area. High winds, dampness and general chilling of the body increase the rate at which tissue freezing may occur (Treasury Board Secretariat of Canada, OSH Advisory Notice, Chapter 6-3).

Frostbite symptoms range from inflammation of the skin to slight pain or burning, pricking sensations to blisters. Frostbitten skin can usually be recognized by its greyish-yellow or white appearance. Frostbitten tissue is extremely susceptible to infection and can lead to gangrene.

The pain from frostbite may be mild or nonexistent and the victim may not be aware he or she is affected. If travelling in teams, it would be helpful to use a buddy system to check each other frequently for signs of frostbite. If frostbite is discovered on the body or on someone else, treat it in much the same way as hypothermia. Do not rub the frozen tissue as this could lead to further damage but apply gentle, direct body heat (never apply heating pads, hot water, etc.) by holding a hand over the affected area. One can warm frost-bitten fingers by placing the hands close to the body, preferably under the armpits. If the feet are affected, do not let the frostbite victim walk: transport him or her to a warm place. In case of frostbite get the victim to medical attention as soon as possible.

13.5 COLD STRESS

In a cold environment, it is crucial to conserve body heat to maintain one's core temperature at normal levels and to ensure an adequate blood flow to your brain and extremities. Working in extreme cold impairs your mental and physical ability and causes frostbite and hypothermia.

Cold may affect a person before they are actually aware of themselves. Overexposure to cold can affect one's judgment. Even temperatures above freezing can be dangerous to one's health especially if wet and have been exposed to cold for a long time. Working in cold conditions can be more tiring than usual because the need to produce more body heat and may be weighed down or restricted by clothing. Do not ignore feelings of chilling, pain or fatigue, since these may be early warning signals of hypothermia or frostbite (Survival in Cold Waters: Staying Alive, Transport Canada, Government of Canada Publications, January 2003).

Safety Precautions

Protect oneself from wind (or indoors, from drafts) because the cooling power of wind can lower the temperature far below what it would be if there was no wind. Have a warm shelter readily available that is protected from the wind and alternate periods of inside and outside work.

A diet high in fat and carbohydrates may help maintain one's body temperature in cold environments. Appropriate foods include pasta, potatoes, rice, dairy products, nuts, fat meat, herring and salmon. Take warm drinks during rest breaks.

If heavy work is being conducted, it is important to drink enough fluids to replace the fluid you lose through breathing and perspiration as dehydration increases the risk of hypothermia. Avoid drinking alcohol in cold environments. Alcohol produces a deceptive feeling of warmth and can have dangerous effects on circulation, particularly to the extremities. If one has a health condition that affects normal body temperature regulation or causes circulatory problems (e.g., Raynaud's disease, diabetes, thrombophlebitis), avoid working in cold.

If one has suffered from frostbite before, one will always remain extremely sensitive to cold and should avoid any risk of frostbite again.

Wear appropriate clothing, layered to trap warm air and prevent conductive heat loss. Wet clothing causes you to lose body heat rapidly through evaporation. Wear waterproof clothes in wet weather and reduce sweating by removing layers, as necessary, and opening closures at neck and wrists.

13.6 SNOWMOBILE SAFETY

Snowmobiles can get into areas where other vehicles cannot. As a result, snowmobilers are often tempted to take their vehicles into situations that may be hazardous. The greatest single cause of death associated with snowmobiles is drowning after breaking through the ice. Nevertheless, snowmobile operations over ice cover can be conducted safely. Awareness of hazards can prevent accidents (Safety Standards: Motorcycle & Snowmobile, Transport Canada, Government of Canada Publications, TP 3814).

13.6.1 DRIVING CONDITIONS

If one must snowmobile at night, the reduced visibility demands that one be extra cautious while operating the vehicle. Drive at a speed that will enable one to stop once the headlights picks up an obstacle. Avoid unfamiliar terrain and be sure all lights are working - headlights, taillights and brake lights. Always carry a flashlight and spare bulbs. Fog may indicate nearby open waters; reduce speed and take great care.

Glare from sun and ice may blind one to obstacles or dangerous areas; wear anti-glare sunglasses under these conditions. Avoid tailgating another snowmobile; if it slows down for any reason, one could hit it from behind and injure the driver and passenger. Maintain a safe stopping distance between the machine and the snowmobile in front. Depending on the terrain, one may need more space to stop than one might think.

Inexperienced operators and uninformed passengers are among the major causes of snowmobile accidents. Always show a new operator how to start and stop the vehicle. Show him or her the correct riding positions and basic snowmobiling hand signals (The Alberta Snowmobile Association, January 2004. [Approved CCSO Snowmobiling Hand Signals](#)). Above all else, only allow him or her to operate the snowmobile in a flat, restricted area - at least until he or she is completely at ease operating the machine.

As for your passenger, make sure he or she is dressed properly for the weather with no long scarves or loose-fitting clothing that could get caught in the snowmobile's moving parts. Make sure his or her feet are on the running boards and that he or she keeps a firm grip on the passenger strap or grips, or you.

Never travel by snowmobile alone. One could run out of fuel, have an accident or damage the snowmobile. Use the "buddy system" - always have a friend or co-worker ride a second machine. Tell someone about the travel plan and the approximate time for the return. Remember, a snowmobile can take a person farther in half an hour than one may be able to walk in a day in deep snow.

Certain snowmobiles have a frame support bar over the running boards. One should never think of this bar as a stirrup. Doing so could cause serious injury if one were to fall off. If one is the driver, place both feet on the footrests beneath the hood or on the running board either in front or behind the support bar, resting against it - never in it.

Don't show off by hurdling the snowmobile as it is only a trick for professional stunt drivers. Be responsible. High speeds can be fatal. When travelling at high speed, one cannot respond as quickly to the unexpected. Ride at a speed that is appropriate for the trail width, condition and length. If a maximum speed is posted, observe it. **Remember:** Watch the speed while carrying a passenger. (Safety Standards: Motorcycle & Snowmobile, Transport Canada, Government of Canada Publications, TP 3814)

13.6.2 SNOWMOBILE TERRAIN

If one unexpectedly encounters open water, slow down, brake gently and turn away; if close, turn as sharply as possible. If one cannot make the turn in time or if one turns into a skid, try to roll off the machine.

Hidden fences and wires can cause serious accidents. Get reflective tape or other markers to identify hazardous wires near the trail and leave room for a wide turn near telephone poles or fence posts.

Overhead branches can be distracting, can slash one's face and even cause serious eye damage. It is mandatory to wear a CSA-approved safety helmet, eye protection and if possible, a face shield. Passengers are required to wear protection as well.

Reduce speed if travelling on roads. Avoid roads if all possible as the snowmobile is not designed to operate or turn on pavement. When crossing a road, make a full stop, then look carefully in both directions before crossing at a 90° angle. Be wary of parked vehicles.

Meadows sometimes have low areas where water accumulates and freezes over in winter. This ice is usually glare ice. Trying to turn or brake on this surface could cause the vehicle to spin out of control. Never brake or try to speed or turn on glare ice. If there is contact with glare ice, reduce speed by carefully releasing the throttle.

Never operate a snowmobile over open water or on turf. Snowmobiles are designed to run on snow; that's the ideal surface for them. (Safety Standards: Motorcycle & Snowmobile, Transport Canada, Government of Canada Publications, TP 3814)

13.6.3 SNOWMOBILE MAINTENANCE

Smoking while refuelling or while checking the fuel level is extremely dangerous as all fuels give off fumes. **Do not smoke near the snowmobile.**

Although the snow on the ground can be many centimetres in depth, dry grasses - in certain areas - may extend above snow level and get caught on the machine. Remove any such accumulation from track, engine and gas tank areas.

All carburetors and throttle cable systems can freeze under certain conditions when condensation accumulates. Make sure to check the throttle movement before starting the snowmobile to confirm that the carburetor and throttle cable are not frozen. Should the carburetor or throttle cable system freeze while driving the snowmobile, immediately turn off the machine with the manual emergency stop switch. Deal with the deicing before you turn the snowmobile on again.

While operating a snowmobile, always be aware of the potential danger of a "stuck" throttle and be prepared to respond immediately if this should happen. Never let the engine run while the hood is open. Even when idling, a snowmobile engine is turning over at 1800 revolutions per minute. Always turn off the ignition key before opening the hood for any reason.

Never remove any original equipment from the snowmobile. Each vehicle has many safety features built into the machine. Such features include various guards and consoles as well as reflective materials and warning labels.

A poorly maintained snowmobile can be a potential hazard in itself. The snowmobile should be equipped with extra spark plugs, drive belts and a tool kit. Worn-out components could make the vehicle break down completely. Keep the snowmobile in good working condition at all times. Never raise the rear of the vehicle while the engine is running; snow, ice and debris could be thrown back and hit someone. To clear the track, turn the engine off and tilt the vehicle on its side. Remove the blockage with a piece of wood or something similar. (Safety Standards: Motorcycle & Snowmobile, Transport Canada, Government of Canada Publications, TP 3814)

13.7 WINTER SURVIVAL

13.7.1 WINTER SURVIVAL TRAINING

All field workers required to work in cold weather conditions should take a course in winter survival, particularly where operations require travel to remote locations by unusual means of transportation such as air charter or by snowmobile.

Course topics should include both psychological and physical aspects of survival. The topics could range from the effects of hypothermia and frostbite to construction of camp fires, temporary shelters and search and rescue.

A number of organizations across Canada offer courses. All organizations will be able to tell you in advance what you have to pack for the course, its cost, location and the amount of time spent in classroom instruction and in practical outdoor situations. It is best if survival training is taken in the region you work in as it is more likely to cover the special conditions found in that region.

14 BOAT OPERATION

The manual can cover only the theory of operational and safety procedures for safe boating. Always respect the water.

One must also keep in mind before heading out to the water that any person wishing to operate a boat needs to carry a proper permit. Please see the Canadian Coast Guard for further information as to province specifics. (Canadian Coast Guard, “The Safe Boating Guide”, www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/main_e.htm)

Both employer and employees must take every precaution to reduce the chance of a boating accident. Because ESS personnel may collect data on rivers and lakes, there is always a risk of injury or drowning. With proper planning the level of risk will decrease.

14.1 BOATING CHECKLIST

Avoid inconvenience and potential danger by taking a few minutes with this checklist:

- ✓ What is the weather forecast?
- ✓ Any local hazards or boating restrictions?
- ✓ Any maps or charts?
- ✓ Are there enough personal flotation devices of appropriate size for everyone on board?
- ✓ All safety equipment in good working order?
- ✓ Ample reserves of fuel for the trip or will refuelling be needed?
- ✓ Is the radio working properly?
- ✓ First aid kit, basic tools and spare parts?
- ✓ Has someone been informed of the party’s travel plans, scheduled return time and description of the boat?

(Canadian Coast Guard, “Before Setting Out”, www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/before_e.htm)

14.2 LIFE JACKETS AND PERSONAL FLOATATION DEVICES

Life jackets and PFDs differ in one important respect: a life jacket will keep an unconscious person’s head above water, face up, without any effort; a PFD does not. Some types of PFDs (e.g., cruiser suits), however, provide protection against hypothermia, whereas a life jacket does not. Regulations require that an approved life jacket, PFD or life-saving cushion, be carried for every passenger on board.

Be sure the life jacket is approved. Try on the jacket and familiarize oneself with the tie tape arrangements. Life jackets are reversible but when using the keyhole style, it is important to tie the waist straps around the body and not around the life jacket. This allows the jacket to float away from the body so one can assume the desired incline, backward and floating positions (even if unconscious).

Every individual is responsible for keeping their life jacket in good condition. Do not use it as a seat cushion, boat fender or kneeling pad. Wear it when in the boat; store it in a well-ventilated, cool area when not in the boat. If it gets wet, hang it up to dry before storing it.

14.3 COMMUNICATIONS FOR BOATING SAFETY

14.3.1 COMMUNICATING WITH SHORE

It is essential to have a method of communicating with the shore, such as a radio or portable telephone. The Canadian Coast Guard gives 24-hour service on channel 16 (156.8 MHz), and on 2182 kHz. These channels are to be used as distress and calling frequencies only. The Coast Guard recommends that radio operators contact the Vessel Traffic Services (VTS) stations directly on the local area VHF working frequencies rather than making initial calls on channel 16. (Canadian Coast Guard, "What to do in an Emergency", www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/emergency_e.htm)

Contact the Coast Guard for complete information about the radiotelephone services they provide.

14.4 WEATHER CONSIDERATIONS

Boat operators should be aware of and make note of all marine weather warnings. Avoid all boat operations in potentially dangerous weather. Weather forecasts may be obtained from various sources.

- Channels 21B and 83B on the Atlantic Coast and Great Lakes
- Channels 21B and 39 (WX1) on the Pacific Coast
- Weather radio Canada (Environment Canada) includes: VHF broadcasts in Vancouver, Toronto, Montreal, and Halifax
- Regular AM and FM radio weather forecasts

Small craft warnings are announced in marine forecasts and near shore forecasts if wind speeds are expected to exceed 20 knots.

Gale warnings mean winds are expected to exceed 34 knots. Storm warnings mean that winds are expected to exceed 47 knots.

14.5 SAFE BOATING GUIDELINES

Observe the following when operating a boat:

- When operating any boat, follow Coast Guard regulations at all times.
- Do not stand up in any small boat. Keep one's centre of gravity low.
- Do not obstruct the operator's view.
- Keep an eye on other traffic, markers, charts, etc.
- Advise base camp of the planned destination and the estimated time of arrival.
- Never start an engine while it is in gear.
- When operating a small boat, use caution and slow down when passing near diving areas.
- Make sure to carry appropriate and up-to-date charts and publications.
- When refuelling a small boat equipped with portable fuel tanks, fill the tanks on shore, not in the boat, in case of spillage. Use only approved containers for transporting fuel.
- Travelling alone is not recommended and should not be allowed on swiftly flowing rivers.
- Where travelling alone is necessary:
 - ▶ prepare an emergency response plan and notify someone prior to departure;
 - ▶ carry a first-aid kit (people travelling alone must have first-aid training); and

- ▶ take along a radio or a portable telephone.
- Never drink and operate a boat.
- Watch for varying water depths.
- Weeds can foul and clog the water intake. To clear it, turn off the motor and check the intake and propeller.
- High winds and driving rain can quickly swamp or capsize the boat. Learn to recognize the signs of changing weather conditions and head to shore.
- Stop and turn slowly. Stopping too quickly or making too sharp a turn could allow the wave to swamp the craft.
- Watch out for floating debris such as ice and trees, especially during high-flow river conditions.

(Canadian Coast Guard, “The Safe Boating Guide”, www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/main_e.htm)

14.6 BOAT MAINTENANCE

To prevent breakdowns, one needs to establish a regular maintenance routine: check the motor for signs of wear and tear; become familiar with basic repairs; read the instructions in the motor’s owner/operator guide carefully.

14.7 DOCKING AND WIND CONDITIONS

When approaching a dock or landing, consider the wind and the current. If carrying fenders, put them out on the side of the boat before starting the approach run.

Docking is easy when the wind is blowing straight from the wharf. At slow speed, head to the wharf straight on. Just as the bow nears the wharf, turn the boat broadside (the motor must be pushing the boat slowly to make this turn). If necessary, shift into reverse to bring the boat to a gentle stop.

When the wind is sweeping along the shoreline or the wharf, follow the same docking procedure, except that the turn at the wharf should be in the direction that will bring the bow around into the wind. Depending on the force of the wind, little or no “reverse” help will be needed from the motor to stop the boat. The most difficult wind condition to cope with is when it is blowing onto the dock from roughly the same direction that one may be travelling. The wind will try to push the boat into the wharf and the full effect of the wind will only be obvious when the boat is turned broadside to the wharf.

The solution is to turn the boat broadside to the dock at least a full boat width upwind of the wharf and use reverse to stop the boat’s forward motion. Now the wind will push the boat up against the wharf, so you must be ready with fenders and paddle to ease the boat in.

Leaving a Dock

Leaving a dock demands the same sort of careful coordination as docking - maybe more because the space is restricted and one must not get in the way of incoming boats.

14.8 BOATING SAFETY - RIGHT OF WAY

In general, power-driven boats must give way to all other boats (sailboats, canoes, rowboats). It is only common sense that small, fast pleasure boats give the right of way to large freighters and passenger boats.

Boats coming from the right (starboard, green light) have the right of way as one holds the right of way over boats approaching from your left (port, red light). When meeting head-on, alter course to the right. A boat approaching from the rear must keep clear of the boat being overtaken.

(Canadian Coast Guard, “Responsible Operation of your Boat”, www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/operation_e.htm)

14.9 BOATING ACCIDENTS

If involved in a boating accident, first determine if the vessel will stay afloat. If it is obvious the boat is sinking, do not attempt to swim ashore, no matter how close it looks. It is far safer to cling to any wreckage and wait for rescue than to try to swim to safety.

If the vessel stays afloat, the first step is to attend to any injuries caused by the accident and then to signal for help.

If another vessel is involved in the accident, there are several important details that should be recorded once one is safe:

- the names and registration numbers of all the vessels involved;
- the names of all persons onboard;
- time of the accident;
- one's version of what happened;
- photographs of the damage, if possible.

Do not make any statements or accusations until a supervisor has been informed. Do not resume field work until all damage has been thoroughly examined and the relevant information documented.

(Canadian Coast Guard, "What to do in an Emergency", www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/emergency_e.htm)

14.10 WATER SAFETY

All ESS field staff who are or may be required to work in and around water should take a basic water safety course. An in-river course dealing with typical situations that field personnel encounter is also recommended. Instructors can tailor the course to suit the needs of the location of choice. The course should include small-craft safety, the use of safety equipment and the ways to handle practical field situations such as overtopping of waders or immersion with field clothing.

(Canadian Coast Guard, "The Safe Boating Guide", www.ccg-gcc.gc.ca/obs-bsn/sbg-gsn/main_e.htm)

14.11 COLD WATER SURVIVAL

Hypothermia is the loss of the body's core heat. The internal organs become so cold that normal functions slow down and finally stop. The fastest way to get hypothermia is to become immersed in cold water.

See Section 13.3 for further information on hypothermia or Survival In Cold Waters by Transport Canada.

15 AIRCRAFT OPERATIONS

Chartered aircraft, both planes and helicopters are often used to reach otherwise inaccessible areas. When using chartered aircraft, follow these safety considerations.

15.1 GENERAL

The pilot in command is responsible for the safety of the aircraft, passengers and cargo. He or she has complete authority to postpone, change or cancel the flight if he or she believes conditions are, or may be, unsafe.

The project supervisor should cancel operations when, in his or her opinion, conditions make air operations abnormally hazardous or when the pilot neglects essential precautions. Passengers must wear safety belts if the pilot asks them to do so. Smoking is not permitted.

All dangerous goods must meet transport of dangerous goods (TDG) requirements (TDG Act, R.S., 1992., c. 34)

The pilot should be informed by the field officer of the purpose and destination of the flight; on the pilot's advice, the flight plan may be modified. Although the pilot will have air navigation maps, provide additional maps and aerial photos, if available, to help him or her locate the destination. The pilot will decide how to use them.

By working in harmony, the customer, operator and pilot can all achieve their goals without jeopardizing mission safety. The customer's goal is to complete the task at hand as economically as possible while the operator naturally wants to make a profit. The pilot must juggle the demands of both. This may cause additional stress for the pilot who, in some instances, may already have enough to worry about.

(Safety for Aircraft Charter Passengers, Aviation Safety Program, Transport Canada, 06-86)

15.1.1 EMERGENCY LOCATOR TRANSMITTER (ELT)

An ELT is a battery-powered emergency transmitter. When properly installed in an aircraft, it will detect the unusual deceleration associated with a crash and broadcast a distinctive distress signal. ELTs transmit on 121.5 MHz or on both 121.5 MHz and 243.0 MHz. With properly maintained batteries an ELT should have sufficient power to produce detectable signals for 48 hours, even at temperatures as low as -20°C.

The ELT is designed to broadcast automatically after a crash. It also has a manual switch for emergency or test use.

What the ELT Signal Does for You

The signal:

- announces a distress;
- enables COSPAS-SARSAT to determine the approximate position;
- alerts the Canadian Forces search and rescue system;
- provides a homing signal to guide search aircraft to the location; and
- speeds rescue.

Emergency ELT Procedures

After a crash or forced landing, place the ELT function switch to "ON" immediately. After turning it on, leave it on until rescued. Satellites and rescue aircraft need a continuous transmission signal to locate and home in on the position. If concerned about battery power, one may want to wait until an aircraft is in sight.

Using the ELT to Improve Your Survival Odds

- If possible, remove the ELT from the aircraft and set it vertically on the highest nearby point to maximize its transmission range (line-of-sight transmission). Make sure that the ELT is connected to an antenna.
- Stay with the aircraft and set up a survival camp.
- Prepare signal fires or some other means of attracting the attention of search aircraft.

(ELT:Your lifeline to Safety., Aviation Safety Program, Transport Canada, 12-85)

15.1.2 GROUND-TO-AIR SIGNALS

Even if no ELT or distress signal has been received, a visual search will start based on the pilot's flight plan or flight itinerary. The search will start along the filed track between the last known position and destination. Searchers will be looking for anything out of the ordinary and all eyes will be drawn to any unnatural feature on the ground. One has the best chance of being spotted if large portions of the aircraft's wings and tail are painted in vivid colours. Keep the aircraft cleared of snow. One may have to wait at least 24 hours before being rescued. As soon as possible after landing, build a campfire. Spread out any bright-coloured material such as plastic or cloth that will contrast with the background terrain. Make the site as conspicuous as possible.

Be prepared to attract search aircraft using flares, smoke/smudge fire, signal mirrors or other available means. Have all equipment handy in advance as one may not have much warning that a search aircraft is about to pass overhead.

Remember: three fire symbols in a triangle are a distress signal.

One of the most conspicuous survival items now available on the market is a cloth panel of brilliant fluorescent colour. It can be staked to the ground during the day and used as a highly effective ground signal. It can also be used as a lean-to shelter and or as a blanket.

The following symbols should be used to communicate with aircraft in an emergency. The first table is internationally accepted and the second is for use in Canada only.

INTERNATIONAL EMERGENCY SYMBOLS	
MESSAGE	SYMBOL
Need Help	V
Need Medical Help	X
No or negative	N
Yes or affirmative	Y
Proceeding in this direction	-

EMERGENCY SYMBOLS FOR USE IN CANADA ONLY	
MESSAGE	SYMBOL
All is well	LL
Need food and water	F
Need fuel and oil	L
Need repairs	W

(The Alberta Snowmobile Association, January 2004. Ground to Air Rescue Signals.)

More About Symbols

- Use strips of fabric or parachutes, pieces of wood, stones, or any other available material to make the symbols.
- Aim for as big a colour contrast as possible between the material being used for the symbols and the background against which the symbols are exposed.
- Symbols should be at least 2.5 m (8 ft.) high. Take care to lay out symbols exactly as depicted so they will not be confused with other symbols.
- A space of 3 m (10 ft.) should separate the elements of code symbol LL.

15.2 AIRPLANE OPERATIONS

Many types and sizes of planes are used in bush operations. **Remember:** *the manual can deal with safety considerations only in general terms as the manual is not intended to replace any instructions given to by your pilot.* However, it is important to become familiar with existing hazards and to know how to act responsibly to diminish the risk of an accident.

15.2.1 TRIP PLANNING

The trip planning phase is an essential part of any trip, especially one by aircraft to remote locations. Without a well-thought-out plan, one may be placing oneself, as well as co-workers, at risk. Safety should always be the first consideration. Although it is unlikely the pilot may have to make an emergency landing, one could end up spending a night or two in the bush. The degree of comfort in which one spends these nights will depend on how well the trip was prepared. One must not depend on the pilot to supply the party with survival equipment as in some regions it is not mandatory for the aircraft or pilot to be so equipped.

Safety and well-being are your responsibility. An ideal way to plan for the safety aspects of the trip is by using a checklist. One may want to review this list with the pilot before the trip. This checklist should include:

- a 1:250 000 map of the area where the pilot will be flying in (1:50 000 is ideal, but it could be cumbersome if required to pack a lot of maps.)
- clothing and footwear requirements, e.g., rainwear, parka, snowshoes
- medication (carry an adequate reserve)
- alerting the pilot to any medical problems anyone may have
- eyeglasses and sunglasses
- a survival kit adequate for the field party
- first-aid kit
- life jackets
- communications: radios, mobile or cellular phone, if applicable
- safety equipment required e.g., safety harness, floater suits
- up-to-date weather report and forecast (The pilot will always have this; ask for it before takeoff.)

15.2.2 PREFLIGHT BRIEFING

Every flight with a new passenger should begin with a thorough safety briefing from the pilot. There are many operational features aboard the aircraft one should become familiar with so that one can operate them on a day-to-day basis or in the event of an emergency. Knowing something as simple as how to open the aircraft door could save one's life in an emergency.

15.2.3 WORKING AROUND THE AIRCRAFT

In remote areas, the pilot may ask a passenger to help him or her with mooring a float plane. It is imperative in these instances that one ask for detailed instructions on the right procedures and safety precautions to take.

Working around the aircraft while the engine is operating is extremely hazardous. Every year many people are killed or seriously injured from walking into propeller blades. The distraction caused by the noise of the engine and the invisibility of the blades while rotating creates the potential for a serious accident. Make sure one is aware of where the propeller is located on the aircraft that has been chartered. One must note that the location could vary on different types of aircraft. Avoid loading or boarding the aircraft while the engine is running. If one has chartered a float plane, take note of the danger markings designated on the floats. Note the arc area of the blades relative to the front of the floats. If one must help the pilot dock the aircraft at the destination, be sure to understand the proper procedures before flight (The Propwatcher's Guide: Landplanes, Transport Canada, Government of Canada Publications, TP 1195).

Never attach a mooring rope to the front of the float until the propeller has stopped. Never throw a rope as it can slingshot back into the propeller. Take special precautions with multi-engine aircraft like the DHC-6 Twin Otter on which the propeller overhangs the dock area.

Remember that aircraft on floats or skis have no brakes. The plane has to coast to a stop. Always keep well clear of the propeller. A piston engine is shut off by the fuel mixture control and there is a brief delay until the fuel to the engine runs dry. The ignition is shut off only after the engine has stopped.

The pilot will need time to stop the engine; in an emergency this can take several seconds. For the same reason keep clear of the overhang of the wing and wing spar so they won't clip you.

15.3 HELICOPTER OPERATIONS

One should follow these safety guidelines when having to perform duties in and around helicopters. These guidelines are not intended to replace any instructions given by the flight crew. However, by being aware of the dangers of working around helicopters, one will be better able to act responsibly to reduce the risks of an accident. (The Propwatcher's Guide: Helicopters, Transport Canada, Government of Canada Publications, TP 1194)

15.3.1 TRIP PLANNING

When flying in a chartered helicopter, personal safety and well-being are an individual responsibility. The company from which the aircraft is chartered has a responsibility of providing a safe, airworthy helicopter, verifying the weather forecast, determining fuel requirements and providing emergency/survival equipment and safety briefings. One must ensure that these requirements are met with no exceptions.

One should always pack for each flight by helicopter as though one is going to spend the night in the bush. Verify that the helicopter is configured so that every passenger has a harness. An ideal way to plan for the safety aspects of the trip is to use a checklist as this will show the pilot that safety is a priority. (Safety Temporary Bush Helipads, Aviation Safety Program, Transport Canada, TP 4262E).

The checklist should include:

- maps of the area, supplied by the carrier;
- clothing requirements, including footwear;
- medication (carry an adequate reserve);
- alerting the pilot to personal medical problem;
- eyeglasses and sunglasses;
- survival equipment (supplied by the carrier);
- first-aid supplies (supplied by the carrier);
- life jackets for over-water flights (supplied by the carrier);
- communications: VHF and HF radios, mobile or cellular phone, if applicable (supplied by the carrier);
- safety equipment for the job, such as life jackets, safety harness;
- up-to-date weather forecast (supplied by the carrier).

(Helicopter Passenger, Aviation Safety Program, Transport Canada, 11-88)

15.3.2 PREFLIGHT BRIEFING

Every flight should begin with a thorough safety briefing from the pilot. Become familiar with the helicopter selected for the job. During the preflight safety briefing, pay particular attention to:

- how the doors close, lock and how they open;
- how the seat belts operate;
- how low the main rotor drops during shutdown;
- the location of the tail rotor (never approach the tail of the aircraft during operation);
- the location of the exhaust (exhaust gas temperatures can reach 800°C);
- where to find the ELT;
- where to find tents, sleeping bags, an axe and a survival kit;
- where to find the first-aid kit;
- where to find life jackets;
- where to find the fire extinguisher;
- how the VHF/HF radio works; and
- what the maximum payload (make sure the pilot knows the entire weight being carried).

15.3.3 WORKING AROUND THE HELICOPTER

The helicopter is a safe aircraft but one should avoid working around it while it is operating, if at all possible. There are instances when one may have to leave or load the aircraft while it is operating. If so, here are some key things to remember:

- Approach and depart only after pilot signals that it is safe to do so.
- Approach and depart to the side or in front of the helicopter, in view of the pilot in a crouched position but remember to keep the eyes up.
- Never approach the rear of the helicopter; the tail rotor is not readily visible when the helicopter is operating.
- On a slope, approach and leave by the down slope side to stay clear of the main rotor. Carry equipment to

the side, never over or above the shoulder.

- Wear hearing protection and any other required or suggested personal protective equipment.

While outside the helicopter:

- **Never** throw articles toward or from the helicopter; they may be sucked into the blades.
- Make sure the landing area is free of objects that could get blown around and remember that the helicopter always approaches and departs into the wind.
- Once all cargo is stored, secure it so it does not move.
- Make sure baggage doors are securely closed.
- Protect eyes against dust.

While inside the helicopter:

Once the helicopter has been loaded and one is prepared to board, remember:

- Move carefully. Avoid bumping the pilot.
- Avoid sudden movements. Apply weight gradually while boarding; take some time.
- Fasten seatbelts as soon as one is seated and keep the belt fastened for the duration of the trip.
- Do not smoke.
- Do not slam the doors.
- Wear a headset or helmet, if provided.
- Do not talk on the intercom or distract the pilot during takeoff or landing.
- Never place maps or other loose articles near an open window while the helicopter is in flight as they could get sucked out the window and into the rotor.
- Leave the helicopter during refuelling.

15.3.4 HELICOPTER EMERGENCY PROCEDURES

In an emergency, the flight crew will instruct the passengers on what to do but keep the following points in mind:

- Follow instructions.
- Do not distract the pilot.
- If over water make sure to wear a life jacket.
- Assume the brace position. With shoulder straps, tighten the seatbelt, put the knees together, fold arms across the chest or keep tucked under the thighs and remember to sit up straight. With a lap belt only, bend forward so the chest is on the lap and head is on the knees; tuck arms under the thighs.
- Wait for instructions to exit or wait until rotor blades have stopped.
- Help others get out of the helicopter.
- Move well away from the helicopter in case there is a fuel leak.
- Give first aid to anyone who needs it.
- Activate the ELT and remove it from the helicopter if there is any danger of it being damaged.
- Set up camp, making the site as conspicuous as possible.
- Don't leave the camp unless certain of the location and one can be found before one is located by search and rescue.

16 MOTOR VEHICLE, TRAILER TOWING AND ATV SAFETY

16.1 MOTOR VEHICLE SAFETY

Earth Sciences Sector (ESS) staff involved in field operations need to be aware of travel-related safety and health concerns

16.1.1 TREASURY BOARD DIRECTIVES AND DEPARTMENTAL POLICY

The operation of an unsafe motor vehicle is prohibited. A motor vehicle is unsafe when any defect exists in the judgment of the responsible supervisor or in consultation with a qualified mechanic could contribute to an accident. A motor vehicle operator must not be required to operate a mechanically unsafe vehicle or a vehicle loaded in a hazardous manner (Motor Vehicle Operations Directive, 2-11).

All motor vehicles must be operated:

- by drivers bearing a valid licence for the type of vehicle they are to operate;
- prudently and at speeds compatible with road, traffic, weather and visibility conditions; and
- in compliance with the appropriate federal, provincial, territorial or municipal laws.

Motor vehicles that are regularly operated in remote or isolated areas must be equipped with appropriate communication devices for emergency purposes and basic survival gear (Safety Standards: Automotive, Transport Canada, TP 3812).

Every motor vehicle accident must be investigated by the employee's supervisor or the manager in charge of the vehicle. A written report must be provided to the Departmental Fleet Manager with a copy to the Sector Health, Safety and Environment Office. If police investigate the accident, a copy of their report must also be submitted. The cause or causes of the accident should be determined immediately. Where mechanical problems or deficiencies are involved, all damages must be corrected to the satisfaction of a qualified mechanic. As well as the Departmental Motor Vehicle Accident Report, a Hazardous Occurrence Investigation Report must be completed and forwarded to the Sector Health, Safety and Environment Office.

Operators and passengers in motor vehicles must always keep their safety belts fastened when the vehicle is in motion. Departmental motor vehicles shall be equipped with a general first-aid kit (Type "A") as described in Chapter 2-5 (First Aid Safety and Health Directive) of Treasury Board Manual, Volume 1, "Occupational Safety and Health".

16.1.2 DANGEROUS GOODS

One must not handle, offer transport or transport dangerous goods unless trained to do so or conducted under the direct supervision of a trained person.

All departmental personnel who offer dangerous goods for transport are required to take a department- approved Transportation of Dangerous Goods course and maintain a current certificate before handling or transporting dangerous goods. For more information, see Section 12.

16.1.3 TRANSPORT OF EQUIPMENT

When transporting any type of equipment, one must ensure that it is properly secured and that the weight is distributed evenly. As an operator of a vehicle, one must know the nature of the equipment being carried and should have the necessary documentation or permits required for the transport of that equipment. One must also ensure that the vehicle being used for transport (car, truck) is capable of safely transporting the cargo (Take Five for Safety: Overloading, Transport Canada, TP 2228E).

Tools, equipment and cargo must be properly stowed and secured to prevent them from shifting in transit.

16.1.4 EXTINGUISHERS IN VEHICLES

Extinguishers must be provided in all Departmental vehicles. Motor vehicles must be equipped with a portable fire extinguisher conforming to FC Standard No. 401, Fire Extinguishers, published by the Fire Commissioner of Canada.

16.2 TRAILER TOWING

16.2.1 GENERAL GUIDELINES

Most trailer accidents are caused by at least one of the following factors:

- poor maintenance and inspection procedures;
- improper trailer loading;
- poor driving; and
- under-powered towing vehicles.

The following information will help drivers take basic precautions to ensure that towing vehicles and trailers are properly equipped and operated safely (Safety Standards: Trailers, Transport Canada, TP 5199).

16.2.2 SELECTION OF THE TRAILER

The trailer must meet the provisions of the Canada Motor Vehicle Act (Motor Vehicle Safety Act, 1993, c. 16) and its regulations. Trailer models should also be purchased from a manufacturer who is a registered user of the national safety mark. Specify these requirements on requisitions.

Registered manufacturers of trailers will affix an identification plate or compliance label bearing the following information:

- model number of the trailer;
- trailer serial number;
- net vehicle weight (unloaded trailer weight); and
- gross vehicle weight (maximum of the loaded trailer).

16.2.3 TRAILER CAPACITY

The weight of the loaded trailer must never exceed its registered capacity. Overloading can cause tire failure, broken springs, shackles and general structural failure.

16.2.4 TONGUE WEIGHT

Proper positioning of a boat or load onto the trailer is essential. One can be sure of the proper balance when the weight on the hitch allows the trailer to stay level with the towing vehicle when the two are attached. Failure to maintain the proper tongue weight and improperly placed loads can cause major damage, resulting in a serious accident or both. Too much tongue weight can cause suspension/drive train damage and can press the towing vehicle down in back, causing the front wheels to lift to the point where traction, steering response and braking are severely impaired. On the other hand, too little tongue weight can actually lift the back of the towing vehicle, reducing rear-wheel traction and causing instability that could result in fish tailing or jack-knifing.

16.2.5 SECURITY OF CARGO

The trailer load should be adequately secured to prevent shifting. If towing a boat, it should be secured with no less than one bow and two stern hold-downs. Also, a boat should never be used to carry anything except its normal operating equipment.

To ensure proper positioning of the boat or load onto the trailer, have about 10 percent of the weight of the trailer on the hitch. One will have found the proper balance when the weight on the hitch allows the trailer to remain in a level position when attached to the towing vehicle. An improper hitch weight and improperly placed loads will cause the trailer to fishtail. Where the tongue weight exceeds 907 kg (10% of the trailer and the load), one must use a weight distributing or equalizing hitch. The boat should never be used to carry anything except its normal operating equipment.

16.2.6 WHILE TOWING A TRAILER

To handle trailers properly; drivers must acquire new skills. All employees chosen for this specific duty should be given special training and be tested to ensure they are competent to do the job.

If required to operate a vehicle that is pulling a trailer, one should either be well-experienced in the driving skills required or one should be given special training to acquire these skills.

One should be aware that the ability to drive safely can be seriously affected by emotional and physical impairment resulting from fatigue, poor health or from consumption of drugs or medication. Fitness to drive is crucial to one's safety and the safety of others.

Driving Techniques

When towing a trailer, one must be fully aware of the restrictions on manoeuvrability, visibility and acceleration. One should also know that the vehicle's brakes can change considerably with the added weight of a trailer. Here are some other points you should pay attention to:

- Never go over 80 km per hour.
- Give extra distance for passing and take care when returning to the driving lane.
- When turning, drive beyond the normal turning point for conventional vehicles to ensure that there is enough clearance to make the turn safely.
- Signal well in advance of any move.
- When following another vehicle, keep back at least one full length of the vehicle plus trailer for each 16 kilometres per hour of speed.
- Before reversing, leave the vehicle and check for hazards in your path. If someone is available to help, ask him or her to stand outside the vehicle to direct the backing manoeuvre.

Launching and Recovering (for boat trailers)

Before launching or recovering a boat, disconnect all power. The trailer should not be submerged in the water any longer than necessary. Launch ramps and boat slipways are usually covered with algae or other types of slippery marine growth. Watch every step as they can be extremely slippery to walk on while launching or recovering boats.

If the trailer is used for a launch or recovery and left idle for a week or more, the trailer's bearings should be checked and if necessary, adjusted or replaced.

Trailer Inspection, Maintenance and Repair

Trailers in regular use should be inspected thoroughly in accordance with instructions provided by the manufacturer. Trailers should also be serviced every 5000 km or every three months, whichever comes first and more frequently when subject to rough usage or adverse conditions.

A record book must be kept for each trailer that shows when inspections and maintenance have been carried out with specific details of repairs.

(Safety Standards: Trailers, Transport Canada, TP 5199)

16.3 SAFETY FOR ALL-TERRAIN VEHICLES

16.3.1 REDUCING RISK OF ACCIDENT OR INJURY

Knowing the all-terrain vehicle (ATV) will reduce your risk of serious accident and injury. Familiarize oneself with the operating instructions and riding tips in the manual provided by the manufacturer. Before riding any ATV, make sure one understands how to operate all the controls. Drive slowly and conservatively until thoroughly comfortable with handling the vehicle. Remember that some ATVs have rear brakes only, while others have both front and rear; learn the recommended stopping techniques for the vehicle. Don't travel alone. ATV users should go out in groups of two or more so that one can go for help in case the other has an accident or a breakdown. Always inspect the mechanical condition of the ATV before each ride to minimize the chance of accidents or breakdowns. (Tips for the ATV Rider, Canadian All-Terrain Vehicle Distributor's Council)

16.3.2 PROTECTIVE GEAR

Helmets

The helmet is the most important piece of protective gear. Choose an approved helmet that meets or exceeds the Canadian Standards Association. Every helmet should fit snugly and always be securely fastened. Full-face helmets provide protection for the face as well as the head. Open-face helmets are lighter and cooler but one should use mouth protection when wearing them.

Eye Protection

To ride safely, one needs to be able to see clearly. An object such as a rock, branch or even a bug could potentially distract or even blind you. Regular sunglasses or eyeglasses do not provide eye protection on an ATV. One must remember to wear a face shield or goggles at all times. Tinted goggles or face shields are best for riding on bright days, clear ones for night riding and yellow goggles for overcast days.

Clothing

Good gloves will keep hands from getting sore, tired or cold, and will provide some protection if there is spill from the vehicle. Off-road style gloves are available at motorcycle shops and provide the best combination of protection and comfort. Handlebar molts are also useful in cold weather.

The most protective footwear is a pair of strong, over-the-calf boots with low heels to prevent the feet from slipping off the pegs. Off-road style motorcycle boots provide the best protection for feet, ankles and legs. A long-sleeved shirt or jersey and long pants are the minimal requirements for rider protection as the protective clothing will help shield skin from sunburn and potentially severe scratches.

(Safety Standards: Motorcycle & Snowmobile, Transport Canada, Government of Canada Publications, TP 3814)

16.3.3 SAFE RIDING PRACTICES

Be sure to negotiate proper turns, to brake, park, anticipate terrain, go up and down hills, traverse a slope, ride through water and if required, ride in the snow and other winter conditions. Do not attempt manoeuvres that are beyond personal capabilities. When in motion, keep feet on the foot rests at all times. (The ATV Rider's Course, Canadian All-Terrain Vehicle Distributors Council)

17 TOWER CLIMBING

This section covers the rules for the safe and efficient inspection and servicing of communications towers and mounted equipment.

This section may serve as a guide for trained personnel or as a basis for training, but reading this section alone is not adequate training for climbing towers.

17.1 FALL-RESTRAINT AND FALL-ARREST SYSTEMS

Climbers should recognize the technical distinction between “fall restraint” and “fall arrest.”

Fall-restraint methods (the preferred approach) are intended to eliminate or at least substantially reduce the risk of a fall occurring in the first place. Some methods are edge protection, work positioning belts, pole straps and certain types of installed systems as discussed in the following paragraphs.

Fall-arresters may prevent a fall from occurring, but are actually designed to stop a fall within a certain distance, ranging from 1.4 m (e.g., a bungyed climbing lanyard) to 5.6 m (e.g., dynamic climbing rope). Most belaying systems, except top ropes, are fall-arresters.

While the two terms are frequently used interchangeably, climbers should be aware that there is a crucial difference in the way the two systems work. Fall-arrest systems use “dynamic” (stretching) components to decelerate the fall slowly over a relatively long distance, whereas fall-restraint systems typically use “static” (no stretch) components to stop movement quickly. Using either system incorrectly can result in system failure and serious injury.

All ESS employees who, by nature of their job, must climb towers for maintenance have been given extensive training in Fall Protection and Rescue. Please note that it is the employer's responsibility to ensure that procedures for performing these duties are in writing. For further information, please refer to Canada Health and Safety Regulations (SOR/86-304), Part XII: Safety Materials, Equipment, Devices and Clothing.

17.2 TOWER INSPECTION CHECKLIST

Go over the following inspection checklist before anyone climbs the tower. If the tower is to be climbed repeatedly, the checklist needs to be completed only before the first climb, unless you have reason to believe the tower has been tampered with since the last time it was checked. Go over the checklist again when the tower is due for its routine or annual inspections.

17.2.1 ANCHORS AND FOUNDATIONS

- Check for stability and effectiveness of anchors; there should be no upward movement or rocking when the guy is tugged vigorously.
- Check the visible steel of the anchor shafts, guy anchor plates, base plates and anchor bolts for bending, fractures and corrosion.
- Check that there is a separate anchor connection for each guy, i.e., if the tower is double guyed, there should be two connections to each anchor.
- Check that the base plate rests solidly on the foundation.
- Check concrete/grout for movement, cracks and spalling or deterioration.
- Check for adequate drainage and back fill at the tower base and anchors.

17.2.2 GUY PREVENTIVE MAINTENANCE

- Check guy wires. The weakest points will be at turns in the wire. Check for silvering, strand breaks and deep-pitting rust.
- Check for loose, worn, cracked, bent or missing hardware. Clips should bite on the live side of wire. The U-bolt of the clip should be on the dead end of wire rope - the live end rests in the saddle. Each termination should have three clips, with the dead end of the wire passed back on itself through the nearest clip.
- Turnbuckles should be lock-wired, and this lock-wire should be attached to the guy with another set of clips. At least 2.5 cm of shaft should remain inside the barrel after adjustment.
- Replace wire that has been crimped.
- Check the tension at the point where the guys are 5 cm apart using the following procedure:
 1. Select the point on guys where they are 5 cm apart.
 2. Pull the guys together at this 5 cm point and observe the upper guy tension.
 3. Release the guys; tension on the lower should now equal that noted on the upper when they were together.

17.2.3 TOWER

- To check verticality, try hand sighting with a plumb line from the anchor points or a 2 m level on each leg of each section. An estimated lean of less than 5o at the mid-section can be considered safe. Check if the tower has bent sections by sighting up the legs of the tower.
- Visually check for bent, broken or missing rungs/stringers; obvious cracks in welds; and bolts that are loose, missing, short or corroded.
- Check all galvanized components for scratching, scoring, flaking and rusting. In particular, check each rung where it joins the stringer, especially on the side of the tower most frequently climbed.
- Check equipment mounting for damage, loose or missing bolts, and bent members.
- Check for any evidence of vandalism, such as guy wires partly severed, or tampering, for example, with turnbuckles, clips or bolts. If ladders, gratings or railings are in use, check for fractured members or welds, loose or missing supports, corrosion on rungs, plugged drain holes, etc.
- If the tower supports additional equipment such as sensors, solar panels, lightning conductors, antennae, junction boxes or lights, check for security of installation and the possibility of a climbing hazard or the weakening of the tower.

17.2.4 GROUNDING AND LIGHTNING PROTECTION

- Check all visible components and mountings for damage, loose or missing bolts, cracked welds, and bent or fractured members.
- Check lightning/ground rods for loose, missing or corroded connections.
- Ensure that grounding cables are not bent, kinked or broken.
- Check junction boxes for drain plugs and water tightness.
- Disconnect or isolate AC power before climbing, where possible.

17.2.5 ELECTRICAL AND COMMUNICATIONS

- Check that obstruction lights are installed if required, and that they meet relevant specifications. Check that they work.
- Check tower mounts for loose, missing or corroded brackets.
- Check power and communications cables for kinks, loose or missing supports, loose or missing junction box covers and screws, blocked drain holes, and deterioration or cracks.
- Check all electrical/communications connections for loose, missing or corroded connections.

17.3 CLIMBING PROCEDURES

The Tower Inspection Checklist should be followed before climbing any tower structure and during routine work or annual inspections.

It is the employer's responsibility to ensure that all climbing procedures are in writing and that the employees understand the procedures.

WARNINGS

Do not climb a tower if a thunderstorm is likely. Do not climb a tower that is covered with clear ice, especially if it is the upper sections of the tower that are iced over. If rime ice accumulation interferes with one's grip, break it off as one climbs (but if safely connected to the tower by a lanyard).

Do not try to second-guess the serviceability of the equipment. Keep track of its life, inspect it frequently and discard if there are doubts as to its safety.

18 SAFETY PRECAUTIONS FOR EQUIPMENT

Employees must be instructed and trained by a qualified person appointed by their employer in the safe and proper inspection, maintenance and use of all tools and machinery they are required to use.

18.1 CHAIN SAWS

All Chain Saws used by employees must meet the standards set out in CSA standard CAN3-Z62.1-03, Chain Saws.

- Keep all chain saws in safe operating condition.
- Don't start a chain saw while holding it against the body or in mid-air.
- Do not refuel the chain saw while the motor is running; it could be hot enough to ignite the fuel vapour.
- Stop the chain saw before carrying it from one place to another.
- Carry the chain saw with the blade at the rear.
- Chain saws should be equipped with chains designed to minimize kickback.
- If you operate a chain saw, one must have a pocket field party first-aid kit.

DO

- INSPECT the chain saw before starting. Do not use a chain saw with damaged, loose or missing parts.
- ENSURE that the guide bar is tight and chain fits snugly without binding.
- KNOW how to use the controls before starting a chain saw.
- ENSURE that the chain saw is clear of obstructions before starting.

- HOLD the chain saw firmly on the ground. Point the chain saw away from the body and nearby obstructions. Use a quick, sharp motion on the starter cord.
- WARM UP the saw prior to cutting. The chain saw should idle without the chain turning. If the chain continues to turn after the throttle switch is released, stop the chain saw. Then adjust the idle as shown in the owner's manual.

DO NOT

- DO NOT "DROP START" (starting saw in hands). This leaves only one hand to control a running chain saw and has resulted in leg cuts.
- DO NOT START chain saw unless it is at least 3 m from a fuel container.
- DO NOT MAKE adjustments to the chain saw or guide bar when the motor is running.

(Chain Saw Safety, Safety Association of Ontario)

18.2 FIREARMS

Firearms are used by some Earth Sciences Sector (ESS) personnel for collecting specimens, protecting life and/or ensuring survival. Proper adherence to the acquisition, disposal, possession, use, control, storage, maintenance and transportation of firearms will meet the legislative requirements of the Criminal Code and promote safety.

18.2.1 ACQUISITION AND AUTHORIZATION

Acquisition

All acquisition of firearms, by purchase or transfer must be recommended by the supervisor of the user before being approved by a Director.

Authorization

Any employee, other than a peace officer, using, transporting or handling a firearm, must obtain written authorization from his or her supervisor, **successfully pass the Canadian Firearms Safety Course (obtain certification) or equivalent and obtain a Possession and Acquisition License (PAL)** .

18.2.2 ISSUING FIREARMS

Before issuing a firearm to an authorized employee, ensure that:

- the employee has passed a proper training program; and
- all required permits and licenses (PAL) are in order.

NOTE: Technical Field Support Services (TFSS) will not issue firearms to individuals who do not provide proof of a valid license.

18.2.3 EXAMINATION

The Director may require an employee to undergo a psychological examination administered by Health Canada or a medical authority approved by Health Canada before authorizing the issue of a firearm to the employee.

18.2.4 USE

employees must use firearms only for the purpose of and in the context of their duties. Section 25(1) of the Criminal code requires ESS personnel to be able to justify their use of firearms. (Criminal Code of Canada, R.S., 1985, c.C-46, s. 25; 1994, c.12, s1)

Firearms are issued from TFSS in a serviced, winterized and lubricated condition. Each firearm is issued with instructions on Safe Storage Regulations. Upon receipt in the field the weapon should be cleaned of excess oil or grease, then test fired and sighted in.

An employee may draw or discharge a firearm only under the following conditions:

- Self defence, in defence of his/her life or when the life of another person is in danger and other means have already been used and were inadequate.
- Practices, in ESS training or shooting practice sessions in an authorized shooting gallery or field.
- As a last resort, to kill a seriously wounded or dangerous animal when responsible organizations cannot provide this service.

Note: The use of firearms for purposes other than those noted above is strictly prohibited.

18.2.5 MAINTENANCE

The holder of a firearm must keep the firearm in good working order at all times. Any repairs should be done as soon as possible by a qualified person or the firearm must be removed from use.

18.2.6 TRANSPORTATION

Firearms will be transported or carried only when required for official ESS duties and in compliance with federal, provincial and territorial laws.

While transporting a firearm:

- it must not be loaded, and
- it must be locked or in a locked container
- on a scheduled commercial aircraft, one must comply with the rules of the airline company.

Note: It is the responsibility of the Field Officer in charge of a field party to ensure that all the necessary precautions are taken to prevent the possibility of shipment of a loaded firearm.

18.2.7 STORAGE

Stored firearms must be stored unloaded and without cartridges; they must be rendered inoperable by:

- a secure locking device;
- the removal of the bolt or bolt-carrier; and/or
- being stored unloaded in a securely locked container.

Restricted firearms must be stored unloaded and made inoperable by a secure locking device, and stored in securely locked container, or they must be stored unloaded and securely locked in a container specifically for the secure storage of restricted firearms.

Note: All firearms are to be returned to TFSS, 2464 Sheffield Road, for safekeeping and maintenance at the end of the field season.

18.2.8 LOSS OR THEFT

Should a firearm be lost or stolen, the holder must report this to the nearest law enforcement agency and Technical Field Support Services (TFSS). If a restricted weapon is lost, one must also report this to a peace officer or the local registrar of firearms.

18.2.9 TRANSFERT/LOAN

A person may transfer or lend a firearm to an individual only if the person has no reason to believe that the individual

(a) has a mental illness that makes it desirable, in the interests of the safety of that individual or any other person, that the individual not possess a firearm; or

(b) is impaired by alcohol or a drug.

A person may transfer a firearm if, at the time of the transfer,

- (a) the transferee produces to the person a document that purports to be a licence authorizing the transferee to acquire and possess that kind of firearm;
- (b) the person has no reason to believe that the transferee is not authorized by the document to acquire and possess that kind of firearm, and
- (c) the transferee holds a licence authorizing the transferee to acquire and possess that kind of firearm.

(Department of Justice, 1995, Firearms Act, Government of Canada)

18.3 TOOLS AND EQUIPMENT

18.3.1 RESPONSIBILITIES FOR ALL POWER TOOLS

This section explains the responsibilities of the employer and the employee to ensure power tools are used safely.

Employer Responsibilities

- Provide employees with portable electric tools that meet the standards set out in CSA standard C22.2 No. 71.1-M89. These tools must be grounded according to the same CSA standard. Electric bench tools must meet CSA standard C22.2 No. 71.2- M89.
- Mark or tag as unsafe and remove from service any tool or machinery used by employees that has a defect that may make it unsafe to use.
- Appoint qualified people who must train all employees in the safe and proper inspection, maintenance and use of all tools and machinery that they are required to use.
- Where a portable electric tool is used in an explosive atmosphere, it must comply with CSA standard C22.2 No. 157-92 “Intrinsically Safe and Non- incendiary Equipment for Use in Hazardous Locations.”

Employee Responsibilities

General:

- Use the right tool for the job. One must read the instruction manual before operating a tool to learn the tool’s application, limitations and specific hazards.
- Consult the instruction manual for recommended accessories.
- Keep all tools in top condition in sharp and clean condition - for the best and safest performance. Similarly, keep the area where tools are used, clean, dry, well lighted and uncluttered.
- Keep visitors at a safe distance from the work area.
- One cannot use an explosive-actuated portable power tool without the approval of the person in charge or without either an operator’s certificate issued by the manufacturer or adequate training in the safe use of the tool.

While operating a power tool:

- The operator (and any helpers) must wear proper apparel when around operating power tools. Do not wear: loose clothing, gloves, neckties, rings, bracelets, or other jewellery. Clothing may be caught in moving parts. For the same reason, cover long hair with a protective hair covering.
- One must wear safety glasses. Non-slip footwear is also recommended to maintain proper footing and balance at all times. In noisy areas, one must wear hearing protection. If the operation is dusty, wear an approved face or dust mask.
- Before each use, check a tool for damage or misuse. Report to the supervisor as soon as possible any defect in a tool that may render it unsafe for use. Repair or replace any parts that are damaged or misaligned. Make sure all guards are in place and in proper working order. (Never operate a piece of machinery without all required guards in place.) Get in the habit of checking that adjusting wrenches and chuck keys or other locking devices are removed from the tool before turning it on.
- Make sure the switch is in the off position before plugging in the power cord. If the tool has a three-pronged electrical plug, plug it into a three-hole receptacle. Never remove the third prong.

- Never leave a tool running unattended. Turn the power off and do not leave the tool until it comes to a complete stop.
- Put the work piece in a comfortable position and secure it using a vise or clamps, whenever possible, to free both your hands to operate the tool.
- Keep a firm grip on the tool and never stand on the tool or force it in any way. A tool will do its job better and more safely if it is used as the manufacturer intended.

After the job is done:

- At the completion of the job, disconnect the tool from the power supply to prevent unintentional triggering. At this time, clean, lubricate (if required) and store the tool in a safe area.
- Follow the manufacturer's instructions for lubricating and changing accessories. When removing or changing an attachment, making any adjustment or repair, one must not proceed unless the tool is disconnected from its power source so that the tool cannot be inadvertently activated.

APPENDIX A

TREASURY BOARD SAFETY GUIDE FOR FIELD OPERATIONS
Treasury Board Manual, Chapter 5-4 (30-06-93)
“Safety Guide for Field Operations”

Foreword

A wide range of activities, environmental conditions and hazards are common to field operations requiring special care and attention on the part of those involved directly and on the part of supervisory staff's responsible for the control of such operations.

This guide has been prepared accordingly, to focus attention on some major areas of concern, and to serve as a basis for the development of more detailed departmental safety rules and procedures. Particular note should be made of action to be taken before personnel are dispatched on any field operation: thorough planning and careful preparation are essential to the continued safety and good health of those involved.

Purpose

Field operations, particularly those undertaken in isolated areas, expose personnel to a wide range of unique occupational risks and hazards. The purpose of this guide, therefore, is to provide an outline of basic occupational health and safety practices and procedures which may be applied and further developed as required by departments.

Application

This guide applies to all Public Service Departments and Agencies, as defined in Part I of Schedule I of the Public Service Staff Relations Act.

Definitions

In this guide:

“field officer” mean a party chief or other officer to whom, during field operations, is delegated the responsibility to manage a project, or a part thereof (agent des opérations sur le terrain);

“field operations” means those operations and activities conducted by individuals or groups of persons away from the department's premises, such as surveys of an engineering and research nature, forest fire fighting, rescue operations or work parties (opérations sur le terrain).

Departments undertaking field operations should, based on the general requirements of this guide, issue detailed safety directives governing the conduct of field operations, appropriate to the particular risks and hazards which may be foreseen. In this regard, the following general practices are recommended:

- (1) one member of each field party (normally the field officer in charge) should be appointed as a safety officer;
- (2) where a safety officer is not the field officer in charge, a clear definition of the safety officer's authority and responsibility should be provided;
- (3) an appropriate official or authority in the area should be advised of the geographical location of an isolated field operation, its estimated duration, the normal and emergency methods of communication, and the names or the number of personnel in the party. Provincial Forest Services should be advised as a courtesy;
- (4) all relevant safety and health directives and standards applicable to the Public Service should be reviewed prior to departure (see the section entitled “Other references” for list);
- (5) inexperienced personnel who will be working in isolated areas should be provided, where required, with basic survival training or information.

Members of the field party should be briefed by the designated safety officer on the basic safety and health rules to be observed according to the type of field operation and the expected environment, including the following:

- (1) the location of the nearest available emergency medical facility, police station, military or forestry establishment;
- (2) the procedures to be followed in the event personnel become lost, or in the evacuation of seriously ill or injured

personnel;

- (3) the location and method of operating of any emergency equipment provided or available in the area;
- (4) the procedure to be followed for carrying out regular field operating reviews for the purpose of identifying and eliminating unsafe and unhealthy conditions and practices; and
- (5) procedures to be followed in the event of encounters with wildlife, particularly bears.

Equipment

Departments should ensure that all field and safety equipment is checked for suitability and serviceability prior to issue, and rechecked by field and/or safety officers on receipt. Personnel should be instructed on the proper use, care and maintenance of field and safety equipment.

Boat and water safety

Comprehensive safety guidelines, embodied in the Transport Canada publication Boating Safety Guide, concerning the use of boats, both powered and unpowered, should be followed. The wearing of approved type life jackets should be enforced in accordance with the provisions of the Personal Protective Equipment Directive, chapter 2-14.

Snowmobiles

Safety rules concerning the operation of snowmobiles, such as those outlined in the booklet "Play Safe with Snowmobiles" (available from the Canada Safety Council), should be followed. In addition, snowmobiles should be operated in compliance with local regulations governing their use. Additional safe operating procedures are contained in the Safety Guide for Operations Over Ice, chapter 5-3.

Motor vehicles and trailers

Departmental safety rules and procedures concerning the operation and use of government-owned or leased motor vehicles and trailers, encompassing the applicable requirements of the Motor Vehicle Operations Directive, chapter 2-11, should be developed and enforced.

Diving operations

Personnel performing diving duties should be physically and mentally fit to perform each task, and be in possession of a valid certificate of qualification satisfactory to the department.

Sanitation and hygiene

The field officer in charge should ensure, as far as is practicable, that personnel involved in the preparation and serving of food are free from any communicable disease, and that sanitation and shelter facilities are maintained in a manner that does not constitute a health or ecological hazard.

Vehicle traffic hazards

All field operation crews exposed to hazards from vehicular traffic should wear a high visibility vest or other similar clothing, and use appropriate warning signs or be protected by a high visibility barricade in accordance with the Personal protective equipment directive, chapter 2-14.

Tent heaters, gasoline stoves and lanterns

All heaters, gasoline stoves and lanterns should be carefully fuelled and lighted, and care should be taken to keep all open-flame models away from combustible materials. During the use of such equipment in tents, shelters, or any confined enclosure, adequate ventilation should be assured to eliminate the possibility of carbon monoxide poisoning or oxygen deficiency.

Firearms

No person should be allowed to handle or use a firearm unless the department is satisfied as to that person's sense of responsibility, competence and demonstrated knowledge of accepted safety practices in the use of firearms.

Use of explosives

Good industrial safety practices and departmental regulations, where applicable, should be followed with respect to the handling, preparation or firing of explosive charges. Information in this regard is available from Labour Canada in Technical Data Sheet "The Safe Use of Explosives in Federal Enterprises". The Explosives Act of Canada should also be observed.

Fire prevention and fire fighting

Basic fire fighting rules and procedures should be developed and enforced for specific field operations consistent with the general requirements and standards prescribed by the Dominion Fire Commissioners. Provincial forestry requirements should be observed where applicable. Fire fighting should be controlled by experienced crew leaders, and appropriate safety clothing and footwear worn.

Air transport operations

The safety of personnel travelling by air is a prime consideration when making arrangements for transport by charter aircraft. Departments should conclude contracts only with those air carriers who have demonstrated compliance with Transport Canada directives relating to air carriers. These directives are found in the Air Navigation Orders (ANOs) available from Supply and Services Canada, which contain safety-related regulations; designated safety officers should carefully renew the following ANOs, as appropriate, before the operation begins:

- (1) ANO VII, 3--Standards and Procedures for Air Carriers Using Small Air planes in Air Transport Operation.
- (2) ANO VII, 2--Standards and Procedures for Air Carriers Using Large Air planes in Air Transport Operations.
- (3) ANO VII, 6--Standards and Procedures for Air Carriers Using Rotorcraft in Air Transport Operations.

Non-compliance with these safety procedures, or any other unsafe practices or conditions, should be reported to Transport Canada, ASP, Transport Canada Building, Ottawa, K1A 0N8.

Emergency equipment and exits

A seatbelt is required for every passenger. The seatbelt should be secured during takeoff and landing and whenever considered necessary by the flight crew. Each passenger seat shall be provided with printed information listing the emergency equipment carried, and the location and operation of emergency exits. The emergency equipment and rations detailed in ANO V, 12, shall be carried on all flights conducted within the "sparsely settled area" which is defined in the order. There should be a readily-accessible life jacket or flotation device for each person on board a floatplane, and the location of these made known to the passengers by the pilot or aircrew.

Personal Clothing

The probable temperature in the area of the flight should be known, and appropriate footwear and clothing worn or carried, including clothing to protect against insects in summer months.

Emergency locator transmitter (ELT)

All aircraft are required to carry a compact radio, which transmits a distinctive signal on the emergency frequency of 121.5 MHz for the detection and location of downed aircraft. It will normally be triggered "on" automatically during a forced landing. If the ELT is not automatically triggered, it can be turned on manually. The battery life of an ELT is at least 100 hours, and signals can be heard up to 100 miles (160 km) away by high-flying aircraft. The ELT provides a homing signal to pinpoint location and greatly reduces time-to-rescue.

Information on the location and operation of the ELT is placarded in the cabin, and its location is marked externally on the aircraft. It is usually mounted behind the cabin or to the rear of the aircraft. Before boarding the aircraft the crew should describe the location and operation of the ELT.

More information on the ELT and the search and rescue system is given in a colour slide/sound presentation available on loan from any Regional Office of Transport Canada.

Flight plans

The purpose of the flight plan is to ensure that a record is available if an emergency develops. For every flight, a flight plan form should be filed by the pilot through the company (or an agent) for transmission to air traffic control. If this is not possible, the pilot is required to notify a responsible person of his proposed flight by means of a flight notification or flight itinerary. This should specify the estimated duration of the flight or series of flights, the estimated time of return, the route or the area boundaries of the flight operation, and the location of any overnight stops.

The pilot is responsible for the safe conduct of the flight, and should not be unnecessarily distracted from the task of flying. Passengers should not request changes from the flight plan for personal reasons such as sightseeing, photography, low flying, etc.

Weather

It is the pilot's responsibility to determine if weather conditions are suitable for a safe flight, and passengers should not attempt to influence the pilot's decision in this regard. Normally, safe visual flight, i.e. flight with visual reference to the ground, requires a 1000-ft (300 m) cloud ceiling and 3 miles (4.8 km) forward visibility. However, minimum requirements permit flight with a 700-ft (210 m) cloud ceiling and 1 mile (1.6 km) forward visibility. If weather falls below these limits, visual flight must be discontinued. Visual flight above a cloud layer is not permitted.

Cargo

Personal baggage and equipment should be properly secured. When cargo is carried in the cabin with passengers, it should be secured by nets, strapping or other tie downs to prevent shifting in flight. Cargo should not be placed so as to restrict the use of emergency or regular exits. It is the pilot's responsibility not to exceed the aircraft's total "maximum gross weight", and to ensure that the load is distributed so that the aircraft is within its centre of gravity limits. Passengers carrying their own baggage and equipment should ask the pilot where it is to be placed; the pilot should not be pressed to put on extra items that might overload the aircraft.

Propellers and rotors

Every year rotating propellers and rotors cause fatal and serious injuries because they are difficult to see when in motion. Passengers should not board, leave or work around aircraft when propellers or rotors are in motion. The helicopter is often an exception to this rule, when rotors must be kept in motion at remote landing sites. Passengers should receive a thorough briefing from the pilot or crew member before boarding or leaving a running helicopter. Most accidents occur when persons walk into the tail rotor. The safe procedure is to crouch low and approach or depart the helicopter from the side or the front but never near the tail rotor area. Never walk downslope toward the helicopter and never walk up slope away from the helicopter.

A passenger should not normally perform any crew function unless safety is otherwise in jeopardy. In any case, a passenger must receive a thorough briefing, including safety procedures, from the pilot or flight crew member. An inexperienced floatplane passenger attempting to assist the pilot to dock is exposed to extreme danger from the rotating propeller. Passengers have been struck by propellers while walking forward to the front end of the float to tie the aircraft to a dock or mooring point. After docking, twin-engine floatplanes create a hazard to persons when rotating propellers overhang the dock. Passengers should not disembark from these aircraft until the propellers are stopped.

Additional safety information is given in a colour slide/sound presentation entitled "Safety Around Small Aircraft", available from any Regional Office of Labour Canada.

Other references

In addition to other applicable safety standards, procedures and guides approved by the Treasury Board for the Public Service, the following specific documents should be reviewed in conjunction with this guide, and applied as appropriate:

- (1) First-Aid and Health Directive, chapter 2-5.
- (2) Tools and Machinery Directive, chapter 2-9.
- (3) Personal Protective Equipment Directive, chapter 2-14.
- (4) Motor Vehicle Operations Directive, chapter 2-11.
- (5) Occupational Health Evaluation Standard, chapter 2-13.
- (6) Safety Guide for Operations Over Ice, chapter 5-3.

This chapter replaces chapter 5-4 of PMM volume 12.

APPENDIX B

Wind Chill Calculation Chart

where T_{air} = Air temperature in °C and V_{10} = Observed wind speed at 10m elevation, in km/h.

T air	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
V₁₀												
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70
30	0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76
55	-2	-8	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

FROSTBITE GUIDE

Low risk of frostbite for most people
Increasing risk of frostbite for most people in 10 to 30 minutes of exposure
High risk for most people in 5 to 10 minutes of exposure
High risk for most people in 2 to 5 minutes of exposure
High risk for most people in 2 minutes of exposure or less

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