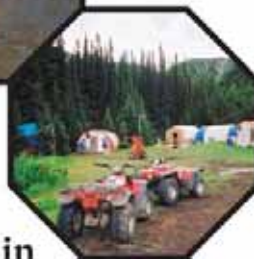




Safety Guidelines



for Mineral Exploration in
Western Canada



ADDENDA

1. Mineral Exploration Regulation in British Columbia *Health, Safety and Reclamation Code*

Mineral exploration in British Columbia is regulated by the *Health, Safety and Reclamation Code for Mines in British Columbia*. All worksites where mechanical disturbance occurs (e.g. trenching, drilling) must have a Manager on site.

Note that the term Mine Manager applies equally to mineral exploration and mining, and in exploration, refers to the person in charge of an exploration site. This may be the on-site VP Exploration, Exploration Manager, Health & Safety Manager/Coordinator, Project Manager, Chief Geologist, or equivalent.

Key Definitions from the Mines Act 1996 [RSBC 1996] CHAPTER 293

"manager" means the person appointed under section 21 to be responsible for the management and operation of a mine;

"mine" includes

- (a) a place where mechanical disturbance of the ground or any excavation is made to explore for or to produce coal, mineral bearing substances, placer minerals, rock, limestone, earth, clay, sand or gravel,
- (b) all cleared areas, machinery and equipment for use in servicing a mine or for use in connection with a mine and buildings other than bunkhouses, cook houses and related residential facilities,

(c) all activities including exploratory drilling, excavation, processing, concentrating, waste disposal and site reclamation,

(d) closed and abandoned mines, and

(e) a place designated by the chief inspector as a mine;

"mining activity" means any activity related to

(a) the exploration and development of a mineral, a placer mineral, coal, sand, gravel or rock, or

(b) the production of a mineral, a placer mineral, coal, sand, gravel or rock,

and includes the reclamation of a mine

References:

Mines Act www.qp.gov.bc.ca/statreg/stat/M/96293_01.htm

Health, Safety and Reclamation Code for Mines in British Columbia

www.em.gov.bc.ca/Subwebs/mining/Healsafe/mxready/mxcode01.htm

2. Bill C-45

Bill C-45 became law in October 2003, and organizations are now criminally liable under the *Criminal Code of Canada* for criminal acts or negligence in the workplace.

Further information:

www.ccohs.ca/oshanswers/legisl/billc45.html

***Safety Guidelines for Mineral Exploration
in Western Canada***

Fourth edition

Health & Safety Committee



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in Western Canada***

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Disclaimer:

- Amendments to the *Health, Safety and Reclamation Code for Mines in British Columbia*, *Workers Compensation Act*, and the Occupational Health and Safety Regulation are ongoing. The online Regulation and excerpts and summaries of the *Act* are updated on the effective date of the amendment.
- The following information is a series of guidelines to best practices for an exploration program in British Columbia. For more comprehensive regulations and requirements, contact the Mines Inspector for the region in question, refer to the *Health, Safety and Reclamation Code* or review the Occupational Health and Safety Regulation.

Dedication

Since the earliest prospectors first penetrated into the mountains of western Canada, mineral explorers have faced the challenge of working safely in some of the most difficult and varied terrain in the world. This exploration has not been without hazard and has not been conducted without accidents, although the safety record compiled by these explorers has been a tribute to their resourcefulness and courage.

These safety guidelines are dedicated to the following explorers who were killed in a tragic helicopter accident on July 3, 1980 in the Iskut River area, British Columbia:

*Robert Clarke
Christopher Bruce Gunn
Keith Alexander MacLean
Ruth Anne Nussbaumer
Ian Ross Shaw*

In the firm belief that accidents can be reduced through increased awareness of the risks, the Safety Committee was formed in the fall of 1980 to collect the combined experience gained by those in the industry into one concise manual. It was our hope that it would prove a useful service to the industry as well as assist others who shared our interest in the outdoors.

The tragic accidents and deaths of those explorers in 1980, to which the Safety Manual was originally dedicated, has undoubtedly led to a substantially improved recognition of the many factors to be considered in protecting such individuals. Accordingly, their deaths were a major contributing factor to the 12-year fatality-free period in western Canada's mineral exploration sector from 1992 to 2003.

A Note of Appreciation

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Chapter 1

Introduction

Safety is prevention of injury when exposed to danger. Most accidents are caused by failure to recognize a potentially dangerous situation and to take the necessary preventive measures. Promotion of safe working practices is the responsibility of all workers, management, and contractors in the mineral exploration industry. Employers and supervisors must provide information, instruction, supervision and enforcement, when necessary, to protect employees' health and safety. It is also the responsibility of each and every employee to do their work in a safe manner and watch out for the safety of co-workers. It is in the best interests of all individuals to become as knowledgeable and self-reliant as possible regarding safety awareness.

Field supervisors, party chiefs and crew chiefs should be thoroughly familiar with safe working procedures. Particular attention must be directed to workers entering the mineral exploration industry, and specifically to workers new to the labour force. It must neither be assumed that any hazard is obvious nor that any safety procedure is necessarily self-evident. Appropriate safety and first aid equipment and suitably trained personnel should be available at working locations. Implementing onsite safety orientation followed by regular safety meetings and training in the safe use of equipment will help ensure safe work practices.

There are few, if any occupations besides mineral exploration which expose individuals to such a variety of hazards. Appendix 1 provides a record of the 14 fatal accidents and 22 fatalities to exploration personnel in British Columbia and Yukon from 1980 to 2004, based on questionnaire returns from member companies of the BC & Yukon Chamber of Mines (now AME BC). Appendix 2 is a summary of potential hazards and documents 117 fatalities from exploration-related activities, mostly in western Canada from 1946 to 2004. Appendix 3 provides a summary of accidents in the USA and Canada from mountaineering, and is applicable to all those who work in the mountains.

The “workplace” or “work-area” commonly referred to by Workers’ Compensation Boards is unusual and affects safety considerations and safety monitoring. In western Canada, it encompasses over 1,400,000 square kilometres ranging from near desert to alpine environments and temperate to arctic conditions. The unwary could succumb to any one of 20 or more potentially fatal hazards including falls in crevasses or on rough to precipitous ground, avalanches or falling rock; hypothermia; asphyxiation; exposure; drowning; lightning strikes; tree falls; animal or insect attacks, including those by rattlesnakes, wasp stings; and a variety of travel-related causes that include aircraft, motor vehicles and boats.

The seasonal exploration workforce (estimated at 2,700 in BC in 2004) includes many students with little previous wilderness experience, who often work in small isolated groups or alone. The need to develop a self-reliant attitude to safety awareness under such conditions cannot be overemphasized. Personnel must become dedicated to recognizing potential hazards in order to safeguard themselves, fellow employees, and /or those working under their supervision.

A necessary part of safety is possession of knowledge and skills that enable workers to make rapid and effective responses to accidents, to summon more skilled help if needed, and to protect themselves and other workers from hazards.

Health and safety in British Columbia are governed by two agencies, the Workers’ Compensation Board and the BC Ministry of Energy, Mines and Petroleum Resources. For guidelines specific to BC WCB Occupational Health and Safety requirements, the Prevention Manual and amendments are available online at www.worksafebc.com/publications/policies_and_regulations/Prevention_Manual/Default.asp.

The British Columbia WCB Occupational Health and Safety (OHS) Regulation controls reporting of unsafe working conditions to supervisors, corrective measures required to remedy unsafe working conditions following an investigation, and procedures required in respect of an employee’s refusal to work in unsafe conditions. The complete OHS is available online at www.worksafebc.com.

Under the *Workers' Compensation Act of British Columbia* Part 1, an "**employer**" is any person who has one or more persons working for them in or about an industry, through either a hiring contract or an apprenticeship contract. The contract can be written or oral, express or implied.

The BC Ministry of Energy, Mines and Petroleum Resources Health, Safety and Reclamation Code for Mines in British Columbia provides specific guidelines for exploration activities, and is available online at www.em.gov.bc.ca/Mining/Healsafe.

Sections of the OHS Regulation and the Code are reprinted in Appendix 8 for reference.

The Ministry of Energy and Mines, Mining and Minerals Division – Mines Health and Safety Inspectors are charged with supervision and administration of safety regulations. Officers are available to assist employers in all aspects of safety, including creating a framework of safety programs, work site safety related classes, and interpretation of safety regulations. Advice may be obtained by telephone, facsimile, email, and by onsite inspections. The BC Ministry of Energy, Mines and Petroleum Resources sponsors safety courses and competitions and Mine Rescue Centres are maintained in several locations in British Columbia. The British Columbia Safety Council sponsors a range of safety courses and, together with Workers' Compensation Board, distributes literature and posters to maintain and reinforce safety awareness.

Employees should be given safety training and be provided with written safety guidelines and principles appropriate to their work. One of the Jury's recommendations at an inquest into the deaths of four exploration personnel in a canoeing accident at Tatsamenie Lake, BC in July 1988 was:

"That a copy of the British Columbia & Yukon Chamber of Mines safety booklet or similar booklet be issued to all exploration personnel. These booklets could be issued by the Ministry of Energy, Mines and Petroleum Resources when notice of work, permit is processed. The possession of this booklet by each exploration member could be checked by the Inspector of Mines during his camp-site inspections."

Written acknowledgement that the contents have been read and understood may reasonably be requested. Clarification should be provided when required. Employees should have access to appropriate means of rendering or summoning assistance in case of emergency. A tallying procedure should be established at each job site to ensure that all workers are accounted for at the end of each working day.

Many companies and individuals engaged in mineral exploration in western Canada have developed safety manuals and guidelines with the continuing objective of reducing accidents. Others, particularly those embarking on exploration programs for the first time, may not have an adequate safety guide, although there are many useful references that deal with various aspects of safety and survival in the outdoors.

In September 1980, the BC & Yukon Chamber of Mines formed a Safety Committee with the object of promoting safety awareness for those engaged in mineral exploration in western Canada. A Safety Manual was available in manuscript form in 1981. It was printed in early 1982 and used by exploration companies to improve safety awareness and reduce accidents. The Safety Manual was revised in 1989 and 2002, and approximately 20,000 copies have been distributed. The AME BC Health & Safety Committee has prepared the 2006 edition to provide continuous availability of safety guidelines for mineral exploration in western Canada.

Since the safety manual was first published, there have been significant changes in the exploration business including increased competitiveness and a demand for very rapid property evaluations. There has been a shift away from dominance of large, integrated resource companies with permanent staffs, management hierarchies, and strong head-office infrastructures complete with in-house safety professionals and insurance and workers' compensation specialists. The emerging exploration scene now includes many profit-oriented service companies that offer strong technical skills and staffs of committed field workers. Their personnel are required to be very adaptable and, as specialists, may have relatively short-term commitments to projects. Consequently, they are exposed to many different hazards often without sufficient time to prepare for and adapt to dramatically different working conditions. Other significant changes

include requirements for better camps and better services. More exploration work is being done in other provinces or foreign countries in very difficult and remote areas. This is particularly evident from the number of companies based in western Canada that do global mineral exploration. Nationally, field seasons have been extended and work is now done during the colder and darker winter months. Thus, as is discussed in the following chapters, there is currently greater potential for fatigue and for winter-type accidents such as those associated with snowmobiles, whiteouts, avalanches, frostbite, and hypothermia. There is greater reliance on helicopters for camp support and daily crew movements, and larger machines, with operational problems different from those of the smaller craft, are now increasingly being used.

Until 1982, there was no organization either in government or in industry which collated data on injuries specific to exploration personnel in western Canada, other parts of Canada or other countries. In late 1982, BC & Yukon Chamber of Mines circulated a questionnaire to all companies engaged in mineral exploration in western Canada that file First Aid Reports with the Workers' Compensation Boards of British Columbia and Yukon Territory, requesting a summary of the extent of injuries and related time lost that year. The process has been repeated annually since then and summary reports based on the results of questionnaires have been widely circulated.

Data from completed questionnaires, judged to represent about 75% of annual exploration activity in western Canada, have provided a base from which safety performances may be measured. Not commonly recognized is the travel-related nature of the majority of fatalities experienced by the mineral exploration sector in western Canada from 1980 to 2004. Sixteen of twenty-two fatalities (73%) resulted from helicopter, canoe or vehicle-related accidents. Slips and falls account for 46% of lost workday accidents; the statistics are relatively constant on an annual basis (see Appendix 1).

In 1988, a Safety Check List was prepared for use by the mineral exploration sector, particularly by newly formed or relatively small organizations (an updated version is provided in Appendix 4). This was followed up by a summer pre-season meeting with selected senior

company representatives. Positive effects were evidenced by the 1988 safety performance of the companies involved.

In 1982, the BC & Yukon Chamber of Mines initiated an **Exploration Safety Award** presented to all companies reporting a minimum of 800 person hours of annual exploration activity without a lost workday case. By 2004, a total of 408 companies had earned this award, presented in the form of a framed diploma. A total of 634 decals had also been awarded recognizing additional or consecutive years without a lost workday. In 1986, the BC & Yukon Chamber of Mines initiated an **Annual Safety Award**, presented to the company judged to have the most outstanding safety record following a minimum of 10,000 person hours in mineral exploration activity without a lost workday accident. A **Five Year Safety Award** was also initiated for presentation to those companies who have worked in excess of 10,000 person hours without a lost workday accident in five consecutive years and in 1995 a **Ten Year Safety Award** was initiated. The Annual Safety Award was presented retroactively to 1982 in order to recognize outstanding safety performance from the first year that safety statistics were collected by the Safety Committee. Recipients of the Annual Safety Award in 1982 to 2004 have recorded from 15,000 to 149,000 person hours without a lost workday accident. Forty-five companies received **Five Year Safety Awards** between 1986 and 2004 for working from 12,000 to 127,000 person hours without a lost workday accident. Two companies received **Ten Year Safety Awards** in 1998 for working 132,068 hours and 161,628 hours respectively without a lost workday accident.

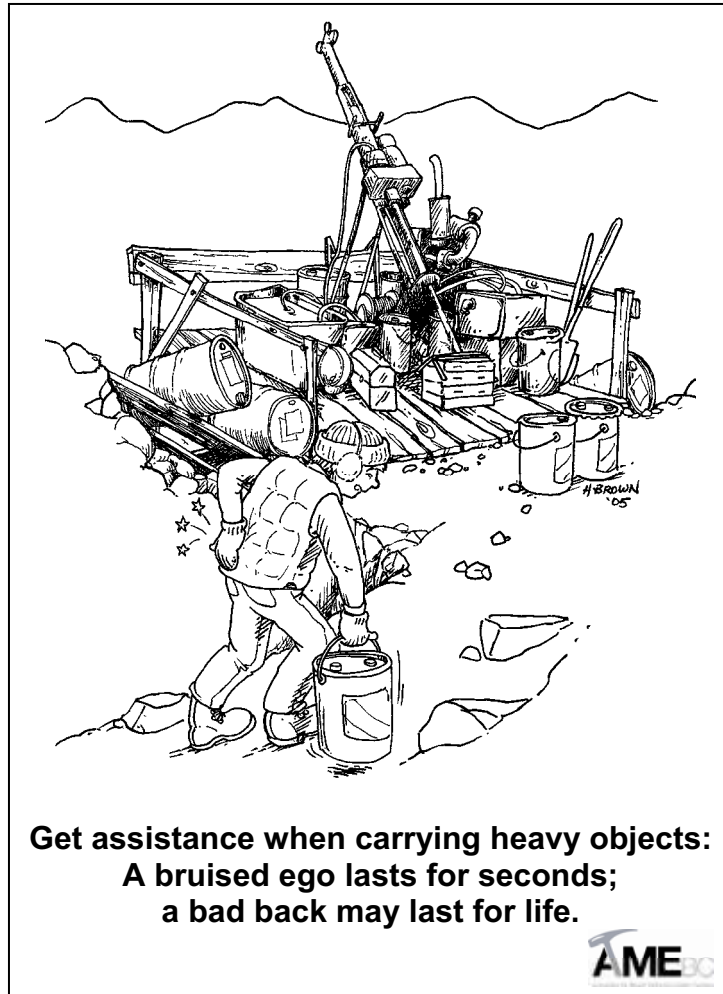
Twenty-three years of data compiled by the Health & Safety Committee focuses attention on the most common causes of exploration accidents. The following observations reflect this experience and are provided for the benefit of present and future exploration personnel.

- Travel-related accidents produce the majority of fatalities with almost 90% resulting from helicopter, canoe and vehicle-related accidents. In terms of miles travelled, canoe-related fatalities are so abnormally high that this mode of transportation for exploration personnel should be discouraged or critically evaluated before being undertaken.

- With improved road access to many exploration areas, there is a greater potential for vehicle accidents; however, both fixed-wing and rotary-wing transportation will continue as essential means of transportation for exploration personnel.
- Although unsubstantiated, there is evidence that early exploration personnel suffered fewer lost workday accidents and fatalities because of their self-reliance. Development of this attribute, which could be life-saving, should be encouraged in all personnel.
- Not surprisingly, almost 50% of lost workdays are caused by slips and falls. These data are consistent with mountaineering accidents in Canada and the United States and are a direct reflection of the amount of time personnel are exposed to traversing rough terrain. These statistics are unlikely to change significantly with time, but can be reduced by individuals paying greater attention to ability and fatigue limitations, steep terrain, proper footwear, and the many hazards that can be expected.
- Back-related injuries, which appear to be on an increase, are the third highest cause of lost workday accidents. Most of these accidents are caused by improper lifting or pushing of heavy objects and directly reflect carelessness by the victim who could, as a consequence, suffer a lifelong back problem.
- As a means of maintaining an adequate focus on safety procedures, even the smallest projects should plan safety meetings at least once a week during the field season.

As will be evident to the reader, these Safety Guidelines do not attempt to provide for safety requirements in any mining operations either under active development or in production. **Recommended safety procedures in mining operations are covered by the *Mines Act* and Regulation and the Health, Safety and Reclamation Code for Mines in British Columbia.**

It is hoped that these revised guidelines will continue to promote increased safety awareness among exploration personnel by identifying those conditions which can lead to serious accidents or fatalities.



**Get assistance when carrying heavy objects:
A bruised ego lasts for seconds;
a bad back may last for life.**



Chapter 2

Personal Work Methods and Protection

(see also Chapter 5)

Follow safe work procedures and wear Personal Protection Equipment (PPE) to help avoid injury. Review Section 8.2 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation, and Sections 1.8.2 and 9.3.2 of the Health, Safety and Reclamation Code for Mines in British Columbia in Appendix 8.

Eyes

- Wear safety glasses at all times while breaking or hammering rock, core splitting, blasting, using a chainsaw, or when visiting mining operations.
- Wear goggles or a face shield attached to a hard hat when hooking up helicopter sling loads.
- Wear safety glasses or goggles when handling chemicals (e.g., battery acid), boosting batteries, or using ultraviolet lamps for extended periods.
- Wear high quality polarizing sunglasses when working at high altitude or on glaciers, snowfields, and water.

Ears

- Wear properly fitting ear protection in any area of loud noise. Use of hearing protection is required for exposure over 85 decibels (See Section 7.2 of the Occupational Health and Safety Regulation and Section 2.6.1 of the Health, Safety and Reclamation Code for Mines in British Columbia). Normal conversation occurs at 60 decibels. An electric drill may produce a noise level of 70 decibels, a table saw 100 decibels, and the rear seat of a helicopter may register 130 decibels.
- Helicopters are noted for deafening noise. In fact, some are so noisy that **both** earplugs and muffs should be worn to reduce the noise level to acceptable levels. Customers should insist that

aircraft are equipped with sufficient earmuffs to accommodate the maximum number of allowable passengers.

- Air hammers, drilling equipment, muskeg tractors, snowmobiles, and outboard engines also produce ear numbing vibrations – beware and take protective measures.

Hands

- Wear appropriate gloves when handling materials or doing heavy manual labour.
- Do not wear rings, bracelets, or wristwatches when handling materials or working near machinery.
- Cold-weather working and snowmobile driving require insulated mitts specially designed for the job, i.e.:
 - insulated gauntlets for snowmobiling
 - water and fuel-proof insulated gloves for handling fuel and salt
- Wear acid resistant gloves when handling acids or corrosive materials. After handling radioactive materials, wash hands thoroughly with soap and water to prevent ingestion of radioactive particles.
- Wear gloves when handling dynamite, as nitroglycerine may permeate the skin and can cause severe headaches.

Feet

- Wear adequate footwear at all times. Some companies insist that exploration personnel wear safety-toed boots at all times during field work and subsidize their purchase.
- Wear durable hiking boots with Vibram soles when working in rugged terrain. These help support the ankle joints and lessen the frequency of ankle sprains.
- Wear safety-toed boots whenever there is a possibility of heavy objects, such as rock fragments or boulders, falling on the feet.
- Wear safety-toed boots when using an axe or chainsaw (see other precautions in Chapter 5).
- Wear warm insulated boots in cold weather to prevent frost-bite. (Avoid standing on metal in cold weather.)
- Wear waterproof boots in wet conditions.

- Take extra insoles/ boot inserts to replace wet ones and allow them to dry out.

Back

Many back injuries are due to improper lifting techniques. These injuries may result in extended periods of lost time and permanent disability.

See Section 4.47 of the Occupational Health and Safety Regulation and Section 2.9.1 of the Health, Safety and Reclamation Code for Mines in British Columbia. In addition:

- Keep your back straight and bend your knees when lifting.
- Keep the weight close to your chest when carrying.
- Use extreme caution when lifting above chest level.
- Be careful of your footing.
- When turning, do not twist your body – turn with your feet.
- Don't catch heavy objects.
- Don't lift too much weight – get help.
- Don't "show off" – this has injured many backs.
- Practice good ergonomics.

Lungs

The Code includes employment underground in a mine and in assay grinding rooms for "more than 20% of working time in any one month" as a "dust exposure occupation" as a "dust exposure occupation." Section 2, "Occupational Health", defines workplace requirements for these areas.

- Personal Protection Equipment (PPE) such as masks and respirators must fit correctly to be effective. Various fumes and dusts produced in industrial processes have detrimental effects when inhaled. Ensure adequate ventilation in the work area to prevent "bad air" problems.
- The use of a rock saw in a closed space exposes personnel in that space to fine silica dust, which is very damaging to the lungs. Rock saws should be operated only with a water-misting or lubricating device, the room should be vented with an exhaust fan,

and a mask or respirator should be worn by the operator—as the dust level requires.

- Persons cutting core may be required to have a chest X-ray, as required in regulations for a dust exposure occupation.
- Pay special attention to the storage of radioactive samples, as radon gas is given off by these samples and may become concentrated in poorly ventilated areas.
- If working with X-ray equipment (e.g. XRF analyzer), operators are required by the regulations of the Canadian Nuclear Safety Commission to be equipped with a dosimeter and to file data on exposure.

Other

Depending upon the work environment, certain other personal protective equipment may be required:

- Hard hats if working in areas where there is a hazard from falling objects.
- Protective suits (chemical resistant full body aprons, full length gloves, and full face shield) while handling acids and corrosive materials.
- Adequate clothing to meet the most severe condition likely to be encountered.



Chapter 3

Health, Allergies, and First Aid

Health and Allergies

- Matters of health, hygiene and allergies require concern of management and co-workers, particularly in remote locations. Confidentiality and objectivity must be exercised (as per the federal *Personal Information Protection and Electronic Documents Act*) to protect employees, to anticipate possible problems, and to achieve proper solutions to health problems that may arise.
- Most companies require potential employees to pass a medical examination prior to employment. A valid Certificate of Fitness is a prerequisite for underground employment, and a similar certificate is required for many catering jobs. Field crew leaders should be provided, on a strictly confidential basis, with completed health forms for all crew members. This form should list ailments, allergies, adverse reactions (e.g. penicillin), medication required, size and frequency of dosages, and circumstances that might cause onset of symptoms (e.g. fatigue, alcohol, hunger, stress, etc.). Recent injuries or operations and special dietary requirements should be detailed. A personal physician should be designated.
- It is not sufficient to rely upon individuals to take suitable precautions or countermeasures to sustain their health. Certain reactions, such as insulin overdose or allergic shock, may render a person incapable of rational or suitable action. It is very easy for one to misplace, use up, or neglect to apply required medication. Dangerous reactions, such as to bee venom or cedar wood, may never have been recognized prior to going in the field. Failure to administer medication on a timely basis can result in comas, seizures, or severe reactions. Thus unplanned circumstances, such as loss or breakage of medicine containers, being stranded away from the medication due to accident or weather conditions, or non-availability of medicine in a remote settlement, must all be considered. Co-workers should be alerted to watch for adverse

reactions and should know what remedial actions may be effective to mitigate distress and symptoms. Numerous highly infectious ailments can disrupt field camps and, once established, may be difficult to control. Extra precautions with respect to drinking water, cookhouse cleanliness, and personal hygiene may avoid problems, but once a condition is recognized, victims should be evacuated for proper medical treatment without delay. Common rapidly spreading illnesses include hepatitis, dysentery, eye infections, boils, and mononucleosis. Although it is less common in cities, tuberculosis is still encountered in all parts of rural Canada, especially in the north.

- Locate garbage and waste disposal areas such that fresh water supplies are not contaminated.
- Tetanus – all field personnel should keep their tetanus inoculations up to date.
- Have regular dental and medical check-ups to avoid problems in the field.
- As a general rule, any condition serious enough to impair a worker's ability to do his/her job should be referred to a first aid attendant or physician. In emergency or in cases of uncertainty, any physician will give advice by radiotelephone or satellite telephone. The worker's personal physician should be contacted if practical.

First Aid

See sections 3.6.1 and 9.3.1 of the Health, Safety and Reclamation Code for Mines in British Columbia in Appendix 8 for regulatory first aid requirements.

- The *Workers' Compensation Act* of British Columbia and other provinces and territories defines particular activities under an escalating hazard classification system. In BC, although mineral exploration field work (soil sampling, geophysics) or prospecting are not classified as Class A hazards *per se*, any mechanical extraction of rock activities such as blasting or diamond drilling have this classification. The BC law is interpreted such that any exploration crew containing 10 or more personnel and situated more than 20 minutes by road from the nearest hospital must

include a person with Level Three First Aid certification. The *Workers' Compensation Act* specifies the size of first aid kit required for camps of varying sizes – **check the law in the pertinent Province or Territory.**

- Every employee should possess valid Standard First Aid and CPR Certificates. The Standard First Aid class must have 16 hours of training to be recognized. Annual CPR certification is recommended. Courses can be customized to suit a company's particular requirements, depending on the provider.
- All first aid kits should be equipped with a St. John Ambulance first aid book and each camp should have a wilderness first aid book.
- All minor cuts, scratches, and burns should be given attention in the field, as these can develop into major problems if left untended.
- Personnel whose work involves the risk of severe wounds, (e.g., axe or chainsaw cut) should carry pressure bandages while working.
- All injuries requiring first aid and/or medical attention, no matter how trivial they may appear, should be reported to the Workers' Compensation Board.

Resources

- In the Lower Mainland, St. John Ambulance offers classes at weekly intervals that cost of \$133.75. Contact 604-321-2651. www.sja.ca/bc.
- Red Cross classes are taught through authorized providers at varying costs. Contact 604-709-6600 or 1-800-565-8000 from outside the Lower Mainland.
- Traumattech, a Red Cross class provider, offers Standard First Aid and CPR courses, as well as a 70 hour Level 3 First Aid course for \$760. Contact numbers are 604-662-7740 and 1-800-351-2266 (BC only). www.traumatech.com
- Wilderness Alert offers a 40 hour Wilderness First Aid Course for \$425. Certification is for three years. Contact number is 604-312-2559 or 1-800-298-9919. www.wildernessalert.com

- *Mis*adventure: Rise to the Challenge, A Step by Step Guide to Accident Handling*. By Anna Christensen. Wilderness Alert, \$39.95 or \$35.95 depending on size.
- *Outdoor Safety and Survival*. Province of British Columbia. This book has a chapter on from pages 130-146 for general guidance in first aid. \$8.99 from Crown Publications at www.crownpub.bc.ca.

Hypothermia

When heat loss exceeds heat production within the body, hypothermia may develop. Hypothermia is one of the leading causes of death to people in the outdoors; it can develop quickly and it can be fatal. Hypothermia is defined as the cooling of the internal body-core temperature below 35°C (95°F). Below this temperature internal organs – including the brain – do not function effectively. Mild hypothermia is classified as having a core body temperature above 32°C (90°F) and severe hypothermia occurs below 32°C (90°F).

The major difference between the onset of hypothermia on land and in water is one of time scale. Hypothermia in water develops at an accelerated rate because water conducts heat away from the body 25 times faster than air at the same temperature. After the onset of symptoms, death can occur within 30 minutes unless adequate measures are taken. Man-overboard accidents account for the majority of hypothermia-related deaths in water. The most common causes of hypothermia on land are a combination of wet, cold windy weather, and hard physical exertion, and inadequate clothing. Temperatures need not be especially cold for hypothermia to develop; it frequently sets in at temperatures between –1°C and 10°C (30°F and 50°F). **The use of drugs or alcohol increases the onset and risk of fatality from hypothermia.**

Hypothermia Prevention

Hypothermia can be prevented on land by taking sensible precautions. Use the buddy system to monitor your field partners because victims often do not recognize their own symptoms. If there is the slightest chance that someone is suffering from hypothermia, never leave that person alone or let them wander off as their condition may deteriorate suddenly. Follow these preventive measures:

- Dress appropriately. Always carry extra warm layers and a waterproof outer garment with you. Remember, some types of wet clothing, especially cotton, can extract heat from the body in cold weather much faster than dry clothing, whereas wool and polar fleece garments even though wet, retain a reasonably good insulating quality. An uncovered head can account for up to 60% of body heat loss in cold weather so carry a wool toque or cap. A hood attached to your rain jacket or life jacket is also a valuable aid.
- Carry waterproof matches or a cigarette lighter and some means of easily starting a fire. Build a fire and/or shelter as soon as you feel chilled.
- Stop and rest or bivouac, depending on the severity of conditions, **before** exhaustion occurs.
- Carry extra food, particularly energy producing items containing fats, sugars and starches (e.g., candies, raisins, and nuts). Eat frequently and drink sufficient water to avoid dehydration since the digestion of food requires water.

Hypothermia prevention for boaters is considerably more complex and difficult. In remote areas, to capsize far from shore in cold water is to invite certain death. Boaters should be aware that some lifesaving devices offer little or no thermal protection in cold water. Unless adequate thermal clothing, foam lined life jackets (preferably with a hood and crotch flap) or survival suits are worn, boaters will otherwise rapidly succumb to hypothermia even though safe from drowning. Any decision to swim to shore must be tempered by the fact that the exertion of swimming causes the body to lose heat 35% faster. Experience indicates that in cold water 4°C to 10°C (40°F to 50°F), one can swim only a fraction (1/10 to 1/4) the maximum distance that

one would be capable of swimming in warm water. Body heat can be better preserved by assuming the “Heat Escape Lessening Posture” (HELP) with arms crossed tightly across the chest and legs crossed and pulled up to the chest, or huddling together with others, provided that life jackets are being worn. Treading water is likewise preferable to the drownproofing technique if no life jacket is worn. If the boat is still afloat, try to get as far out of the water onto the boat as possible and hang on until the boat drifts ashore or until rescued. Predicted survival time for the average lightly clothed person in 10°C (50°F) water with a standard life jacket on is two and a half to three hours.

- Always wear a life jacket or PFD (personal flotation device), preferably one that keeps your head out of water, is insulated, has a hood, and keeps the torso fully protected by a foam lining and crotch flap. Such a jacket extends survival time in cold water by about two to three times.
- Wear warm, heat retentive clothing (e.g. wool or fleece).
- Keep your shoes or boots on for extra warmth.
- Remain as still as possible to avoid dissipation of body heat.
- Always carry waterproof matches, flares, some cord, and a knife for use when you reach shore.
- Once on shore, build a fire immediately. Concentrate on warming your head and trunk area. Put on dry clothing. If none is available, remove your articles of clothing one at a time. Wring them out and put them back on.

Symptoms

Hypothermia is a progressive disorder. Mild hypothermia can usually be treated in the field, but severe hypothermia is life-threatening and is extremely difficult to treat in the field. It is really important to recognize and address early symptoms so hypothermia does not progress. Note: there are both physical and behavioral symptoms.

- **Early stages** – victim may be alert and answer questions sensibly.
 - Feeling cold and numb is the first symptom. Victims focus on getting warm rather than the task at hand.
 - Shivering may be intermittent, or uncontrolled or violent
 - Pulse and breathing are rapid
 - Urinary urgency

- Slight incoordination: some difficulty performing tasks with fingers and hands
- **Moderate stages** – A victim of moderate hypothermia is in grave danger and may die if hypothermia progresses.
 - Increased incoordination and clumsiness
 - Fatigue—wants to rest or go to sleep
 - Reduced shivering
 - Slurred speech and amnesia
 - Weakness and drowsiness
 - Apathy and poor judgment
 - Dehydration
 - **A victim stumbles frequently, is uncooperative and confused, and may wish to be left alone.**
- **Severe stages**
 - Shivering diminishes and then stops
 - Inappropriate behaviour such as removing clothing
 - Speech is slurred
 - Reduced heart and respiratory rate, depressed brain function,
 - Irregular pulse (cardiac arrhythmia)
 - Muscle rigidity
 - Unconsciousness
 - Cardiac arrest occurs when the body core temperature cools below 30°C (86°F).

Treatment

Take immediate action to **PREVENT FURTHER HEAT LOSS.**

- Get the victim into some sort of shelter. If there is no outdoor shelter, use whatever is available—a tent, an overturned canoe, a space blanket or tarp, branches rocks or snow for a windbreak. Build a fire as soon as possible.
- Remove wet clothes gently without exposing bare skin to wind or rain, if possible. Share dry clothing to the extent that no other member of the party is endangered.
- Use blankets or sleeping bags to insulate the body against further heat loss.

- Concentrate on warming the head, neck, chest, and groin areas. Apply heat with skin-to-skin contact with a healthy person, or with heat from hot water bottles, chemical heat packs, or even heated rocks, if they are wrapped to prevent burning the victim's skin.
- Insulate with hat, gloves, and socks, to prevent further heat loss, but do not apply heat to the extremities. Applied heat causes peripheral blood vessel dilation, which may result in a drop in blood pressure and other circulatory problems.
- The victim should avoid unnecessary activity, as this circulates cold blood from the extremities into the body core thus increasing the rate of heat loss. Do not rub their skin or extremities.
- Administer warm, sweet drinks (non-alcoholic and caffeine-free) to a victim who is conscious and not shivering uncontrollably.
- For moderate hypothermia: keep victims as still as possible and handle them very gently, as a cold heart is susceptible to ventricular fibrillation, which can cause death.
- **Gently transport victims to a medical facility as soon as possible.**
- **An unconscious severe hypothermia victim** requires considerable care in order to survive. Carefully assess pulse and respiratory rate for up to two minutes. If respiration only is absent, begin mouth-to-mouth resuscitation to donate heat. If a pulse is absent, start CPR *only* if it can be maintained until a pulse is restored or until Advanced Life Support personnel arrive. It may be better to leave the victim cold and untreated, as intermittent application of CPR will likely cause ventricular fibrillation to occur.
- Always remember that a victim is never considered dead until "warmed and dead".

Hyperthermia

When heat production exceeds heat loss within the body, hyperthermia may develop. The four main types of hyperthermia or heat stress are: 1) heat cramps, 2) heat syncope (fainting), 3) heat exhaustion, and 4) heat stroke. Heat cramps and heat exhaustion result from dehydration and salt depletion as the body sweats to lower its internal temperature.

Heat stroke occurs when the core body temperature exceeds 41°C (105°F) and the body cooling mechanisms have failed. Hyperthermia can develop during exercise in only moderate to hot temperatures (e.g. 30°C or 86°F) with fairly high humidity (50% or more).

Prevention

- Risks of hyperthermia are increased by rising air temperature and humidity level, by solar and reflected radiation, by clothing that doesn't allow good ventilation close to the skin surface, by low fitness level (but not exempting even the best athletes when they're competing in extreme conditions), and by large body build (the less bulk, be it muscle or fat, the more efficient the body's cooling system). Recent illness and lack of heat acclimatization increase the risk of hyperthermia. Excessive exertion is often the precipitating cause of body core overheating.
- As with hypothermia, common sense is the best prevention. Dress for the weather and activity level - wear loose fitting clothing that protects the skin from sun. Drink plenty of fluids – before feeling thirsty, take salt with food in normal to liberal quantities, and always wear a hat in the hot sun.

Symptoms and Treatment

Recognizing hyperthermia is not easy as the early or mild stages may generate few clear symptoms.

- **Heat cramps** may indicate dehydration and salt depletion.
Treatment: rest in a cool place out of the sun and provide fluid replacement (an electrolyte replacement solution such as Gatorade or other commercially available drink). Note: saline solutions are no longer recommended for treatment of heat stress. Gently stretch the affected muscles and apply ice.
- **Heat exhaustion** has a variety of symptoms ranging from mild to severe. These include:
 - Cool, clammy skin
 - Headache, dizziness, and fainting; hyperventilation
 - Nausea and vomiting
 - Confusion

Treatment: cool the victim. Rest in a cool, shaded place with legs slightly raised and clothing loosened. A conscious victim should drink an electrolyte replacement solution to replace the water and electrolytes lost by dehydration. 24 hours of rest and rehydration are necessary before resuming work.

- **Heatstroke is a life-threatening condition demanding immediate medical attention.** As the body core temperature approaches 41°C (105.8°F) the victim can no longer produce sweat. There are two forms of heat stroke: *Exertional Heat Stroke* (which more commonly affects field employees) and *Classic Heat Stroke*.

Symptoms:

Exertional Heat Stroke

Pale, cool, damp skin **or**
Hot, dry, red skin
Irrational hostile behaviour
Rapidly rising core temperature
Headache, dizziness
Nausea and vomiting
Collapse

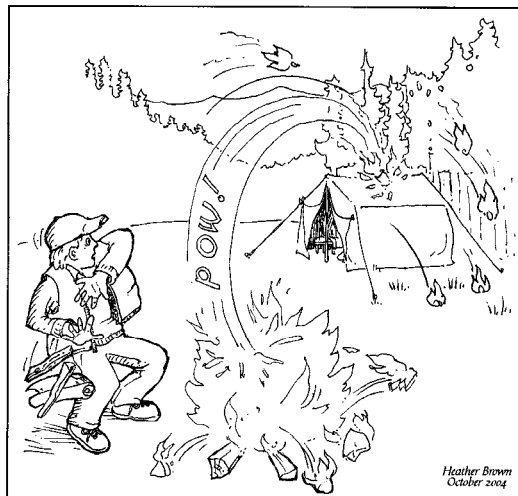
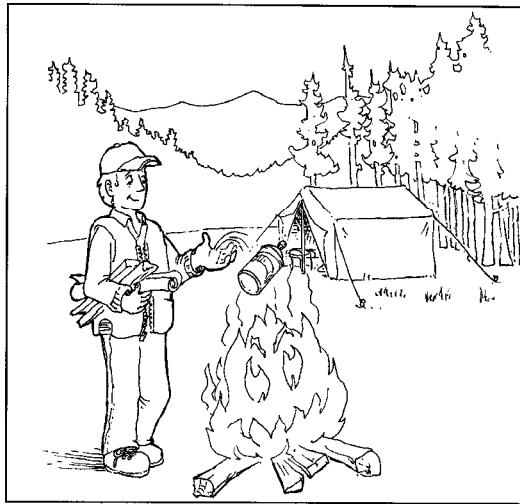
Classic Heat Stroke

Hot, dry, red skin
Rapidly rising core temperature
Rapid pulse
Headache
Nausea and vomiting
Delirium
Convulsions
Collapse and coma

If any heatstroke symptoms are apparent, treatment for heatstroke must begin without delay. As the core temperature rises above 41°C (105.8°F), unconsciousness, delirium and convulsions may occur.

Interim Treatment – prior to evacuation to a medical centre.

1. Move victim out of the sun into the coolest possible place.
2. Cool the victim as quickly as possible, paying particular attention to the head, armpits and groin. Drape the victim with lukewarm wet sheets or towels to conduct heat away from the body.
3. Fan the body using electric or handheld fans. Try to place the victim on a screen so they can be cooled both from above and below. The aim is to maximize evaporation from the body to cool the core body temperature—without chilling the victim.



Heather Brown
October 2004

DO NOT DISPOSE OF AEROSOL CANS IN A FIRE!!



Chapter 4

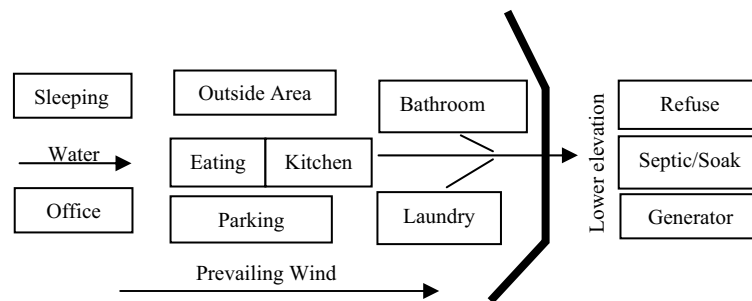
Camp Management

It is extremely important for the camp manager and/or party chief to be safety conscious. The party chief's attitude and actions set the tone for the rest of the crew. Failure to recognize and prevent hazards may in some circumstances leave the manager liable as per Section 117 (1) (2) of the Workers' Compensation Act of BC. Camp safety is a matter of common sense combined with adequate preparation. The following "checklist" is probably not complete, and should be considered merely **as a guide to the types of hazards** that are present in locating, designing, and running a small to moderate size camp in the bush. See requirements in 9.12.1 of the Health, Safety and Reclamation Code for Mines in British Columbia in Appendix 8.

Location and Layout

Camps should be constructed:

- In a safe location removed from environmental threats such as avalanche, flood, falling trees, animal trails, aircraft take-off/landing/operation paths, etc.
- To have minimum environmental impact.
- With camp structures located at minimum safe distances apart (at least 6 metres) to prevent spread of fire and within an area protected by a fire break.
- With an emergency tent/building far enough removed so that it can act as a separate shelter if the rest of the camp is destroyed. This tent must have 3 days of emergency rations.
- According to the principles shown in the general layout on the following page. Locate tents in a straight line. It is important **not** to arrange tents in a circle, so that if a bear must be shot, no one is in the way of fire by being in their tent.



Consider the following:

- Rising water or flooding at times of high runoff
- Vulnerability from potential forest fires
- Avalanche, rockfall, or slide danger
- Tall or dead trees and especially dead branches nearby that could fall into the campsite area with strong winds or lightning strikes
- Safe drinking water
- Animal habits – e.g. Bear encounters may be increased near old garbage dumps or camps, bear trails, spawning creeks, berry patches
- Camp size – i.e. Is the area sufficient to carry out operations safely?
- Appropriate camp permits where needed from provincial or territorial authorities
- If the campsite has been used previously, enquire of previous users as to its suitability.
- Winter sites should be selected with regard for potential wind and snow drifting problems and must be kept clear of snow for instant use in case of medevac.
- Locate fuel caches or flammables away from camp.
- Locate helicopter pad 100 meters away from camp.
- Locate garbage disposal and kitchen area away from sleeping area (at least 100 metres and 50 metres respectively). These first two areas are the most likely sites for furry nocturnal visitors.

- Burn garbage in a safe open area away from camp (at least 100 metres away and visible from a distance so as not to surprise bears).

Electrical supply to camps usually will be by generator. Diesel fueled generators are preferred as they have a longer durability and diesel reduces the danger of fire.

- Power lines should be buried at a safe depth or suspended from insulated poles at a safe height and protected from damage by vehicles.
- Except for simple extension lead electrical distribution, wiring must be installed by a qualified and registered electrician or must be checked by an electrician before start up.
- All cables and extension leads should be regularly inspected and replaced if damaged.
- All outlets must be installed with over-current protection and/or ground fault circuit interruption.
- All electrical distribution and supply will conform to local electrical code and regulations. This may require wiring diagrams.
- All computers and electronic equipment must be protected by surge protectors and line conditioners.

Fire Hazards (see also Chapter 6)

Prevention is the best way to combat fire. Before a fire can start and burn, it must have fuel, oxygen, and heat. Removing any one of these three components will prevent or extinguish a fire. Fires are classed as:

- A. Fires in ordinary materials (paper, wood, rubbish, etc.)
- B. Fires in petroleum products (fuel, oil, grease, paint, etc.)
- C. Fires in electrical equipment (control panels, switches, etc.)
- D. Fires in combustible metal (magnesium, sodium, etc.)

Dry chemical fire extinguishers can be used on A, B, or C fires, which are the most likely type to start in a camp.

- At least one dry chemical fire extinguisher must be located in each separate tent/building/room and in other strategic places (next to stove).
- Fire extinguishers must be regularly checked, visible and free from obstruction.
- Each tent/building/separate room must be equipped with a smoke detector and carbon monoxide detector.
- Each camp occupant must know how to operate a fire extinguisher.
- Each camp must have a fire alarm system, or similar system, and fire fighting equipment appropriate for the situation.
- Each camp must carry out fire evacuation/emergency drills.
- A fog horn and flashlight must be located beside each fire extinguisher.

Take the following precautions:

- Arrange camp to reduce risk or spread of fire.
- Be aware of dangers from:
 - unattended stoves and fires (e.g. wood-burning airtight stoves)
 - lanterns – fill and light lanterns outdoors
 - smoking
 - flares
 - propane tanks
 - forest fires
 - mosquito coils
- Acquire appropriate permits for campfire or garbage burning from provincial or territorial authorities. In some areas (e.g. BC), firefighting equipment is required by regulation, the type depending on the size of the camp.
- The firefighting equipment should be kept in a separate cache and be used only for fire fighting.
- Small ABC chemical extinguishers in kitchen, office areas, and near engines such as generators are a wise precaution.
- A filled sand pail beside each tent may extinguish a fire at an early stage.
- Have a method of defense in mind in case a fire does break out, and conduct regular fire drills.

- Have a water pump and hose ready to go located at water source closest to the sleeping, eating and office tents.

Firearms (see also Chapter 6)

Firearm laws and regulations vary from province to province, state to state, country to country, and under local ordinance legislation.

- Know and comply with the general firearm laws policy.
- Find out about areas where it is necessary to use firearms for protection against bears and other predatory animals.
- Firearms and any ammunition must be stored in a secure, safe place in camp, under supervision of the safety coordinator or a certified person.
- If the camp is in an area with large predatory animals, know how to use the firearm(s) for protection.
- Each camp in which firearms are permitted will have firearm safety systems. Know and adhere to these.

Sanitation and Hygiene

Sanitation facilities must comply with all applicable legislation.

- Small, short-term camps must employ a drop toilet with a drop hole of greater than 1 metre.
- Use lime to speed decay.
- Cover with a minimum of one metre of soil.
- Must not be built in a drainage way.
- Must be downstream of water supply.
- Larger and longer-term camps must have a septic or filter/incinerator system installed by a qualified and registered engineer.

Water and Food

- Do not use water from open water supplies unless it has been tested and shown to be fit for drinking or has been treated to ensure it is safe to drink.
- Store water in dark, cool, insect and animal proof containers.

- Dry and packaged food should be stored in clean, insect and animal free conditions. Perishables and frozen foods should be stored in cool or frozen conditions.
- If in doubt about food quality, do not eat it.

Drugs, Alcohol, and Tobacco

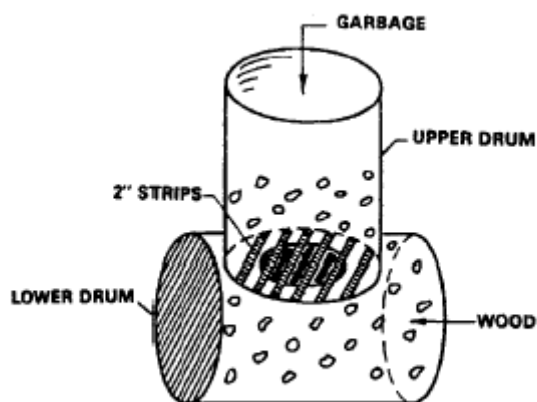
See sections 3.1.1 and 3.1.2 relating of the Health, Safety and Reclamation Code for Mines in British Columbia relating to alcohol and tobacco.

- Have a zero tolerance policy for the use of illegal drugs or the abuse of prescription drugs in camp. Users must be removed from camp (NO WARNINGS), may have their employment terminated, and may be reported to the authorities.
- Alcohol policy may vary from camp to camp, ranging from a total ban, to a few drinks per night.
- Have all first aid attendants on 24-hour duty refrain from consuming any alcohol.
- Have a zero tolerance policy toward alcohol abuse. People under the influence may be removed from camp. Intoxicated workers will be removed from the work site.
- Smoking policy may vary from camp to camp, ranging from a total ban to tolerance, and in accordance with local regulations regarding smoking. Smoking is banned from kitchens, eating areas, field offices, fuel caches, helipads, and sleeping areas. Smoking is permitted in designated smoking areas only.
- It is your responsibility to know what the policies are and to observe them.
- Have employees advise the Project Leader and Project Coordinator if they must take prescribed medication that affects judgment or performance.

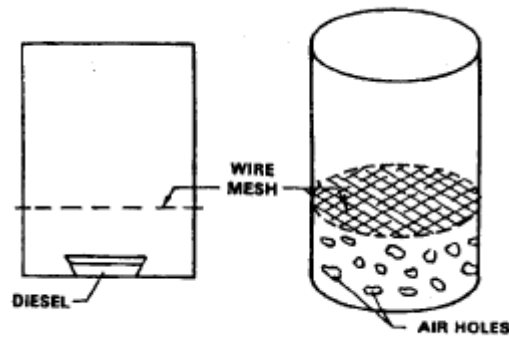
Bears (see also Chapter 10)

Good garbage disposal practices greatly reduce the probability of bear problems. After bears have discovered and fed at a garbage dump, it is almost impossible to discourage their return. Ensure that garbage is burned thoroughly.

- Reduce encounters with proper camp layout, proper garbage disposal, and daily thorough burning, as in the following diagrams.



An incinerator, for use in locations where wood is available, made from two 45-gallon drums. Cut the tops out of each drum using an old axe as a chisel. Punch holes in both drums to aid burning. Cut a hole smaller than the upper drum shown in the side of the lower drum. Cut 2-inch strips out of the bottom of the upper drum and flatten side of lower drum to accommodate the base of the upper drum. The incinerator can also be used as a water heater if a clean drum with the top removed is substituted for the upper drum.



A simple incinerator, for use where wood is not readily available, made from a 45-gallon drum with top and bottom removed. The wire screen can be made by threading heavy gauge wire (1/8") through small holes punched around the side of the drum. It is easier to achieve complete incineration by burning small amounts at a time, mixing occasionally with a stick. Daily and complete incineration is essential. The remains may be removed to a legal dump or buried in a suitable pit that, when full, is at least 1 metre deep as per your land use permit.

For a fly camp of less than one week duration it is probably sufficient to wash and flatten tin cans and store them in an airtight garbage bag. The garbage bag can be returned to the main camp or town for incineration and burial.

- A suitable size of firearm should be kept in base camp for use as a last resort to protect life or property. Current gun legislation must be followed.
- Bear spray is an additional defense available.
- Problem animals should be reported to local wildlife authorities. If an animal is shot it is a legal responsibility in most areas to turn in certain portions of the remains to wildlife authorities for recording.

Animal, Insect, and Disease Control

Animal, insect and disease can be attracted to camps and make them uncomfortable, unsafe, or unhealthy.

- Do not feed or attract wild animals, or bring them to camp.
- Do not alarm or provoke animals that do appear in camp.
- Insects should be kept out of camp buildings using screens and/or the mildest effective repellants/poisons (use only as directed).

Cleanliness, tidiness, and proper refuse/waste disposal will minimize insect invasion and disease. (No food in sleeping/office/tents).

Communications

See Section 3.2.3 of the Health, Safety and Reclamation Code for Mines in British Columbia and Section 4.21 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8 regarding communications when a worker is working alone.

- Each camp should have a reliable means of communication (radio, phone/fax), and at least one daily contact with the site head office via the camp manager.
- It should be the responsibility of all employees to know where the communication equipment is, know how to operate it, and to know regular schedules.
- Each camp should maintain at a minimum weekly contact with head office.
- In remote areas, dependable radio communication and backup both between camps and between camp and aircraft is essential.
- Radios should meet requirements of transmission distances and conditions of use.
- Handheld FM radios require regular battery charging. Backup batteries should be carried in the field.
- Radio frequencies used should allow communication with outside camps or other outside contacts. In some areas (e.g. Yukon), there is a common frequency used by industry over which help can readily be obtained.

- Antennas and lead-ins should be well flagged to avoid entanglement with aircraft, vehicles or people, and should not be located on potential flight paths.
- Radiotelephones and satellite telephones require clear lines of sight to repeaters or satellites. Camps should not be in closed valleys if possible to minimize the restrictions on communications. A generator is necessary to recharge batteries.
- Establish radio or other contact with local expeditors, RCMP, forestry, or other officials so that your timetable and whereabouts are known locally.
- If a badly injured member of your crew needs medical evacuation you should know:
 - Who to telephone for a medevac
 - Location of nearest medical facility to which evacuation would proceed
 - Who to contact for medical advice and to advise of your arrival
 - Location of nearest available fixed-wing or helicopter aircraft, and how to contact these quickly in an emergency (see Appendix 7)
- Should seriously injured or sick individuals require medevac transfer in British Columbia, contact should be made immediately with the British Columbia Ambulance Services (BCAS) Provincial Dispatch by telephoning 1-800-561-8011. BCAS coordinates air and land transfers of sick or injured individuals requiring transfer from one area to another. As BCAS receives 30 to 40 emergency calls daily, the following information should be available when the request for assistance is placed:
 - Available history of injured or sick individual, including name, home address, and date of birth
 - Specific grid reference for emergency aircraft required to transfer the victim
 - Description of injury and/or sickness
- An emergency call list of the nearest medical facility, RCMP, government officials and air transportation facility should be kept at each communication station.

- All crew members at each location should know how to operate all communications equipment.

Personnel

- Is the crew aware of the safe procedures for operation of any equipment that they use or work around? (see Chapter 5 and Appendix 4)
- Is appropriate personal protective clothing being worn (i.e., boots, goggles, gloves, etc.)? (see Chapter 2)
- Is the crew advised on the proper course of action if lost or if, through circumstances, they must spend an unexpected night or nights out? (see Chapter 9)
- Do individuals carry suitable clothing and safety gear in case the above occurs (e.g. signal mirror, signal cloth, matches, etc.)? (see Chapter 5; Appendix 5)
- Working in pairs is safer than working alone and should be mandatory when working in dangerous areas or when one of the individuals is inexperienced. It is the responsibility of the party chief to evaluate the hazards of working alone against the experience of the individuals concerned (see Chapter 7)
- Individuals who carry firearms must be licensed and proficient in their safe use (see Chapter 6)
- A member of the crew, preferably the party chief or a dedicated Occupational First Aid attendant, must have a knowledge of first aid, and be backed up by a suitable first aid kit and manual (see Chapter 3)
- All crew members should carry a personal medical kit and it is recommended unless already stipulated by legislation that all members of the crew have first aid training and/or wilderness survival training.
- Are you, as a manager, aware of the medical condition of each member of your crew (e.g. allergic reaction to insect stings, etc.)? (see Chapter 3)

Hazardous Substances

Hazardous substances are governed by the Hazardous Products Act (R.S. 1985, c. H-3; available at <http://laws.justice.gc.ca/en/H-3/index.html>) and Section 2.33 of the Health, Safety and Reclamation Code for Mines in British Columbia (see Appendix 8).

- Hazardous substances in camp must be clearly labeled, stored in a safe and secure place, and used only as directed. The MSDS sheets must be present in camp and stored in an easily accessible place.
- If a crew member brings hazardous substances into camp, the camp Project Coordinator should be notified and substances should be stored as and where directed.
- Dispose of unused hazardous substances and containers in a safe, appropriate manner and location. Refer to MSDS (Material Safety Data Sheet).
- WHMIS (Workplace Hazardous Materials Information System) binder must be located in site office.
- Should an accident involving a hazardous substance occur that requires medical attention, take the MSDS sheet with the patient to the medical facility so doctors know immediately what must be done for correct treatment.

Refuse

To minimize the impact on the environment, adopt the “If you can carry it in, you can carry it out” policy. See Section 9.12.1 (3) in the Health, Safety and Reclamation Code for Mines in British Columbia in Appendix 8.

- All non-biodegradable refuse should be removed from the site and disposed of at an appropriate location (municipal dump).
- Biodegradable refuse can be buried in pits above the water table or burned at high temperatures.
- No refuse must be left exposed where it can attract animals, insects, or disease.
- Waste water must be disposed of in septic systems or soak pits.
- Kitchen garbage must be burned daily.

Medical Equipment

Each camp must have first aid kits according to the WCB regulatory policies of the area and Section 9.3.1(1) of the Code (see Appendix 8).

Each camp should have a more comprehensive medical treatment kit. Designated person is responsible for administering emergency medical treatment and maintaining medical treatment supplies and equipment.

- It should be each worker's responsibility to know where the first aid kits and medical treatment kits are, who the camp First Aid Attendant is, and to seek treatment when needed.

Emergencies

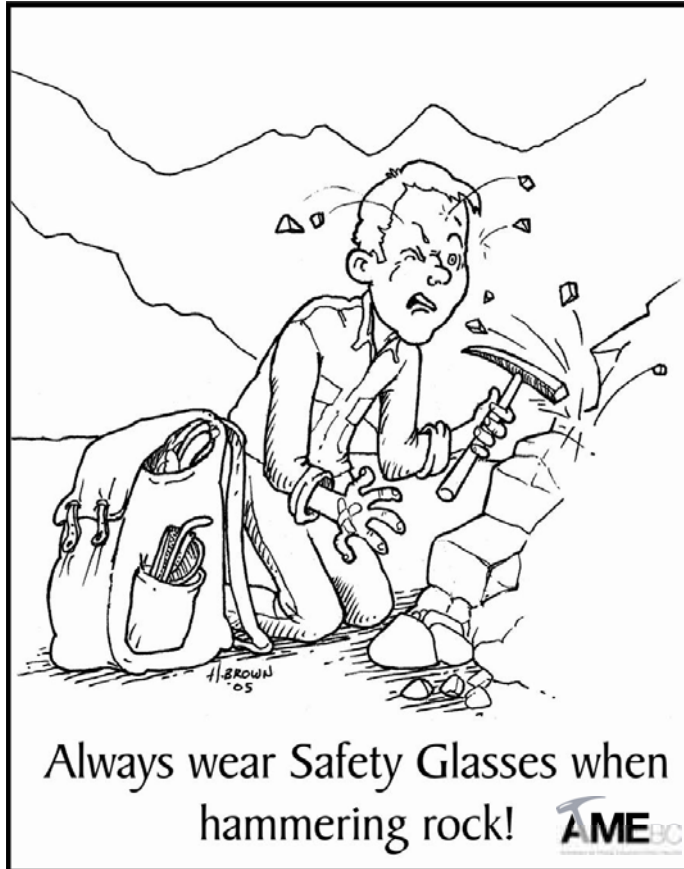
In the event of an emergency in camp, follow the instructions of the camp Project Coordinator, and the camp specific emergency procedures.

REMEMBER: NO ONE IS OBLIGED TO LIVE OR WORK IN A CAMP THAT IS UNSAFE OR UNHEALTHY

Last But Not Least

Don't go into a new area or region "cold". Talk to someone who has worked there before. Obtain the name of the outside contact and phone for information before going into the field.

In 1988, the party chief of a four-man exploration crew was advised against using a small canoe for crew transport on a large glacier-fed mountain lake subject to sudden strong wind conditions and rough water. A more stable Zodiac inflatable boat was recommended in addition to a campsite on the working side of the lake which would eliminate the need for daily crossings. The advice was not heeded and the four men died of hypothermia and drowning in an accident within two days of the start of the program.



Always wear Safety Glasses when
hammering rock!



Chapter 5

Clothing, Tools, and Equipment

Clothing

- In general, clothing should be light, but warm and water-repellent. Several layers of light clothing are most effective. Avoid jeans as they have no insulating qualities and do not dry quickly when wet.
- Dress for the environment being travelled through, not the inside of the vehicle or aircraft. Proper footwear is essential – i.e. boots, not running shoes. Particularly in winter conditions, failure to plan for proper clothing can be quickly fatal. If travelling, consider not only the weather conditions at your starting point, but also those likely to be encountered en route and at your destination.
- When travelling in aircraft, the decision must be made whether to wear outdoor clothing or to carry it in the aircraft. In any case, clothing should be stored within easy reach inside the aircraft (i.e. not in the tail or cargo compartment). In the event of a crash landing, survivors of the impact may succumb to exposure if injuries or fire prevent them from recovering outdoor clothing and sleeping bags.
- Carry Gore-Tex type clothing, a wool sweater or shirt, and a waterproof rainsuit at all times, no matter how warm the weather appears when you begin your trip. Use them before you get wet or cold. Hypothermia occurs mainly in cool wet conditions when the insulating value of clothing is lost due to wetness. Loss of body heat with wet clothes is 30 times faster than with dry clothes. Gore-Tex type clothing and wool clothing provide far better protection than cotton in wet weather.
- Avoid overheating by slowing down or by removing layers of clothing. Many plastic or oil-soaked cloth rainsuits trap body moisture. Evaporation of sweat from the body causes great heat loss and when dead air spaces in clothing become filled with heat-conducting moisture; this heat loss is accelerated.

- Always wear a hat (in winter this should be a toque or preferably a 100% wool peaked hat with ear-flaps). Sixty per cent of body heat is lost through the top of an uncovered head.
- In winter, the best outer garment is a long thigh-length parka with hood and bottom draw string. A full fur-trimmed hood will protect the face. Mittens protect the fingers better and are much warmer than fingered gloves. Attach mitts to tape threaded through arms of jacket to prevent loss. Leather mittens with wool liners are the best and should be tightly closed at the wrist. Insulated half rubber-half leather boots with insoles (two pairs if extremely cold) that are warm and waterproof are essential.

Tools and Equipment

Requirements for personal protective equipment on a mine property are specified in Section 1.8.1 of the Health, Safety and Reclamation Code for Mines in British Columbia (the Code; see Appendix 8).

Before using tools and equipment, ensure that you are familiar with operating requirements. Provide adequate instructions to those who have not had experience with equipment:

- Explain the function of the equipment and warn of possible dangers.
- Demonstrate correct operating procedure.
- Check out the trainee.

Safety Glasses

Under the Code, any person who may be exposed to specified risks of eye injury must wear properly fitting goggles, face shields or other eye protective equipment complying with the current CSA Standard for “Industrial Eye and Face Protectors” and suitable for the type of work of activity being performed. Safety glasses should be used in rock sampling, core splitting, and tool grinding. Many companies bear the cost of prescription safety glasses for their field crews (see Chapter 5).

Hearing Protection

In exploration, the need for hearing protection is rare. Most frequent use is in helicopters equipped with earphones, which facilitate

communication between pilot and passengers and reduce fatigue and motion sickness (see Chapter 2). Hearing protection is also required when using chain saws or rock saws, around drill rigs, or when loading aircraft.

Hard Toe Boots

Under the Code, protective footwear complying with the current CSA Standard for “Protective Footwear” and suitable for the type of work or activity being performed must be worn by any person where there is a risk of foot injury or where required by a manager or a mines inspector. In exploration, hard-toe work boots should be worn during rock excavation work and around underground workings. Several companies require that exploration personnel wear safety-toe boots during traverses and some provide an allowance toward purchase.

Hard Hats

Under the Code, a protective hat complying with the relevant requirements of the current CSA Standard for “Industrial Protective Headgear” and suitable for the type of work or activity being performed must be worn by any person who is exposed to risk of head injury or where required by a manager or mines inspector. Hard hats should be worn on appropriate occasions, particularly in quarries, underground workings, and on exploration work around cliffs, icefalls and diamond drills. Hard hats can embrittle and should consequently be tested after 3 to 5 years of use to ensure that they provide adequate protection and comply with current systems. Painted hard hats should be avoided as some paints can combine with solvents in the hat and either soften or embrittle the material. Hard hat liners should be replaced annually if in frequent use.

Axes and Knives

All axes should have a blade protector or sheath during transportation, as should hunting knives. When carrying an unprotected axe in the bush, hold handle immediately below the head with the blade facing outward for maximum protection in the event of a fall. The best knife for use in the bush is one having a steel shank extending to the butt end of the handle.

- **Axes**

- Choose a long-handled axe and keep it sharp. The long handle will allow the axe to hit the ground, not your leg. A sharp axe will reduce the work required thereby reducing fatigue and fatigue-induced accidents. As a general guide, the weight of the axe head should be matched to the weight of the handle, e.g., a 2.5-pound head to a 26 inch (66 cm) handle, or a 3.0-pound head to a 32 inch (81 cm) handle.
- Always hold the axe with both hands.
- Clear the work area of obstructions.
- Ensure axe head and handle are secure. This will prevent “fly off” type accidents. Soak axe head area in water overnight and insert new wedges as required.
- Ensure good footing while chopping.
- Maintain a firm grip on the handle.
- Maintain an even temper. If you “fly off the handle” the axe may end up in your leg.
- Wear boots with steel-protected toes.

Rock Hammers

There are several potential hazards to users and bystanders when rock hammering is in progress.

- Eye injury to anyone in the vicinity may be caused by flying rock or metal chips. Therefore, eye protection must be worn.
- Hammer heads could fly off the handle. Before use, inspect the hammer to ensure the head is secure.
- Ensure swing area is clear of shrubs or twigs which might deflect off the hammer.
- Use care when carrying the hammer. Injuries have been sustained by people falling on the sharp end of their rock hammers.

Chainsaw Safety

This section is designed as a convenient reference for safe power saw operating techniques. Due to the rising number of accidents, compliance with a few basic safety points will significantly reduce injuries.

Training

The most important aspect of chainsaw safety is the formation of good working habits and familiarity with the equipment. This requires a training program by a qualified instructor. The operator should have a good working knowledge of the function of the power saw and the ability to make minor adjustments and repairs in the field. Physical fitness also results in a more alert approach to the job and the worker is less likely to develop lazy cutting habits, the cause of many accidents.

Personal Safety Equipment

All operators must wear adequate protective equipment while operating a power saw. This includes:

- **Leg Protection**

Available in short chaps with interwoven nylon pads protecting the leg from 30 cm (12 inches) above the knee to 30 cm below the knee for a person of average height. However, those people of above average height will find that these chaps provide only about 5 to 8 cm (2 to 3 inches) of protection below the knee thus leaving the shins vulnerable to injury if worn with ordinary hiking boots. Also available are professional faller's pants with built-in pads which provide considerably greater protection and are much more comfortable.

- **Headgear**

A lightweight plastic hard hat is required to prevent serious injury from falling debris. Headgear should be of bright colour for easy visibility.

- **Ear Protection**

Two types of adequate protection are available and highly recommended for use. A "muff type" protector that clips onto the hard hat is useful during cooler weather while "insert plugs" may be more comfortable and equally effective during warmer weather.

- **Eye Protection**

Adequate protection against eye injuries is available in three basic styles:

- A face shield that clips onto a hard hat, and is composed of either fine mesh screen, clear safety **glass or plastic**, offers good visibility and air circulation.
- Plastic goggles that fit snugly to the face are effective but become fogged and uncomfortable in warm weather.
- Hard plastic or glass safety glasses.

- **Footwear**

Wear good Vibram-soled leather boots at all times for best possible footing during dry periods. In extremely wet, timbered areas leather or rubber caulk boots are recommended – particularly on the West Coast, the Queen Charlottes, and Vancouver Island. Caulk boots should not be worn on exposed rock surfaces because of the danger of slipping.

- **Gloves**

Appropriate chainsaw gloves are inexpensive lightweight nylon gloves with latex webbing that permit a sure non-slip grip on the power saw especially in wet weather.

Falling Techniques

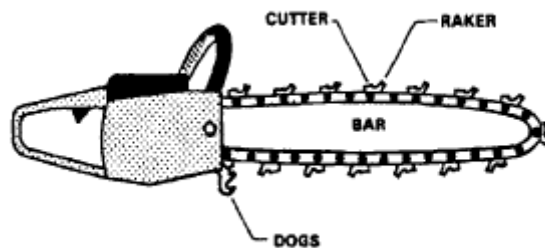
There are six fundamental steps to follow in falling timber.

1. Accurately judge the lean of the tree.
2. Plan a retreat route.
3. Clear the ground surrounding the tree and along the escape route.
4. Always look above for falling debris.
5. Take special care in making a proper undercut and leave an adequate hinge of wood to maintain control of falling direction.
6. Ensure that no one is in the immediate area and/or that they are aware of your activity.

Operation Safety Guidelines

The Workers' Compensation Board of British Columbia supplies a "Chainsaw Safety" brochure and *BC Faller Training Standards* (which replaces the *Fallers' & Buckers' Handbook*). "Chainsaw Safety" is available for download from www.worksafebc.com and is also available from AME BC free of charge.

The most common injury related to chainsaw operation is kickback. This occurs when the operator momentarily loses control of the saw, resulting in the blade bouncing back off the log into the operator's neck, face or leg. Kickback can be avoided by not working in an awkward position; i.e. standing too far away, working off balance, or working with poor footing. Proper care must also be taken while cutting branches, brush, or windfall slightly above ground level, where hidden obstructions on the opposite side of the log may cause the tip of the bar to kickback through the cut.



Chainsaw Components

Perhaps the most important aspect in the prevention of kickback is that great care be taken to sharpen the chain properly and to maintain the razor sharp cutting edge (including height of rakers). If the chain is dull, you must exert great pressure thereby exposing yourself to stronger than normal kickback forces.

Helpful hints for safe operation:

- Check the power saw frequently to ensure all parts are tight and chain is properly adjusted.
- Maintain the saw so that when the saw is idling, the chain is stopped.

- Keep the chain bar to the rear while carrying the saw. If you trip, you won't fall on top of the chain. In addition, the dogs and the bar won't get caught up in the brush.
- Shut off motor when carrying the saw any distance.
- Hold saw firmly against body when using the tip of the bar to reduce impact from kickbacks.
- When cutting limbs, remember that the end of the bar causes most kickbacks.
- Learn to use the saw equally well with the right and the left hand to avoid awkward positioning.
- Never stand directly behind the saw and never straddle the saw. Always work to one side to minimize injury from potential kickbacks.
- When cutting in heavy windfall, assess each tree for stress – make a shallow cut on four sides to relieve tension before completing the final cut.
- Carry a portable first aid kit containing Band-Aids and at least one four-inch pressure bandage with ties.

Electrical Equipment

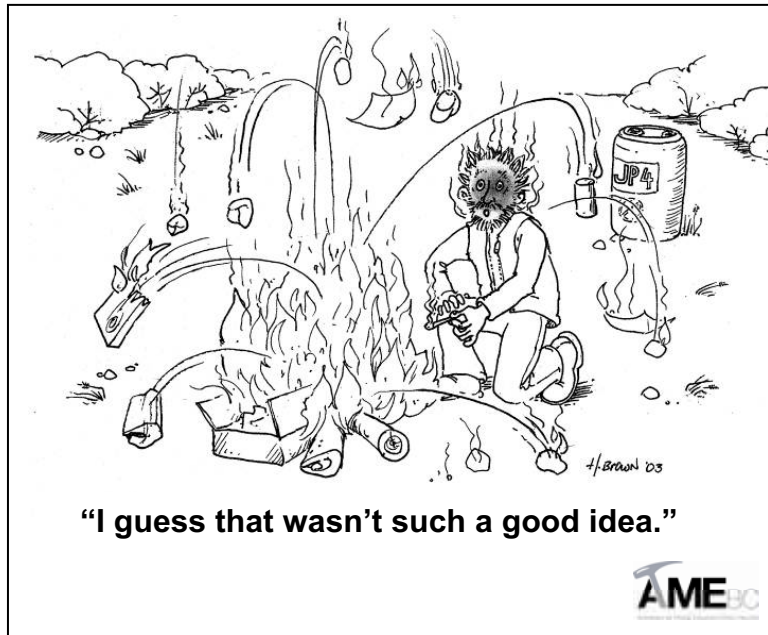
Observe adequate precautions with electrical equipment and remember that fatal accidents have occurred because of the operator being inadequately insulated from electrical shock. Use only CSA-approved or double insulated types of electric tools. Follow the regulation in Section 19.10 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation.

When **generators** are used as a source of power in the field, grounding of this equipment is very important. A fused breaker-box must be used for all circuits to ensure any shorts will immediately shut off the current. A ground wire should be carried in all circuits and electrical boxes should be grounded in tents. When establishing a large camp an electrician should be involved in the design and construction of the system.

An **electrically powered rock saw** is an example of a potentially dangerous situation where water can accumulate under the operator while using the saw. This equipment must be carefully grounded and

you should stand on a wooden platform so water will not collect at your feet.

Particular care should be taken when working with **geophysical equipment**. Conductor wires used in induced polarization surveys become energized during use and in some circumstances have caused fatalities. In inhabited areas, when surveys are in process, road crossings should be guarded and warning signs should be posted.



Chapter 6

Fire Hazards, Firearms, Explosives, and Lightning

Fire Hazards

There are two key elements to fire safety:

- Prevention
- Early action with pre-positioned equipment and an established plan

Fire Officer

Be constructively aware of fire safety. In a large camp, it is good practice to appoint one or more mature persons to be responsible for the implementation of fire safety measures.

- The safety officer or designee should establish procedures (and equipment deployment) for various types of fire occurrences, and advise all other personnel of them. Hold periodic fire drills.

Regulations

See Section 3.9.1 of the Health, Safety and Reclamation Code for Mines in British Columbia in Appendix 8.

- Consult the fire regulations in the jurisdiction where you will be working (provincial or territorial) for the type and quantities of fire equipment that are required for the main camp and for each subsidiary camp.
- Study the regulations carefully; they constitute a manual of good fire prevention practice.
- Check annually for any changes.

Firefighting Equipment

- Maintain the general camp fire equipment at one location. Have it painted red, and ensure that it is not used for any other purpose.
- Keep additional equipment where it is most likely to be needed.
 - Appropriate 4-kilogram ABC fire extinguishers should be placed in, or adjacent to, each tent.

- A large container (45-gallon drum) of water located near each tent in addition to a water bucket and sand bucket guarantees operational firefighting capability.
- An adequate extinguisher should be maintained at each fueling point, such as for vehicles, power saws, or pumps.
- A reservoir should be available from which water can be drawn by pump or bucket line.
- Fire extinguisher locations should be adequately marked so that they are readily visible.

Flammable Items and General Fire Protection

- Store flammable liquids away from living and working quarters and overhanging trees.
- Ensure that all fuel storage tanks and motors have plastic lined confinement or storage areas underneath lined with absorbent pads, capable of holding all the fuel in the tank if a leak occurs.
- Spill kits should be strategically located.
- Do not smoke or use a light source with an open flame when refueling anything. If light is required, use battery powered illumination. Vaporizing gasoline or naphtha is highly flammable.
- Fuel drums should be clearly marked with respect to contents and grouped according to contents to minimize the danger of using the wrong type of fuel.
- Keep camp sites clear of flammable debris.
- Turn off all oil and propane heating units at the tank when the camp is unoccupied.
- Ensure that all fires are completely extinguished before leaving camp.
- Fire regulations prohibit smoking while travelling in the woods.
- Butt cigarettes against a hard, non-flammable object, such as a rock or boot – or in a puddle. In areas of moderate to extreme fire risk, take butts back to camp.
- It is a good practice to break a wooden match before throwing it away.

Heated Tents

Care should be taken with heated tents.

- Ensure that chimneys are adequately insulated from the tent wall with fire retardant material, metal inserts, or tin cans.
- Use non-clogging spark arresters on both oil and wood stoves.
- Use aluminum foil reflectors to ensure that radiant heat from the stove or pipe does not set fire to the canvas or wooden tent walls.
- An outside pole that is used to support the stove pipe should be shorter than the top of the pipe and should be separated from the pipe by a flattened tin can.
- Ensure that stove pipes are adequately wired and braced to resist wind storms.
- Separate the tents adequately to prevent the spread of fires.
- Place metal safety guards around all oil heaters.
- Place metal base plate under heaters.

Heaters and Water Heaters

Airtight heaters should have a thin layer of sand or sandy soil spread on the bottom to prevent metal from being burnt through.

- Space heaters and water heaters should be placed on metal stands and have clearance from flammable surfaces as specified by the manufacturer. If flexible fuel lines are used, it is necessary to provide extra lengths to accommodate possible movement of the fuel tank or propane cylinder. Semi-permanent and permanent propane installations should be done by licensed fitters – the inspectors will ultimately insist upon it, your insurance agent will be happier, and you will be relieved of many potential disasters. Temporary hook-ups are equally hazardous – protect the lines and double-check the fittings after each move.
- In a fly camp, if a small wood stove is set on the ground, ensure that the mineral soil is exposed for an adequate area around the stove, then set the stove on small stones or gravel. Furthermore, ensure that there are no hidden roots beneath soil level that may eventually dry out, smolder, and carry the fire to the tent wall, or cause excessive smoke inhalation while occupants are asleep.

- Avoid starting wood fires with flammable liquids. Plan ahead and purchase solid-fuel fire starter if you intend to use wood fires.
- Never pour a flammable liquid into any stove, or into a fire area that is still warm; the immediate fuming of the liquid will result in an explosive vapour. In the event that a flammable liquid is used to start a fire, ensure that it is “contained” in an absorbent material (e.g. absorbent paper) so as to reduce fuming.
- When starting a wood stove, a small piece of burning paper placed directly under the stove pipe creates a column of heated air in the pipe, so that when the tinder and kindling are lighted, there is already a favourable draft.
- Build fires from “small to large”. Get the tinder, kindling, and small wood burning before piling on large pieces.

Lanterns

Lanterns and stoves require particular caution.

- Lanterns should be hung up so that they are not easily dislodged.
- The handle of a lantern that is hung up while lit will become dangerously hot; use caution in taking the lantern down.
- Lanterns should be taken down for lighting so that they can readily be taken out of doors in case of accident.
- Before lighting a lantern, think of where you will take it, and how you will carry it (such as with a stick through the handle) if it flares up because of a gasoline leak. Alternatively, light it outdoors.
- Fill pressure tanks only to the recommended level.
- Do not pump in excessive pressure.
- Ensure that radiant or convective heat from a lantern does not set fire to the wall or ceiling of a tent.
- Do not leave lit lanterns unattended.

Campfires

- Use care and foresight when choosing the location of a campfire or signal fire to ensure that it does not spread into trees or forest litter.
- Clear the immediate fire area down to mineral soil.

- For a campfire, it is advisable to use a small fire pit. Square-faced stones built up to form a wall about two feet high on the back of the fire pit will help reflect heat to the front.
- For a small signal fire, it may be convenient to use a large flat rock.
- Use particular care in extinguishing camp and signal fires. Extinguish with ample water wherever possible; a plastic sample bag is useful for carrying water for this purpose in the field.
- Check the ashes carefully and test for hot spots with your bare hand.
- Avoid scattering of signal fire ashes by helicopter blade wash.

Tips for Surviving a Hotel Fire

With improved transportation facilities, exploration personnel are commonly accommodated in hotels or motels near work areas. Hotel and motel fires kill hundreds of occupants each year. Experience shows that fatal fires occur in first-class hotels and large motel chains – fires are not restricted to older, rundown buildings. Careless smoking is the greatest single cause. Arson is responsible for almost 20% of hotel fires. It is therefore important to be ready for a fire and to know what to do should it occur.

- **At Check-In**
Ask:
 - For a room on no higher than third floor if possible.
 - How guests are notified of fire.
- **Escape Plan**
Immediately after check-in:
 - Locate the nearest exit and fire alarm, and then find an alternate exit.
 - Count doors to exit.
 - Note hallway obstacles.
 - Does the window open? If not, how would you break it?
 - Keep key, small flashlight, and eyeglasses on nightstand.

- **Escape Action**
 - Grab room key, flashlight, and spectacles.
 - If room is smoky, crawl to door.
 - If cool, open door slowly. If hot, stay put.
 - Crawl to stairs, hugging wall on exit side.
 - Walk down to ground floor; hang onto railing.
 - If smoke “stacks” in stairs, walk up to the roof, prop open the door, stay put.
 - **DO NOT USE ELEVATOR.**
- **Room Survival**
 - Stay in your room if the door is hot and the hallway smoky.
 - Try to phone desk.
 - Fill tub with water, turn on bathroom vent.
 - Use an ice bucket or trash can to bail water on hot doors and walls.
 - Stuff wet sheets or towels around door and vents.
 - Tie wet towel around your nose and mouth.
 - If smoke fills the room, open the window (break as **last** resort).
 - **DO NOT JUMP FROM ABOVE THE SECOND FLOOR.**
- **DON’T PANIC – THINK!**

Firearms

Although rarely used, firearms are found in most field camps. Consequently, they are likely to be carried in vehicles and backpacks, to be readily accessible to all crew members, and to be a constant item of concern. Both ignorance and familiarity lead to carelessness in the handling of weapons. Management has the right, duty, and responsibility to exercise full control of the transportation and use of firearms by employees.

In contrast to a few decades ago when most people acquired familiarity with firearms at an early age or in the military service, young people now entering the workforce are seldom knowledgeable about the use and handling of firearms. Therefore, many are likely to encounter their first guns in a field situation and will lack knowledge of even the rudiments of safe handling practices.

Guns of any sort are seldom required in the field. The only need may occur when there is a bear hazard. Even so, possession of an inadequate or improperly used firearm will not ensure safety and may even contribute to the problem. Bears are discussed in Chapter 10.

Although a distinction can be made between “official” and recreational/personal firearms, management must establish safe handling practices applicable to all weapons. Discuss these rules at time of hiring or upon arrival at your first camp.

Ensure that you follow the current regulatory mandates. Firearms fall under the Criminal Code of Canada and are therefore regulated by the federal government, not the provincial or territorial government. All enquiries related to Canadian firearms regulations should be directed to the Canadian Firearms Centre at www.cfc-ccaf.gc.ca.

As of January 1, 2001, the Wildlife Act accepts a Firearms Acquisition Certificate (FAC), Possession and Acquisition Licence (PAL), or Possession-Only Licence (POL) for the purposes of carrying a gun in the bush. If you borrow a firearm you need a valid FAC or the new federal firearm licence (PAL, or POL) unless you are being supervised by someone who is legally allowed to have that firearm.

Note that in addition to the FAC or federal firearms licence, in order to hunt, you also need a hunting licence issued by the province or territory.

Transportation

Transport of firearms and ammunition is governed by common sense and by innumerable statutes and rules. Rules for long guns differ from those for handguns. Most police departments and RCMP detachments have a gun-control officer who will advise on permits, licences, and approved practices. Also helpful are conservation officers, who can be contacted at Fish and Wildlife Department offices.

As a general rule, loaded firearms may not be transported in **any vehicle**: this includes helicopters and snow machines. Keep the chamber empty in all circumstances, and store ammunition in a separate container.

Handguns carried in the field require special permits. Normally these permits apply to a very specific location for a limited time. A

permit issued in British Columbia will not be valid in Yukon. Check with the local RCMP detachment.

Weapons should be adequately protected in transport. Sights are easily damaged and alignment should be checked for possible blockage by packing material.

Camp Use

Ensure that proper ammunition is provided and keep the firearm and ammunition together under lock and key. It is embarrassing to be unable to locate both items in time of need and frustrating to find that they do not match one another.

If the camp is to be unattended, remove the firearm to a nearby location so that you will not return and find a bear and the gun in the same place.

Avoid firing at bears in the camp area unless mauling is in progress. It is difficult to be sure of the whereabouts of every crew member; equipment may be damaged; and having a dead bear in the campsite creates an awkward disposal problem. Avoid firing in inadequate light as chances of hitting a vital spot are reduced and a wounded bear may result. Do not use an inadequate weapon.

Field Use

Be aware that rifles and shotguns are awkward to carry in combination with day packs, rock hammers, geophysical gear and rock or soil samples, and that allowance should be made for the extra weight and unwieldiness of the firearm. Protect the sights from damage and check regularly to ensure that the barrel and breech have not become fouled by twigs, snow, sand, or other debris.

Know the effective range of your firearm. Give a bear every opportunity to go away unharmed, but if it is determined to attack you, force yourself to wait until a fatal shot can be made (see Chapter 10).

Most exploration people lack the skills required to be effective with a handgun. Considerable practice is required before one can fire repeatedly and on target. The noise and recoil are decidedly uncomfortable.

Recreational Use

Crew members will inevitably want an opportunity to practice firing of weapons. A suitable site should be designated, preferably some distance from the camp and backstopped by a sandhill. Avoid firing into rocks. Discourage “quick draw” practice as it is a dying art, and prohibit recreational use of firearms near camp if immature behaviour is noted. Take extra precautions if any crew member exhibits symptoms of becoming “bushed” or is using alcohol or drugs. Hijackings and hostage-taking incidents have occurred!

General Safety Rules

Finally, the following rules of gun safety should be observed at all times:

- Treat every gun with the respect due a loaded gun.
- Be sure of your target before you pull the trigger.
- Always be sure that the barrel and action are clear of obstruction.
- Never point your gun at anything you do not want to kill.
- Never leave your gun unattended unless you unload it first.
- Alcohol and firearms do not mix.
- Never climb a tree or cross a fence with a loaded gun.
- Never shoot at a hard, flat surface or the surface of water. Make sure you have a safe backstop.
- Carry only empty guns in trucks, boats, and helicopters. No loaded guns are permitted in camps or tents.
- A padlock through the frame after opening the cylinder will safeguard a revolver from unauthorized use.
- Store guns and ammunition safely, away from the reach of children.
- After use, ensure that rifles or handguns are cleaned with cleaning kits.

Explosives

The transportation, storage, use and disposal of explosives on a mine property are regulated under Section 8.4 and Section 9.3.6 of the Health, Safety and Reclamation Code for Mines in British Columbia (the Code) and Part 21 of the Workers’ Compensation Act of British

Columbia Occupational Health and Safety Regulation (see Appendix 8 for details).

This section is only concerned with the transportation, storage and destruction of explosives as related to mineral exploration. No attempt is made to discuss the use of explosives, as all blasting operations must be conducted by the holder of a valid blasting certificate issued under the Code. More detailed information is available free of charge from WCB at www.worksafebc.com. Further guidelines are in the Natural Resources Canada publication, *Blasting Explosives and Detonators: Storage, Possession, Transportation, Destruction and Sale*, available from Natural Resources Canada at Suite 101, 605 Robson Street, Vancouver BC V6B 5J3, Tel.: 604-666-0366. Highly recommended is the Commercial Explosives Course offered by the British Columbia Safety Council, although competency is achieved only by working closely with an experienced blaster. All blasting operations associated with exploration or mining activities must be discussed with the Mines Inspector and approved under the *Mines Act* prior to commencement. Adequate warning signs must be placed in the vicinity of blasting operations and access routes must be guarded. Ensure that all personnel on site have been oriented to blasting warning protocols.

Transportation

Transportation of explosives requires a vehicle in **good** mechanical condition accompanied by an authorization from the owner to use the vehicle for this purpose. Fire extinguishers must be carried with the vehicle: two 5 BC rating fire extinguisher for a vehicle with a gross weight of up to 2,000 kilograms; and two 10 BC rating fire extinguishers for a vehicle of more than 2,000 kilograms. If the amount transported exceeds 25 kilograms, the vehicle must display “explosives” signs on all four sides.

Some insurance policies exclude carriage of explosives without payment of an additional premium.

Absolutely no smoking is permitted near the vehicle (within 50 metres), and no combustible material or compressed gasses or liquids may be carried in the same vehicle.

Explosives must be transported in a fully enclosed, locked, fire resistant van, tank or fixed container:

- Standard panel truck (van) with lockable doors and compartments.
- Aluminum, fibreglass, or wood camper-top secured over pickup truck with a suitable lock.
- Fixed container with lockable lid, made of 2-inch dressed lumber or ¾ inch plywood.
- For small quantities, the trunk and glove compartments of a car emptied of all loose objects.
- **If both explosives and blasting caps are being carried,** a separate lockable compartment which will prevent communication of an explosion must be provided (steel plate and fibreglass partition).

The transporting vehicle must not exceed 90 kilometres per hour (55 mph) on the highway.

(Note that federal regulations regarding explosives and the transportation of dangerous goods updated August 31, 2004 must be reviewed before commencement of program and blasting activities – visit <http://laws.justice.gc.ca/en/E-17>.)

Storage

All explosives on a mine property must be stored in an explosives magazine, approved under an Explosives Storage and Use Permit issued by the Inspector of Mines under Part 8.1 of the Code. Explosives magazines must conform to all standards specified and are subject to inspection at any time. (Note: Federal *Storage Standards for Industrial Explosives* were revised in May 2001). The storage for more than 75 kilograms and 100 caps or for a period in excess of 90 days must be covered by a User's Magazine Licence. A quantity of explosives and accessories not exceeding 75 kilograms and a maximum of 100 blasting caps may be stored in separate unlicensed magazines for a maximum of 90 days.

If the magazine weighs less than 140 kilograms it must be anchored to an immovable object, i.e. bolted to a truck or chained to a tree. In these cases, the magazine can be used as a "day box" and

secured for storage purposes at night. The Mines Inspector has the authority to make judgment decisions to allow for flexibility of the magazine standards.

The following items may be stored within an explosives magazine:

- explosives
- blasting agents
- detonating cord
- primers and boosters

N.B.: Detonating caps, safety fuse assemblies, delays and relays must be stored within a separate magazine at a minimum distance of 50 metres from the explosives.

Destruction

DISCLAIMER – REFER TO REGULATIONS.

Only a certified blaster should attempt to destroy explosives as per requirements. Confirm approval with the mines inspector of where you conduct exploration.

It is necessary to destroy explosives that have deteriorated through exposure to excessive moisture, heat, and prolonged storage since decomposition causes misfires and instability. Explosives that have absorbed moisture are usually soft and mushy while heat will cause gelatin-type explosives to “sweat” (i.e. ooze out clear oily beads of nitroglycerine). Remove and transport the explosives to the desired location for destruction.

There are two common methods of destroying high explosives: by detonation or by burning. Detonation is the quickest method, but if the explosives are badly deteriorated, some cartridges may fail to detonate and would hence be scattered around by the explosion of others.

The most efficient method is by burning, although burning of more than 50 kilograms at one time is not recommended. The choice of location should be such that surrounding property and lives will not be endangered in the event of the explosives detonating instead of burning.

- Prepare a combustible bed of dry material sufficiently long so that the cartridges may be spread out without overlapping.
- Douse the bed with kerosene to assist the burning.
- Prepare an ignition trail leading to the combustible bed so that ignition will be against the wind direction.
- Ignite the trail and stay clear of the area until the fire is completely burned out.
- Sift ashes with a wooden rake to ensure all explosives were burned.
- If additional quantities must be destroyed, use a new location.

Most blasting agents can be destroyed by emptying into a pit and pouring water over them as most are water soluble. However, if the blasting agents and blasting slurries contain TNT, they are best destroyed by detonation.

The safest and surest method of destroying blasting caps is to tie them in compact bundles with the detonating ends together, place them in a box or bag, and bury them; and finally, explode them with a good blasting cap, or for greater assurance, with a primed cartridge.

All other blasting accessories should be destroyed by burning. Special care must be taken while disposing of Primacord: it should never be burned on the spool but rather strung out in parallel lines one centimetre apart.

Lightning

In Camp

When a lightning storm approaches camp:

- Disconnect radio antennas and move them away from the radio.
- Move the antenna leads of both personal and short-wave radios away from both people and the radios. Lightning strikes in the general area can induce a high voltage in the antenna, resulting in an arc discharge to the nearest ground.
- All employees should move away from the drill rig—the mast may act as a lightning rod.

Outdoors

During a lightning storm:

- Avoid standing in areas that are susceptible to a strike, e.g. a single large tree, a mountain ridge, or a large open area where you are the only tall object.
- Move to a safe place before the storm arrives, such as inside a car or truck. Look for shrubs or trees of uniform height, ditches, trenches, or low ground.
- If fallen live wires are touching the vehicle, do not step onto the ground while they are touching the vehicle; you are a better conductor than the tires.
- Head for shore immediately if you are in a boat or canoe.
- Geophysical crews must be especially alert for storms in their area as equipment may stretch for kilometers. Disconnect all wires from equipment and stay well clear for the duration of a storm.
- Choose a campsite where the possibility of lightning strikes is minimal.
- Maintain high awareness for thirty minutes after the last observed lightning or thunder.

If lightning strikes in the vicinity, you must minimize your contact with the ground.

- **Crouch** down with your knees drawn up and your feet *close* together. **Crouch** on insulating material if possible, such as a dry sleeping bag. Never let your hands, shoulders or head touch the ground, as current passing through them will also pass through your vital organs.
- A field party should spread out at least 20 metres apart so they do not provide multiple paths for the current.

If a person is struck by lightning, check if the victim has a pulse and is breathing. Follow the ABCs of first aid.

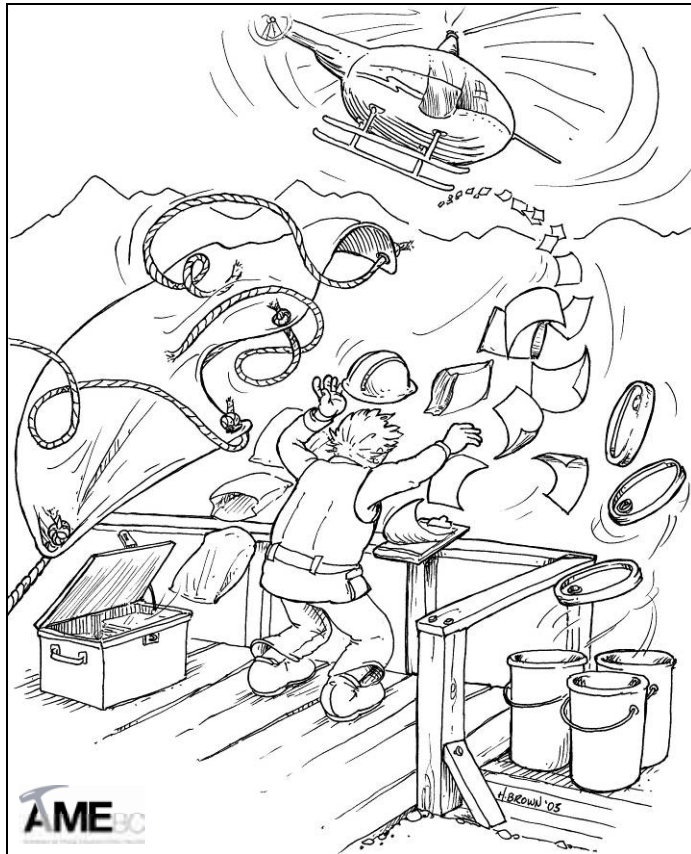
- **Airway- check**
- **Breathing – respiration rate**
- **Circulation - CPR**

Treat burns as required. Aftereffects may include impaired eyesight and loss of hearing.

Note:

- **You cannot receive an electrical shock from someone who has been struck by lightning.**
- **Lightning rarely kills outright—it paralyzes body functions. Recovery is common, even if some time has elapsed since the strike.**

The National Lightning Safety Institute (NLSI) recommends that all organizations prepare a Lightning Safety Plan and inform all personnel of its contents. Visit the NLSI website at www.lightningsafety.com. A useful outline of a lightning safety decision tree is at www.lightningsafety.com/nlsi_pls/decision_tree_people.html.



Chapter 7

Travel and Transportation

Traversing

Persons who have had previous experience in the outdoors including hikers, campers, and those engaged in exploration work will have developed an awareness of the preparation and precautions that are required. Nevertheless, travel on foot is the most frequent outdoor activity. It seems like a normal activity, but familiarity should not be allowed to dull safety awareness. Over the past 23 years, slips and falls averaged 46% of all lost workday accidents in the exploration sector in western Canada. Furthermore, when travelling on unfamiliar terrain one may encounter new and unexpected hazards.

Clothing and Equipment

- Footwear should be in good condition and suitable for the terrain that you expect to encounter.
- Clothing should be in good repair, without loose ends to snag branches or sharp rocks.
- Carry extra clothing (or protection) for any foreseeable emergency, including rain and an unexpected night outdoors.
- Compass, map, GPS unit, sheath knife, waterproof matches, signal flag, flare, first-aid kit, and signalling mirror are essential for even the shortest trip. Ability to light a fire in wet or cold conditions is mandatory if remaining out overnight is a possibility. A mosquito net and insect repellent are necessary in insect season. A lightweight tarp or plastic sheet will make unexpected nights out far more comfortable and, if it is wet, may mean your survival.
- An axe is a very useful tool in wooded terrain; one should be carried if there is any possibility of remaining out overnight. Each axe should have a sheath. When carrying the axe, keep the blade facing away from you. Never carry an axe over your shoulder!
- A light nylon rope should be carried if there is any possibility of crossing fast flowing streams.

- Consider carrying other emergency equipment such as a space blanket, candle (for lighting fires), signal flares (see other sections on survival, survival equipment and clothing).
- Matches should be in a waterproof container – do not become separated from your matches (e.g. by leaving them in a packsack). (See also Chapter 5 and Appendix 5.)
- Individual First Aid kits with antihistamine and/or EpiPens should be carried. EpiPens are used for injecting adrenalin to counteract allergic reactions.

General Traversing Precautions

- Traverse in pairs, preferably with at least one experienced person, or within communication distance (use hand-held radios between groups). Employ the “buddy system” where each person looks out for each other.
- The less experienced person should be learning, not just following; the experienced person should be teaching.
- Travel at the speed of the slowest party member.
- If it is necessary to travel alone, use greater caution. Even a minor mishap may be fatal if there is no one to come to your assistance promptly.
- Avoid following too close to a person ahead of you to prevent branches from springing back into your face or being stung if the lead person stirs up a wasp nest.
- Inform others of your travel plan, or (if there is no one immediately available) leave a note and a map in camp to be used if you do not return, showing your planned route and any alternate routes that you might take. Include the expected **time** and **date** of your return.
- If you must travel alone, be sure that there is someone who will come to your aid promptly if you do not return (See Section 3.2.3 of the Health, Safety and Reclamation Code for Mines in British Columbia and Section 4.21 of the Workers’ Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8).

- Be aware of the location of cliffs, particularly on snow-covered terrain.
 - Avoid walking above cliffs on snow-covered terrain
 - Avoid walking near edges that may crumble, i.e. snow, soil, or rock.
 - Avoid prolonged walking or working below a cliff face, but if it is necessary to do so, be alert for the sound of rock falls commencing above you, especially when the sun shines on frozen cliffs.
- Watch where you step and avoid such dangers as slippery mud and logs, or unstable rocks. When travelling in very dense underbrush, look before each step. You may hear rushing water before you see it, and a stream bank, dark pool, or hole may be obscured in front of you, particularly if the stream is only a few feet wide and the forest floor appears uninterrupted. When snow is on the ground, especially in spring, be aware of the possibility of breaking through the snow into an open space below.
- Stay alert to the possibility of a slip or fall; take extra care when you may land on snags, cut saplings, or sharp rocks.
- Never smoke while travelling in the bush during the summer. Take a break, so that you can enjoy your smoke, and then dispose of butt and ashes properly.
- Be extra careful as the day wears on and you become tired, less alert, and less agile.

Plotting and Executing Traverses

Plot your route carefully. Use the best information available such as air photos, maps, and the comments of others familiar with the area.

- Be realistic in assessing what traverse can be made in the available time. For long traverses, have a back-up or escape plan, and an alternate shorter route in case your proposed traverse cannot be completed.
- Be thoroughly familiar with the use of your compass and GPS unit. Before departure, check that the magnetic declination and GPS settings are correct for the area. Check that these instruments are working correctly while you still know your location. Then you can use and trust the instrument readings later. You may have to

depend on your instruments. Carry an extra set of batteries for the GPS.

- A GPS unit does not remove the need to carry a map and compass or eliminate the need for skills to use them. Your GPS unit may not give reliable readings in heavy timber or steep-walled canyons.
- Attach your instruments to your body or pack, and then stow them in pockets which can be closed up. Losing equipment is both discouraging and costly in time and efficiency.
- Trust your compass, as it is usually right. Because the compass needle aligns with the strongest magnetic field, nearby iron such as a belt buckle, magnet or lanyard clip, or a nearby iron formation or ultramafic rock will produce inaccurate readings. Check by taking bearings back toward your last compass checkpoint.
- Note natural indicators of general direction, e.g. brighter sky in the east in the morning and west in the evening; moss on the north side of the trees; wetter slopes and indicators of cooler microclimate on the north side of mountains; etc.
- Always “navigate” when you are travelling in the field. This requires checking compass bearings, keeping track of time, and possibly pacing.
- Practice your pacing skills where there is chance to check them (e.g. on or beside marked lines cut for geological, geochemical or geophysical surveys). Learn how to adjust your pacing count for changes in terrain conditions such as dense underbrush, swamp, or steep slopes.
- Avoid the temptation to stop navigating when your goal seems within easy reach (such as on the return leg of a traverse). If your goal does not materialize as anticipated, mentally review your progress and noted landmarks, such as the shapes of high points, and the direction of drainages.
- Be cautious about using game trails or logging roads to make travel easier. These may gradually change direction, and take you considerably off course. Continue to “navigate” particularly with respect to direction. Be aware that a normal pace will carry you almost twice the distance on a hard road surface compared to the usual bush surface.

Slippery Surfaces

Be very cautious about walking along logs (or avoid them entirely). If working exclusively in heavily timbered area such as Vancouver Island, consider using a pair of caulked boots. Note that caulked or equally effective footwear must be worn on logs or similar slippery services (see Section 8.23 of the OHS in Appendix 8).

- When the inner bark of a log begins to rot, it becomes very slippery when the surface is wet from dew or rain. The weathered surface of an old log (with no bark) may offer firm footing when it is completely dry, but becomes very slippery when the surface is wet from dew or rain.
- Lichen on outcrops is very slippery when wet (the colour often changes from black or grey to brown as the lichen absorbs water).
- Do not carry pointed or sharp items in your front or hip pockets; they may injure you in an uncontrolled fall.
- Avoid areas of active rock fall, steep road cuts, recent slides and unvegetated glacial moraines. In these places you are asking for accidents. If you must work in such places **a hard hat** is absolutely necessary.
- Do not follow another person in steep terrain where rocks may be dislodged. Wait for each person to clear the danger area before proceeding, or pick a parallel path a couple of metres to one side.

Crossing Snow Patches

Be careful when crossing patches of steep snow (may result in uncontrolled slide, possibly onto rocks or over a cliff), or snow-filled hollows (may break through into mountain torrent or pool).

- The surface hardness of a snow patch will vary with the time of day.
 - In the morning (while the slope is still in shadow), it may have an icy glaze that is too hard to allow you to make adequate footholds with your boot. This is particularly dangerous because there is little hope of stopping if one starts to slide.
 - In the late afternoon, the snow surface may soften considerably and make walking very slow and arduous.
- Cornices (overhanging crests of snow on ridge crests) are particularly dangerous. If you are travelling on a snow-covered

ridge, be certain that you are not walking on a corniced part of the ridge; the unstable overhang cannot be seen from above. Travel well back from the edge. Avoid slopes below a corniced ridge because of the possibility of the cornice breaking off, which might trigger an avalanche.

Crossing Creeks

Use extreme caution in crossing streams. Falls and slips in mid-stream can be disastrous. A simple misstep can curtail your life. The type of danger to be anticipated will vary with the characteristics of the stream being crossed. Choose the place to cross with care. Make sure there are no hazards downstream. Plan for the worst. Consider dividing and carrying your load across in two trips, so that half your load will always be on the bank (and have matches and dry clothing in each half).

- Mountain streams are generally fast and cold.
 - Remove socks and replace boots.
 - Consider keeping trousers on to act as a “wet suit” against the cold water.
 - If possible, carry a stout pole (should be as tall as or taller than you) on the upstream side leaning into it slightly to give better footing.
 - In a fast stream, water depth above your mid-thighs can easily sweep you off your feet.
 - It may be advisable to use a light nylon rope and cross one person at a time, but the free end should be tied to a tree if possible, because a man on the bank can easily be pulled into the water by a semi-submerged man who has lost his footing.
 - Remember that mountain streams are subject to extreme variation in volume during spring-summer melting and after rainstorms. Plan your traverse to avoid being stranded by a stream in flood in the late afternoon; however, if this occurs, it is better to remain stranded than to risk being drowned.
 - If travelling with a group, make sure that at least one member of the party checks that other members have all safely crossed.
 - If you are carrying a heavy pack, undo the hip belt and chest strap so you can drop the pack quickly if you fall. Remove

- your pack before attempting to drink from a stream or pond, as the pack can tip over, pinning your head beneath the water.
- Slow-flowing, meandering streams with swampy banks present a different type of hazard.
 - The water may be fairly shallow at the swampy margin of the stream, but the bottom may drop off vertically at the edge of the main flow channel.
 - Muddy water may obscure this sudden change in depth; if you are carrying a pack full of rocks, you may drown before you get clear of your pack (loosen straps, as mentioned above). A staff can help you “feel” your way.
 - For this type of stream, if the water is not too cold, it may be better to remove outer clothing such as trousers.
 - Although narrower streams can be bridged by falling a suitable-sized tree, remember that the tree may become very slippery or be swept away.
 - If the water is fairly deep, the shortest crew member should lead the way so that a taller person does not inadvertently lead shorter companions beyond their depth.
 - Adequate rafts require a great deal of hard work to construct; poorly constructed rafts are a safety hazard. Rather than rafting, an alternative crossing should be sought in most cases.
 - If the crew is set out by helicopter on a gravel bar, it is **mandatory for the pilot to wait until all personnel are safely on the bank**, regardless of other flying commitments.

Avoid Panic if Lost or Disabled

- If problems arise, do not panic! Remember that your greatest resource is your intelligence; do not do anything or go anywhere without it!
 - Be aware that reasonable anxiety can gradually be replaced by panic. This is particularly true if it is late and you are hurrying to reach camp or a pick-up point before dark. Be aware of this; continue to travel carefully, and maintain the compass sightings and pacing that you should normally use.
 - **When you start to travel blindly, STOP; you are dangerously close to panic!** (see Chapter 9).

Mountain Travel

All areas in western Canada above timberline present special difficulties and hazards (Appendix 2). Many of the techniques used to overcome the difficulties are learned only through proper training and instruction. The judgment necessary to recognize many dangers comes only with increasing experience in mountain travel. These notes are not a substitute for practical instruction or experience. It is desirable that parties working in high and rugged mountains have several people on the crew who are trained in mountaineering. Useful courses in basic and intermediate mountaineering and wilderness travel are offered by the non-profit Canada West Mountain School, 47 West Broadway, Vancouver, BC, V5Y 1P1 (phone 604-878-7007 or visit www.themountainschool.com).

Special Clothing

- **Boots.** Medium to heavy-duty mountaineering boots are mandatory. Such boots should have padded sides that are higher than the ankle and stiff and rugged soles.
- **Clothing.** Mountain weather is unpredictable and often cold and windy even in summer. Clothes must protect against rain, wind, snow and sun. For warmth, several lighter garments that can be “layered” are preferable to one heavy item. Non-cotton clothing made of fleece is excellent and has largely supplanted wool. Fleece is warm, durable, and dries quickly. Cotton clothing has good durability and offers protection from wind, but is useless when wet and is very slow to dry. Warm mittens and a toque should be in your pack. A high-quality Gore-Tex or equivalent jacket and rain pants will cut the wind and keep out most rain. A rainproof (coated nylon) parka or anorak will keep out the rain but keeps the perspiration in.
- **Sun protection.** At high altitude, ultraviolet radiation is much stronger than at lower elevations. The light can cause snow blindness (burns on the retina), even on overcast days. Dark sunglasses or goggles are essential; make certain that the sunglasses you buy block the UV radiation (cheap ones don’t). You should also carry sunblock (SPF 30 or higher; suntan lotion is inadequate) for all exposed surfaces.

- Many climbers use a good quality lip salve to protect the lips.
- Wear a good hat when you are in the sun, even if you have a good head of hair.

Special Equipment for Steep Rock, Snow, and Ice

Although specialized tools have evolved for rock- and ice-climbing and skiing, a few basic items will suffice for most field work. Purchase the best quality you can afford, from salespeople who can advise on their use and care. **Proper training is essential before these items can be used effectively. Carrying these tools without knowing how to use them properly gives a false sense of security.**

- An **ice axe** is for travel on steep snow and ice. Used properly it can prevent and stop slips on snow; provide an anchor for a safety rope; cut steps; and be used for many other purposes. Have a knowledgeable friend or sales person help you choose a suitable ice axe.
- A **climbing rope** requires instruction for proper use. It is mostly used for safety and rappelling (easy descent of steep ground). Buy a rope only after you have learned how to use it, and seek experienced advice. 45 metres of 11 mm thickness is the best compromise in length and weight. A climbing rope is for climbing only; never use it to tow a vehicle, hold up tents, or tie gear onto car-top carriers. Once it has become abraded or knotted, it is unsafe to hold a person in a life-threatening situation. Climbing ropes are attacked and weakened by sunlight, battery acid, and other chemicals.
- **Crampons** are spiky contraptions that strap onto stiff-soled boots to ease climbing on ice or hard snow. Most geologists seldom need crampons. Proper fit is essential to avoid unpredictable release or tripping. The points must be kept sharp to work properly; they should be kept in a dry, padded container when not in use.

Slips and Falls

- Accidents typically occur on relatively easy terrain due to inattention or over-confidence. If the terrain is such that an unchecked slip would have serious consequences, you should not work there.

- Proper planning of the traverse may avoid some of the inherent difficulties. If reconnoitering the route by helicopter, remember that obstacles that appear insignificant from the air commonly increase in size and difficulty when seen on the ground. It is better to fly alongside the ridge, so that the crest is seen in profile than to fly directly above it.
- Rope up or turn back when the **least experienced** and **least skilled** member of the party feels uncomfortable or when there is the slightest doubt about their ability to handle the terrain.
- When difficulty is combined with exposure (a dangerous distance to fall) roped climbing is mandatory – get expert training and/or help.
- Beware of wet, lichen-covered rock. Beware of carpets of moss on rock slabs as they can peel off without warning.
- Falls or slips on even moderately steep snow or rock are very difficult or impossible to stop without proper equipment and training. Loose rock, or seemingly solid rock, can give way without warning, causing a fall. When moving up or down steep terrain keep three points of contact (move only one hand or one foot at a time). Trust your foot placements more than your handholds. Never lunge for a handhold, and keep your body upright with your weight over your feet. Turn sideways or face in when descending steep terrain. **If unsure about the traverse, do not attempt.**
- On snow, keep an upright position. If you lean into the slope, your footholds will tend to break out.
- Pay attention to the nature of the snow slope below you. A slope studded with or ending in rocks, cliffs, talus, trees, or bare ice is inherently more dangerous than a smooth unbroken slope. Serious injuries result when you slam into rocks at the end of an uncontrolled slide.
- Beware of slopes that increase in angle as you descend. Make sure you can see all the way to the bottom.
- Slips on steep, soft snow are best arrested by digging in knees, toes, elbows and ice axe, and by making little jumps to try to regain your feet. When descending fairly soft snow, it is often best

to hold the ice axe by the head and keep it somewhat below you so that in case of slip the weight of your body will drive it into the snow.

- On steep, hard snow, falls can often be stopped only with the ice axe. If you are sliding feet-first, on your back, hold the ice axe with one hand on the head (adze on the thumb side), and with the other hand low on the shaft. Roll over towards the head of the axe, and slowly dig the pick in. Keep the spike end of the shaft clear of the snow. Dig in your knees and toes (unless you are wearing crampons) to help you stop. This technique should be thoroughly practiced near camp before approaching a hazardous area.
- Many geologists think that a rock hammer is an adequate substitute for an ice axe. It is too short in the handle and is easily torn from your grasp. Even to stop a fall with an ice axe (self-arrest) takes practice; you may go over a cliff or strike rocks before stopping.

Falling Objects

- **Rockfall.** The danger is most severe in gullies and least on ridges. The greatest hazard is material kicked loose by people above or freeze/thaw action dislodging rocks from cliffs. Hard hats are recommended on steep terrain. Party members should take parallel paths so that one climber is not below another. If this is not possible, move one at a time past the difficult spots with other members of the party under cover.
- **Icefall.** Keep away from areas beneath ice cliffs and hanging glaciers, especially if there is recently fallen debris. Danger from icefall is generally least very early – near dawn – and greatest during the afternoon and evening, when rain is falling, or after the weather warms rapidly.
- **Cornices.** When approaching a ridge from the leeward side, cornices are readily visible. Do not travel in the potential fall-line of a cornice. Look for fracture lines and signs of cornices on other parts of the ridge and be extremely wary when approaching the ridge crest as it is often impossible to judge where the cornice commences. Many people have been killed when the “ridge” they

were standing on (or beneath), collapsed without warning and they were carried down the slope in an avalanche.

Glacier Travel

- Crevasses and icefalls are the special dangers of glacier travel. Even a small or flat glacier can have hidden dangers. Many hazardous crevasses are completely covered by surface snow or appear only as narrow cracks, but widen beneath the surface snow.
- On snow-covered glaciers, **the party must be linked by a rope**. An unroped fall into a crevasse is usually fatal. An inexperienced or ill-equipped party has no choice but to **stay off snow-covered glaciers**. It is easy to move unawares from a safe snowfield to a snow-covered glacier.
- Rescuing someone who has fallen into a crevasse, even if roped, is generally a very difficult task, even for a party trained in crevasse-rescue techniques.
- On “dry” glaciers (bare ice without snow cover), it is safe to travel unroped if crampons are worn and if steep areas are avoided. Falls on ice normally cannot be stopped with an ice axe.

Bad Weather

- Weather changes dramatically and rapidly in the high mountains, even in summer. Snow and fog are common in many ranges.
- Route-finding in bad weather above timberline can be very difficult. It is easy to proceed from safe and familiar terrain to dangerous and unknown obstacles. With fog, the perception of distance is distorted and sense of direction is suspect. A major hazard is the inability to discern dangerous terrain such as cliffs below or potential avalanche slopes during foggy conditions.
- If you are lost in the mountains in bad weather, you must decide whether to stay where you are (and safe) or attempt to get below the base of the clouds. This decision may depend on how exposed you are to the weather and how easy it is to reach a sheltered spot. A good map and knowledge of your position, and perhaps information (via radio) on the level of the clouds, are the best information you can have. Travel dangers must be balanced against the possibility of exposure and hypothermia. Always carry

extra clothing and some means to rig an emergency shelter. Then an uncomfortable night will not become a life-threatening emergency.

Medical Problems

- **Dehydration** is a common and often unrecognized problem. It is easily prevented by an adequate fluid intake. Drink plenty of water, fruit juice, non-caffeinated pop, soup, and similar liquids. Avoid alcoholic and caffeinated drinks such as tea, coffee, caffeinated pop, and hot chocolate, because alcohol and caffeine increase water excretion. The tendency to become dehydrated increases with increasing altitude.
- **Hypothermia** (depression of body core temperature) is a serious danger in bad weather, where the lack of shelter and inadequate clothing accentuate the effects of the harsh mountain climate. See Chapter 3 for prevention, symptoms and treatment of hypothermia.
- **Frostbite** most commonly affects toes, fingers and face. Adequate clothing and properly fitting boots will prevent frostbite. For superficial frostbite, rewarm with body heat. Deep frostbite should not be rewarmed except by competent medical aid.
- **Altitude Sickness.** Shortness of breath, headache, and weakness are experienced by some individuals at altitudes as low as 2,100 metres (7,000 feet).
- **Pulmonary edema** is a fairly common, and frequently fatal, form of altitude sickness at elevations as low as 2,700 metres (9,000 feet). It is marked by cough, nausea, weakness, rapid pulse, dizziness, and a gurgling sound. Immediate removal to lower altitudes and medical aid are essential for survival.

Avalanches

Avalanches are a leading killer in the mountains of British Columbia. Sometimes their causes are complex and timing unpredictable. If you are working in an avalanche-prone area, experienced help is advised (see p. 94).

- **Kinds of Avalanches**

- Dry (powder) snow.** Most common in winter after storms, particularly if windy; they are rare in spring or summer.

- Wet snow.** These consist of heavy, wet sun-heated or rain rotted snow, or wet new snow. The avalanches start at a point and grow in force and size as they descend. They are most common in spring and summer, particularly on south-facing slopes.

- Slab.** Slabs consist of fairly cohesive layers of snow are poorly bonded to the snow beneath. Unlike loose snow avalanches, slab avalanches start over wide areas. The whole slab begins sliding at once and with great force. Slab avalanches are the most dangerous and insidious avalanches.

- **Avoiding Avalanches**

There is no easy, sure way to tell if a given slope is stable or not. Slabs, in particular, can survive for months after they have formed and can be covered with new snow. The resulting surface can look and feel safe, but the unstable slab-substratum interface may be present at depth.

- The best plan is to avoid areas that might be prone to avalanching.
 - There is least danger on ridges, more on valley floors, and most on slopes. Gullies are more dangerous than the adjacent open slopes.
 - Leeward slopes tend to receive heavier snowfall than windward slopes. Windward slopes are generally safer. Cornices provide a useful guide to prevailing wind direction. Do not climb beneath corniced areas.
 - Avoid old avalanche paths. Look for bands of slide alder, small bent conifers, shattered trees and down-sloping bush.

Avalanches rarely start in standing timber, but slides from above can cut swaths through mature forest.

- Avoid hollow-sounding areas and slopes that suddenly settle when you are on them. These can indicate the presence of dangerous slab conditions.
- Most avalanches start on slopes ranging from about 30° to 45° in steepness, but once moving, they can sweep over flat valley floors for great distances.
- Particular care is needed during and shortly after storms or snowfalls.
- Conditions change from day to day, and yesterday's safe route may be today's death trap.

- **Crossing Suspect Slopes**

- Cross as high as possible, leaving most of the dangerous snow below. Put on mittens and spare clothing. Loosen pack and skis so that they can be discarded quickly if caught.
- Cross one person at a time. There is no point in everyone being overwhelmed. Cross quickly. The rest of the party should watch closely. Should an avalanche occur, note the spot where the victim was last seen.

- **Caught in an Avalanche**

- Discard pack, skis, and other equipment.
- Fight to stay on the surface: make swimming motions. Try to make your way to the side of the avalanche.
- If buried, inhale deeply as the avalanche slows to a stop and try to make a breathing space in front of your face. Stay calm. Don't try to fight to the surface unless you can see light.
- Death is commonly by asphyxiation. The snow consolidates almost instantly after coming to a stop. The crushing weight and eventual lack of oxygen are the leading killers.

- **Searching for Survivors**

- **Call for help – a satellite phone is a must.**
- Further avalanches are possible. Post a lookout and pick an escape route.

- Mark where the victim was last seen.
- Make a quick search down the fall line from the marked point. Pay particular attention around trees and outcrops. Listen for the victim's voice.
- Probe suspect areas with reversed ski poles, blunted ice axes, or the nearest equivalent items.
- If a hasty search proves futile, decide whether or not to go for help. Remember, half of all victims die within 30 minutes – many die within five minutes. After two hours, a buried victim's survival chances are very low.
- First aid for survivors should treat suffocation and hypothermia. Many victims have head and internal injuries as well. Evacuation to a hospital is essential.

These notes have hardly begun to treat the subject of avalanches. For parties working in areas of high avalanche danger, the following steps are recommended before field work begins:

- Take a course in avalanche safety. Contact The Canadian Avalanche Association. Box 2759, Revelstoke, BC, V0E 2S0. Phone: 250-837-2435 Fax: 250-837-4624, or visit www.avalanche.ca. The Canadian Avalanche Association also provides current information on weather, avalanche hazards, and backcountry travel conditions. For information, visit the website or phone 604-290-9333 in Vancouver or 1-800-667-1105 throughout BC. Further information is available from Snow Avalanche Programs at the Ministry of Transportation (PO Box 9850 Stn Prov Govt, Victoria, BC V8W 9T5, phone: 250-387-6361).
- Obtain enough avalanche beacons (electronic search devices) for the field party. Thorough practice with experienced people is necessary for these to be of value.
- Consider hiring experienced people to monitor snow conditions.

Suggested Reading

Mountaineers Staff and Fulsaas, Kris (editor) (2003). *Mountaineering: The Freedom of the Hills*. 7th edition. Seattle: The Mountaineers.

- By far the best general book on the subject for the North American mountains. It is highly recommended that all geologists working in

the mountains read this book. It contains much of value, if you are interesting in rock climbing or mountaineering, and even if you are not working in mountainous regions.

Wilkerson, James A. (editor) (2001). *Medicine for Mountaineering and Other Wilderness Activities*. 5th edition. Seattle: The Mountaineers.

- Excellent, comprehensive handbook, useful for anyone working in the field. Starts where most first aid manuals leave off.

Boats and Canoes

Transport Canada is phasing in new requirements for operating a motor boat. Persons operating a motor boat over 4 meters in length must possess an operator competency card, which can be obtained by taking a course from a provider approved by the Canadian Coast Guard. Alternatively, one can obtain a card by providing proof of the successful completion of a boating safety course that was held prior to 1999. This card must always be on board the vessel during operation.

For additional information, please visit www.tc.gc.ca/marinesafety/tp/tp511/safe-boaters.htm#operator or call 1-800-267-6687. For a list of accredited courses, visit the Transport Canada website at www.tc.gc.ca/BoatingSafety/providers/acc.htm.

Water safety is particularly important in the Cordilleran region. Most lakes and rivers are perpetually cold – any exposure to these waters quickly results in hypothermia (see Chapter 3).

Most Cordilleran lakes are bordered by mountains and late afternoon winds can cause sudden storms, resulting in rough water. Waves tend to build in the longitudinal direction of the lake, i.e. broadside to any small craft endeavouring to cross from one side to the other, the worst possible configuration. Party chiefs must exercise discretion when such conditions arise and, if necessary, postpone the crossing until the wind has abated. If caught out in such a situation, head into the waves at a 45° angle.

Remember, in remote areas, to capsize in cold water far from shore is to risk almost certain death due to hypothermia, even if a Personal Flotation Device (PFDs) is worn. Inflatable boats offer a high degree of flotation, but even they can flip over in strong winds and turbulent water.

Due to rapid changes in elevation, most rivers, particularly in British Columbia, are not navigable and no attempt should be made to utilize these for transportation.

Use of boats in ocean waters for exploration purposes requires special knowledge of seamanship and should only be undertaken by those with appropriate training and experience.

Always endeavour to check local conditions with a knowledgeable resident.

Preparation

Prior to beginning any boating activity, several essential factors should be considered:

- Transport Canada requires that all small craft less than 18.0 feet (5.5 metres) in length and under 10 horsepower (7.5 kW) in power must carry one (1) approved PFD per person being worn aboard, paddles or oars, a bailing device, and a sounding device (whistle or air horn). Other useful items may include a towline, flares, a survival kit, repair kit, spare fuel and lubricants. See the Transport Canada website at <http://www.tc.gc.ca/BoatingSafety/equipment.htm> for requirements for your craft. PFDs are designed to be worn – **WEAR THEM!**
- Review the applicable sections of Part 17 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation (see Appendix 8).
- Part of the Jury's recommendations regarding a canoeing accident in July 1988 which claimed four lives from hypothermia and drowning at Tatsamenie Lake, BC, a cold northern lake, included the following:
 - (1) All small vessels (canoes, Zodiacs, etc.) should have specification plates stating maximum load, recommended size of outboard motor, and maximum numbers of persons allowed.
 - (2) An orange strip or other recommended colour be placed along the keel of all small vessels so that when overturned in the water they can be more easily detected from the air.

- (3) Notification of abandoned or empty vessels floating on the surface of the water should be made immediately to the RCMP.

In addition, the AME BC Health & Safety Committee strongly recommends that:

- (4) In any exploration operation requiring transportation by water, that the use of unpowered canoes less than 5.5 metres in length be avoided and that preference be given to the use of inflatable or other more stable craft of the size required for the operation.
- (5) Personal Flotation Devices used in such an operation be of a type which provides the best insulation available and that the size of the PFDs be specific to the occupants.
- (6) In such an operation, that adequate communication be maintained with a base camp containing a support craft manned with the required operating personnel.
 - Ensure all equipment is in good working condition (despite having a bailer, a small leak in the boat may become a significant problem).
 - Leave a travel plan including a photo/diagram of your boat, destination, route, and time of return with someone responsible. These may be instrumental should you get delayed due to equipment failure, weather conditions, or injury (see also (3) above).
 - Monitor the weather reports well in advance of your departure to ensure good weather. Research local water conditions before setting out as well (tides, currents, water levels, etc.).
 - Learn basic navigation and safety skills. Courses for these skills are listed on the Transport Canada website at www.tc.gc.ca/BoatingSafety/providers/acc.htm.
 - Be aware of personal limitations and knowledge!

En Route Safety

Once launched, a boater can reduce the chances of being involved in an accident. Major considerations include:

- Practising proper navigation and safety skills. Enough emphasis cannot be placed on the use of proper boating safety techniques. It is important to learn these in a formal setting from professionals.
- Keep a constant watch on the wind and developing weather as squalls may build up in a matter of a few minutes, especially on interior lakes.

Ensure Survival

If an accident occurs to the user of a small craft, his/her chances of survival are increased by having a basic knowledge of small craft safety survival and rescue procedures. Everyone should stay by the craft in the event of an upset. Climb on top of the craft or get as high up as possible and huddle together. Use an emergency whistle or sound-making device (see Hypothermia in Chapter 3).

Equipment

- Oars or paddles
- Bailer – empty can or pail—attached to boat with a line
- Towline of reasonable length (minimum 2.5 times boat length)
- Flares
- Survival kit – first aid, spare blankets, flares, waterproof matches, emergency rations
- Radiotelephone or satellite telephone communication with base camp
- Repair kit – tools for outboard motor, shear pins, operating manual, patching equipment for cracks
- Fuel and lubricants
- Sea anchor

Safety Notes

- **Loading**
 - Avoid overloading. Passengers and equipment must be arranged with respect to centre of gravity. If loading in

sheltered water, and travelling in open water, make allowance for larger waves.

- **Fuel**
 - Ensure that adequate fuel supplies are carried, with provision for emergencies.
 - Monitor fuel consumption closely so that refueling may be carried out on shore. This provides an escape route which would not be available on open water and avoids possible stranding due to restarting failure.
- **Lake Travel**
 - Stay close to shore whenever possible. When travelling across large bodies of water, endeavour to head at a 45° angle into waves.
- **Ocean Travel**
 - Never travel without local tide charts (and know how to use them).
 - Stay close to shore, but during rough conditions keep well clear of shore break while keeping land in sight.
 - When beaching small boats, make allowance for tides.
 - Do not travel in foggy conditions.
- **River Travel**
 - Do not attempt to run rapids – be prepared to portage or to “line” canoe from shore using lines attached to the bow and stern of the boat.
 - Strong currents must be taken into account when approaching shore – watch for fallen trees or sweepers.
 - Logjams are a major hazard. In unknown terrain examine aerial photos for evidence of predictable hazards and portage around any suspicious areas.

- Professionally taught Small Craft Safety Survival/Basic Boating Safety courses are available from the Red Cross Water Safety Service throughout western Canada. In addition to being held regularly, especially in the summer months, courses and workshops can be organized solely for your group by contacting:
Canadian Red Cross Water Safety Services
100-1305 11 Avenue SW
Calgary, Alberta
T3C 3P6
Telephone: 403-205-3448
www.redcross.ca
- Ensure that anyone doing exploration work using boats knows how to swim.

Snowmobiles

- The use of snowmobiles, whether for recreation or work, is associated with a high rate of serious injuries.
- Obey all laws enacted by federal, provincial, and local government agencies pertaining to safe use and operation of snowmobiles. Note that WCB regulations pertaining to Mobile Equipment apply to snowmobiles (see applicable sections of Part 16 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8).
- WCB regulations state that all operators and passengers shall wear approved (by Motor Vehicle Branch) safety helmets, faceguards, and suitable eye protection.
- Become aware of the effects of wind-chill factor on exposed skin and dress accordingly. Learn the signs and symptoms of hypothermia (see Chapter 3) and its treatment. Hypothermia is the greatest hazard encountered in snow vehicle travel.
- Maintain a safe speed and keep the snowmobile under control.
- Avoid areas where avalanches are possible. Travel in heavily treed areas, tops of ridges or flat areas away from avalanche paths.
- If travel over lakes or rivers is absolutely necessary, test the thickness of ice beforehand and avoid areas with fast flowing water, such as narrows.

- Watch out for overflow conditions.
- Beware of hidden obstacles such as fence wires and boulders.
- Be aware that some light conditions make it difficult to see hazards. Drive so you can stop within your limits of visibility.
- Learn general maintenance and trouble-shooting procedures for the machine.
- Become familiar with maps and compass readings, survival techniques and ground-to-air rescue signals (see Aircraft – Hand Signals in this chapter and Chapter 9).
- Do not unduly damage the environment or harass wildlife.
- Carry repair kits.
- Carry survival kits on extended trips.
- If using a Sno-Cat, ensure that there is an escape hatch in the roof.

Essential Equipment

Essential equipment, sufficient for each person and machine, to be carried on extended trips includes the following:

- extra fuel in safe containers
- 2-cycle gas de-icer
- map and compass
- GPS unit
- communication (radiotelephone or satellite phone)
- snowshoes
- knife
- candles
- extra clothing
- tool kit and spare parts
- block and tackle
- waterproof matches
- axe or saw
- flashlight and extra batteries
- flares
- first aid kit (Level 1)
- large metal cup or small pot
- steel wool

- bright tarp or plastic sheet
- high-energy food
- satellite phone
- emergency shelter
- rope
- spare key

Automotive Vehicles

- Review applicable sections of Part 16 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8 for regulations specific to the workplace or work-area.
- Vehicles should be mechanically sound, adequately equipped, suitable for the job and under the control of a licensed, mature, and competent operator at all times.
- Operators should be trained and thoroughly familiar with operation and maintenance of vehicles. They should be designated and given authority to enforce observance of safe practices in and near vehicles under their control. Casual drivers and recreational use of vehicles should be avoided. Defensive driving courses are recommended; see the Canada Safety Council website at www.safety-council.org and the British Columbia Safety Council website at www.safetycouncil.bc.ca for details.
- Vehicles should be equipped with safety items required by the job and by general conditions. Broken, worn, or missing items should be replaced. Vehicles with defective steering or brakes, or inadequate or leaking exhaust systems must be parked until repaired. A vehicle log book should be carried in the vehicle and maintained.
- Safety equipment, including mirrors, lights, seat belts, tires, brakes, wiper blades, windshield glass, ROPS-type canopies, fire extinguishers, flares, shovel, fan belt, and first aid material should be considered part of the vehicle and not “borrowed” for other vehicles or other uses.

- Vehicles should not be used for a specialized task (e.g. ambulance, crummy, tow truck, explosives truck) unless suitably equipped for that task.
- As a condition of employment, prohibition of operation of any vehicle by an operator who is impaired by alcohol or any type of drug should be enforced by dismissal.
- Operators should be aware of hazards or potential hazards that may be encountered in areas of work (e.g. washouts, unsafe bridges and culverts, avalanches, landslides, wide or heavily loaded vehicles, snowplows, graders, livestock).
- Operators should perform safety checks regularly and following exposure to unusual conditions. Particular attention should be directed to brake lines, fuel lines and tires.
- Loose cargo items (e.g. fuel containers, boxes, crates, bumper jacks, spare tires) that might become lethal projectiles in cases of sudden deceleration must be secured and restrained by suitable holders, racks or clips, or should be tied securely to vehicle chassis by lashings or cargo nets.
- It is recommended that workers do not stand in the back of pick-up trucks. In 1983, an employee at an exploration site in northern British Columbia was fatally injured when falling from the back of an open pick-up truck in which she was riding. In the same year, a diamond drilling employee was fatally injured when struck in the chest by an unsecured fuel drum after both passenger and the fuel drum were thrown out of a pick-up truck.
- If more than one vehicle is travelling to the same destination, each driver should know how to arrive there independently without keeping the leader in sight.
- Carry a spare vehicle key secured in a safe place accessible from the outside of the vehicle and known only to the occupants. Your life may depend on it in winter in a remote location.
- The following safe driving practices are recommended:
 - Wear seat belts at all times while operating, **except** if crossing ice bridges.
 - Be aware of your position relative to other vehicles at all times, check the rearview mirror frequently.

- Adjust your speed to the driving conditions. Drive steadily and smoothly maintaining sufficient distance between your vehicle and the one ahead to allow you to stop if the other vehicle comes to an abrupt stop.
 - Avoid driving fatigue. If you begin to feel sleepy, stop and have a nap, or change drivers.
 - Maintain an even temper. Don't let someone else's bad driving cause you to lose your temper and have an accident.
 - Yield your right-of-way if necessary; don't insist on it.
 - Maintain the vehicle properly, and when renting or leasing choose a reputable company.
 - Know how to control skids.
 - Do not push the weather. In snow, wait in a safe area until the road is plowed; in fog, wait until it clears or drive at a speed that does not exceed your visibility with low beam lights on; in rain, reduce speed; and in freezing rain, avoid driving if at all possible.
 - Do not assume other vehicles will turn in accordance with their turn signals. Wait until they have commenced their turn before passing or pulling in front of them.
 - Do not run "stale" yellow lights and when leaving a stop light, wait a few seconds (and look both ways) after the light has changed to allow "red light runners" through the intersection.
 - Proceed with extreme caution near accident sites. Other drivers looking at the accident may not be paying attention to their driving.
 - Do not overload the vehicle. If hauling field gear and personnel or pulling trailers, use extra caution.
 - Driving one-lane bush roads requires special caution on corners and going over hills as these areas are usually blind.
- Roads within active logging areas may require that special radio communications be set up with the logging company to determine when the road can be travelled safely.**
- Extreme caution should be taken to avoid the area near the cable when winching vehicles. Slipped hooks have caused many leg injuries. Novice winch operators should practise

using the winch under supervision at the beginning of the field project.

Note: Do not use small hand winches with nylon cables for winching vehicles as the nylon stretches and will backlash very badly if the hook slips.

All-Terrain Vehicles (ATVs)

- **Three-wheeled ATVs are illegal and should not be used under any circumstances. They have been responsible for many accidents and are no longer manufactured.**
- ATV-related activities are the third most common cause of severe injuries next to cycling and snowmobiling.
- If ATVs are used in the field, it is highly recommended that a training program by Canada Safety Council certified instructors be taken. For information and a free CD, see www.safety-council.org/training/ATV/atv.htm.
- Part 16 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation is applicable to ATVs, specifically sections 16.7 and 16.49 through 16.55 (see Appendix 8).
- Always make a pre-ride inspection before you start the engine.
- Do not ride fast on unfamiliar terrain or when visibility is limited. Never ride headlong past your limit of visibility. It is sometimes impossible to see obstructions, holes and depressions. Always exercise caution.
- If carrying loads or towing a trailer, follow the manufacturer's rated vehicle capacity for loads and speeds.
- Most ATVs are designed to be ridden only by the operator. Their design does not permit carrying a passenger safely, as attested by the many injuries experienced by the passengers.
- In particular, avoid the more obvious pitfalls, i.e. steep, rocky or irregular slopes; unsafe speeds; and exceeding your physical capability in righting an overturned ATV.
- Wear a crash helmet, scuff-resistant clothing, gloves, and goggles or face shields.

- Ensure that all ATVs are insured. ATVs must carry a minimum of \$200,000 liability insurance when ridden on active Crown logging roads in BC - \$1,000,000 in insurance is recommended.
- Ensure that all ATVs and personnel meet the current provincial or territorial legislation – at time of press, BC is the only jurisdiction in North America that does not license ATVs.
- No horse play or racing should be permitted – too many accidents have resulted.
- Special hazards include the following:
 - Sprains or back injuries may occur when picking up a fallen ATV.
 - Burns may result from contact with exposed exhaust pipes.
 - Blind corners on narrow trails or roads may cause collisions with other vehicles or persons unless particular care is exercised – slow down!
 - Unless goggles are worn, overhanging branches may lead to serious eye injuries.
 - When crossing small streams, the depth of water and the type and condition of the banks and stream bed should be checked as they can cause spills.
 - Be aware of the possibility of fallen trees across your trail.
- The ATV is a valuable aid to the prospector or geologist, and its limitations should be respected.

Motorcycles

Use of motorcycles is not common practice in exploration in western Canada, and is discouraged by the Health & Safety Committee. If used, personnel must be properly trained and licensed in the operation of such vehicles. When operated by a novice, motorcycles are extremely hazardous in any environment.

Aircraft

The nature of mineral exploration requires the use of chartered fixed-wing aircraft and helicopters. At times, the aircraft may be used in terrain and weather conditions that may make flying difficult or dangerous. By following safe operating procedures the risks associated with flying can be minimized. Clients that charter aircraft can play a significant role in minimizing risk by establishing an onsite safety culture.

Accidents and Incidents

The Transportation Safety Board of Canada defines an accident as “an event resulting in serious injury, death, or substantial damage to an aircraft”. Such events are reportable and are well documented. An “incident” is usually considered as a situation when an accident almost happens – a “near miss”. Incidents are not necessarily reportable except as company policy by some operators. Consequently, incidents or “near misses” may not be consistently investigated until they become serious enough to be officially classified as “accidents”. The Transportation Safety Board of Canada reports that in 2004, 41 Canadian-registered helicopters were involved in accidents.

Any activity on the part of the flight crew that places personnel or equipment in jeopardy should be considered an “incident” and reported to the company providing the aircraft and/or Transport Canada. Exploration personnel in western Canada and other readers of this manual are urged to report incidents. Keeping track of incidents will alert supervisors to situations that need improvement regarding safety and potentially can prevent a true accident from happening.

Remember – to improve air safety it will be necessary to accumulate tragic statistics, unless the potential accidents are prevented by concerned, safety-conscious individuals capable of convincing operators that improvements in operating equipment and techniques and recognition of unsafe conditions are warranted.

Authorized Operations

There are four authorized conditions for aircraft operations:

- Use only registered, chartered, passenger aircraft, preferably from an audited charter company, or a company that has a reputation for safe, reliable operations.
- Use only pilots who have flown more than the minimum number of required hours on the type of aircraft to be used, and who are rated for the conditions.
- No one may fly as a passenger or an ad hoc crew member on: 1) an aircraft chartered for cargo, 2) geophysical surveys, 3) on a helicopter carrying a load on the cargo hook.
- There must be no stunt, trick, or extreme flying on aircraft.

Pre-Flight Actions

- Ensure a flight plan is filed. This should be with Flight Services. In remote areas, advise base camp, local police, or similar base of your planned route. Advise them of the destination, estimated time of departure (ETD), estimated time of arrival (ETA), passenger numbers and names.
- Establish a Search and Rescue (SAR) plan and stick to it.
- Identify and address any obstacles/restrictions that might be present in the operational area.
- Check that no flags, tags, or tie downs are attached to the aircraft.
- Check that emergency exits, SAR plan, seat belts, life jackets, radio operation, fire extinguishers, ELT, first aid, and survival kits are in order.
- Ensure aircraft are equipped with first aid kits, mobilization equipment, and a litter kit.

Helicopter Selection

When planning an exploration program, the type of helicopter most suited to the program should be carefully considered within the context of efficiency, safety and cost. When possible, read the aircraft's performance section in the pertinent flight manual and discuss the aircraft capabilities with the operator to ensure that it can safely fulfill the needs of the exploration program. It is important to understand how the following factors can have an impact on safety:

- Terrain, weather, and altitude of area of operation
- Seating capacity
- Visibility for passengers
- Maximum and average loads to be carried
- Range required
- Fuel consumption
- Airspeed
- Special equipment to be carried (internally/externally)
- Medevac capability (litter kit)

The type of terrain will influence helicopter selection. For instance, a reconnaissance-type program may require many landings on irregular ground surfaces with relatively confined landing sites. In such a case, it would be prudent to have excess power available and a machine with relatively short rotor blades and a high skid to ensure sufficient ground cover clearance.

Although similar hazards are present in the operation of all helicopters, including the lighter models (e.g. B206, AS 350, and Hughes 500), there are several safety-related implications associated with the use of medium and heavy lifting helicopters (e.g. Bell 204, Bell 205, B 212, S-61, and S64 “Skycrane”). These larger helicopters are used for the development of vertical reference slinging (long line) and the transportation of sophisticated externally carried electronic equipment

The development of vertical reference slinging (long line), and the transportation of sophisticated externally carried electronic equipment in exploration has several safety-related implications. Although similar hazards are present in the operation of all helicopters, including the lighter models (e.g. B206, AS 350, and Hughes 500), the greater size and lifting capabilities, the use is accompanied by more noise and rotor downwash and possibly more confusion in the landing or loading area. Some operators provide loadmaster specialists as crew members who are given the responsibility for organizing and positioning loads. In the absence of a loadmaster, it is essential that your personnel have clearly defined safety responsibilities and authority.

The Pilot

In the field, if you are unfamiliar with the pilot's credentials, it is your responsibility and your right to satisfy yourself that the pilot meets or exceeds the required skill and experience level needed for the project. Inquire about **total flying hours, total hours on A/C type, formal mountain flying training (if applicable), vertical reference training and experience, accident record, experience on your type of operation, date of last Pilot Proficiency Check, and hover exit training.**

The pilot is in command of the aircraft and his judgment shall be respected concerning such items as adequacy of weather for flying operations, suitability of landing sites, payload to be carried, etc.

Under no circumstances should the pilot be harassed, coerced or otherwise encouraged to act against his own judgment. Your safety as well as that of others may be imperilled. Encourage full, frank discussions of the pilot's role and skills. Pilots should not be expected to work at or beyond their level of experience and training. It is possible that the performance of the aircraft may have been "oversold" to obtain the contract. The pilot must not be pressured to do likewise. Consult the relevant flight manual.

The pilot is responsible for the safe conduct of the flight and should not be unnecessarily distracted during the flight. He must thoroughly brief passengers concerning safety procedures, particularly in helicopter operations. If he neglects to provide a briefing and you are unfamiliar with procedures, do not hesitate to ask for the information before an emergency arises.

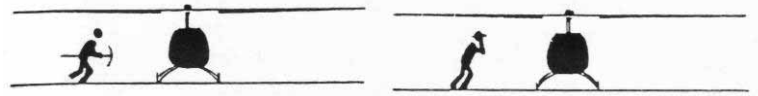
Pilot Fatigue

Fatigue is a progressive decline in one's ability to perform safely. In a pilot, fatigue results in an insidious change of attitude toward flying. The pilot's personal standards decline; more risks are taken; and small (warning) incidents tend to occur. If the pilot exhibits stress symptoms (e.g. irritability, isolation, missing cues, distracted attention), contact the helicopter company immediately and advise them of the situation. Flight and duty times are clearly defined and governed by the Canadian Aviation Regulations (CARs). Fatigue is the cause of many aircraft accidents and incidents.

Clear communication between pilot and management will reduce fatigue and stress.

The Passenger

Although passenger-related accidents are few, the passenger or individual working around aircraft must be aware of potential hazards, which can endanger not only his life but also that of the pilot and others. A passenger should not perform any crew function unless safety is otherwise in jeopardy. An inexperienced float plane passenger attempting to assist the pilot to dock will expose himself 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. Many incidents and several fatal accidents have occurred when a passenger or bystander walked into a moving helicopter tail rotor or main rotor. Similar accidents and incidents have been caused by hats or other loose items being blown into the main rotor blade. Inexperienced personnel frequently misjudge the location of a revolving main rotor blade. Therefore, items such as shovels, skis, and drilling rods should be carried low and parallel to the ground in the vicinity of the helicopter to prevent them from striking the blade.



Carry tools horizontally below waist level (never upright or over shoulder).

Hold onto hat when approaching or leaving machine, unless chin straps are available and secured.

During flight in helicopters, where passengers are frequently seated next to the pilot, ensure that no loose items are permitted to interfere with controls or to obscure the pilot's view. A seat belt buckle or earphone jammed underneath the pilot's collective lever at a toe-in landing site where both pilot's hands are occupied would almost certainly cause an accident.

In-Flight Procedures

- Wear seat belts at all times.
 - Do not smoke.
 - Do not open doors or windows in flight unless instructed by the pilot.
 - Do not extend parts of your body or equipment out of the aircraft unless instructed by the pilot.
- Do not throw anything from a moving aircraft unless specifically approved by the pilot.
- Do not talk to or unnecessarily distract the pilot during take-off, climb, descent, landing or when flying in difficult conditions.
- Calmly advise the pilot if you think there is something wrong.
- Follow the pilot's instructions and do not pressure the pilot to fly against his judgment or against regulations.

Ground Safety

- Do not remain on an aircraft that is being refueled and do not smoke within 15 metres of refueling operations.
- Do not approach, enter or exit or refuel a fixed-wing aircraft with the propeller turning.
- Use extreme caution if you approach and leave a helicopter with the rotors turning. The rotors are flexible and generally 2.5 metres above the skids of the helicopter. However, this clearance can be greatly reduced if the ground is uneven, in gusty or windy conditions, or if the engine is running down or idling. (Figure 1)

Figure 1

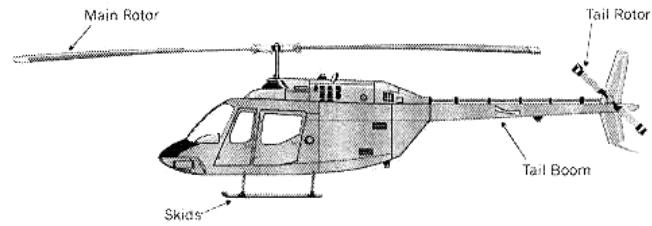


Figure 2
Approaching or Leaving a Helicopter

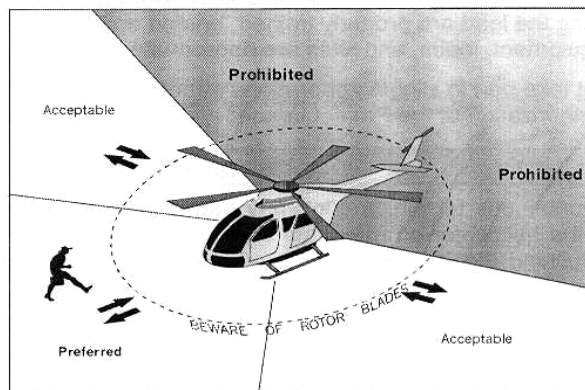
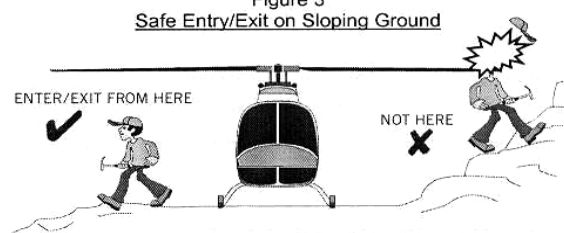


Figure 3
Safe Entry/Exit on Sloping Ground



- Always approach/leave a helicopter from the downhill side, in a semi-crouched position, in full view of the pilot. Only approach from the front after the pilot has seen and acknowledged you. Walk, never run. (Figures 2,3)
- Under no circumstances, approach the tail rotor or move behind the rear passenger doors or baggage compartment of the helicopter, or move to the other side of the helicopter by crossing under the tail boom. (Figure 3)
- Helicopter supported reconnaissance programs commonly involve landing, hovering, vacating, entering, unloading or loading a helicopter in undesignated landing sites. These are potentially hazardous operations that require a high degree of cooperation and trust between pilot and passengers. Never feel pressured to conduct these operations, never pressure a reluctant pilot to participate and never utilize inexperienced personnel in this work.

Passenger Briefing – Pilot Responsibility

Prior to boarding the aircraft, each passenger must have a complete safety briefing. Briefings should be repeated frequently throughout a sustained operation to combat complacency, and when anyone who has not been briefed for the specific aircraft or a new pilot is assigned to the aircraft.

The safety briefing should include but not be limited to:

- Aircraft Description
- Approaching and Departing
 - Hazards of main rotor and tail rotor
 - Crouch position
 - Eye contact with pilot
 - Sloping ground
 - Obstacles
 - Pilot's field of view
- Caution Areas
 - Antennas
 - Floats
 - Baskets

- Doors
 - Opening
 - Closing
 - Latching and locking
- Baggage and Cargo
 - Bear spray
 - Dangerous goods
 - Long items
 - Thrown objects
 - Secured cargo
 - Weight
 - Baggage doors
 - Cabin baggage
 - Electronic devices
- Seat Belts
 - Use of
 - Adjustments
 - Release
 - Stowage
- Communication
 - Use of headset
 - Hand signals
- Emergency Procedures
 - Pilot's direction
 - Exits – location, operation, disabled person
 - Ditching
 - Life jackets – location, operation
 - Raft – location, operation
 - ELT – location, operation
 - Briefing card – location
- Safety Equipment
 - First aid kit – location
 - Survival kit – location
 - Fire extinguisher
- No Smoking
 - In helicopter

- Within 15 metres (50 feet) of helicopter
- Within 30 metres (100 feet) of fuel storage

Special Operations Procedures Briefing

- Helipad Procedures
 - Size
 - Function
 - Clear of loose objects – clothing, tarps, plywood, etc.
- Approach and Departure
 - Clear of personnel
 - Clear of vehicles
 - Clear of power lines
- Landing Sites
 - Size
 - Terrain
 - Loading procedure
 - Unloading procedure
 - Special conditions
 - Pilot's instructions
- Special Equipment
 - Long lines – type, function
 - Carousel – type, function
 - Hook(s) manual release
 - Hookup procedure
 - Ground crew safety
 - Hand signals
 - Radio communication
- Hover Exit
 - Seat belts
 - Headsets
 - Baggage
 - Weight transfer
 - Mustering (gathering) point
 - Pilot signals & instructions

Emergency Procedures and Exits

A seat belt is required for every passenger. The seat belt must be secured during takeoff and landing and whenever considered necessary by the flight crew. In the event of an accident, correct use of available restraints and proper body positioning immediately prior to impact can reduce the chances of serious injury in a high impact landing or a crash.

Occupants should have their restraint systems securely fastened and tightened to a snug position at all times, when seated. If a shoulder harness is available, it should be used in its entirety. When high impact landing or crash is imminent, crew and passenger safety can be further enhanced by assuming the following body positions:

- **Seats with Lap Belt Only**

Passengers should lean over until their chest rests on their thighs and should attempt to protect face and upper body with any garment available. Their arms should be clasped together under their thighs to hold this position. Front seat passengers must avoid interfering with the flight controls.

- **Seats with Lap Belts and Shoulder Harnesses**

Occupants should sit with their backs straight and against the seat back as much as possible. If a manual inertia reel lock is available, and time and conditions permit, the inertia reel should be manually locked. Unless hands are required on the flight controls, the arms should be used to brace in the upright position.

In helicopter operations, it is good practice to buckle both ends of the seat belt together when leaving the helicopter, as this avoids a loose buckle from interfering with the pilot's controls or flapping against the outside of the hull during flight.



Fasten seat belt on entering helicopter and leave it buckled until pilot signals you to get out.

In large fixed-wing aircraft, each passenger seat is provided with printed information listing the emergency equipment carried and the location and operation of emergency exists. In smaller charter aircraft, there may be no emergency exists. Passengers should be aware of the location of life jackets or flotation devices on float planes. Certain authorities insist that life jackets be worn when in flight over open water.

Emergency Locator Transmitter (ELT)

All Canadian aircraft operating in Canada are required to carry one or more serviceable emergency locator transmitters and a compact radio or satellite phone in a crash-proof container. The radio will pick up distinctive signals on the emergency frequency of 121.5 MHz, permitting the detection and location of other downed aircraft equipped with ELT. Although the ELT is normally activated automatically during a forced landing, it can also be turned on manually if this does not occur. The battery life of an ELT is at least 60 hours, and signals should be heard up to 100 miles (160 km) line-of-sight distance by high-flying aircraft. The ELT provides a homing signal to pinpoint location and greatly reduces rescue time. The location of ELT devices is indicated by placards inside the cabin and is externally marked on the aircraft. Passengers should know how to remove and operate the ELT manually. **ELT orientation should be provided to all staff members.**

Flight Plans

Flight plans provide air traffic control with a record of the destination and routing of the flight. In helicopter-supported mineral exploration program, contact between the aircraft and airbase may not be possible or reliable. Accordingly, each party chief should leave adequate information on the proposed flight plan. One of the most convenient procedures is to plot the flight plan. One of the drop-off or pick-up points on a map of the general area (1:250,000 scale preferred) which is displayed at base-camp at an appropriate location, e.g. next to the radio/satellite telephone or in an office-tent. If the only means of communication with the outside world is by radio, the party chief should ensure that whoever is left in camp is conversant with the

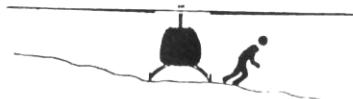
operation of the radio and knows how to describe the camp's location and the proposed routing of the aircraft. There have been many instances in the past where proposed or changed flight plans were not filed, or the flight plan was inadequate or changed, and serious delays have resulted in locating missing aircraft and passengers.

- A properly filed flight plan leading to rapid location of downed aircraft and passengers and crew could be the determining factor in whether injured individuals survive.
- Ensure that the pilot has an adequate copy or copies of maps covering the complete flight area.
- Ensure that the pilot accurately locates the drop-off point on a map unless he is thoroughly familiar with the area.
- If the pick-up point is at a different location from the drop-off point, be sure that it is accessible to the aircraft and agree with the pilot on an alternate pick-up plan if necessary. As a general rule, if the pick-up point is different from the drop-off point, the proposed route should be flown before drop-off. This will only take a few minutes of extra flying time and it may save the ground party several hours, particularly if the pilot needs to rendezvous with the ground party before the designated pick-up time.

Helicopter Approach and Take-Off Procedures



Approach or leave machine in a crouched position (for extra clearance from main rotor).



Approach or leave on the down slope side (to avoid main rotor).

Do not damage the body or the bubble of the helicopter. Scratches on the bubble impair vision.



Approach or leave in pilot's field of vision (to avoid tail rotor).



Do not touch bubble or any of the moving parts (tail rotor linkage, etc.).

Give the pilot a clearance to take-off after ensuring that his skids are free from possible obstructions and that all personnel are at a safe distance from the helicopter.



Keep landing site clear of loose articles - water bags, groundsheets, empty cans, etc.



Keep cooking fires well clear of landing site.

Ensure that there are no loose items near the landing site which could be blown into the rotor blades either during the approach or take-off of a helicopter (see Landing Site).



When moving larger crews:

- Brief them on safely as above.
- Keep them together and well back at the side of the landing zone. This gives the pilot more space to maneuver in the event he has to land suddenly either during landing or take-off.
- Have them face away and shield their eyes from machine during landing and take-off.
- Have each passenger look after their own personal gear.
- Have passengers paired off and ready to get aboard as soon as pilot gives the signal.

Inside the Helicopter

Keep your seat belt fastened until the pilot signals that he is satisfied with the landing site. Ensure that no items which could obscure the pilot's field of vision are against the bubble. Similar care should be taken to ensure that items such as seat belt buckles and earphones are not allowed to get jammed underneath the helicopter controls. There should be no unsecured baggage.

Never throw any object while near a helicopter, either in the air or while on the ground, to avoid objects being sucked into moving parts.

Landing Sites

Prior to arrival of the larger helicopters it is necessary to prepare loading and landing sites free of loose debris and with dimensions adequate to accommodate freight being handled. Normally the volume of freight and weight of individual pieces is such that very little can be organized once freighting begins. If possible, a tractor should be on

hand to move heavy pieces from nets and slings so that hernias and other muscle damage can be avoided.

Experience will give you an idea of how much room is required and type of site each pilot requires. Some pilots and helicopters require more room and more level sites than others. For your own safety, it is essential that you find or prepare a site which your pilot will use with confidence. Remember that every helicopter landing is a unique combination of winds, terrain, elevation and temperature. If you are on the ground, stand on the upwind side of the landing site, if possible, and signal the wind direction, preferably with flagging or, alternatively, with your arms (back to the wind with arms pointing in wind direction). Remember that all aircraft take off and land into the wind.

When directing machine for landing, stand with back to wind with arms outstretched toward landing pad.



Clear any obstructions from the landing site area, bearing in mind the clearance required for the tail rotor. In tight landings, the pilot may want you to help him position his tail, which he cannot see (whether you are inside or outside). Use your thumb to indicate direction tail is to move and your palm to indicate vertical movements (see 'Signals'). If the terrain is too rough at the site to land solidly, the pilot will sometimes steady the helicopter by resting only part of the skids on the ground while you enter or leave. You must shift your weight very slowly in these situations so that the pilot can maintain his delicate balance (see 'Toe-in Landing-Sites').



Helicopter Landing Pad

If the pilot has not provided instructions on an adequate landing pad, or if instructions are forgotten, for small helicopters allow a level landing area about 4 metres by 4 metres and clear the area to ground level within 6 metres of the landing pad to provide main rotor clearance and tail rotor clearance in two directions. If a landing pad is required in soft ground place 5 or 6 poles on the ground, each about 4 metres long and about half a metre apart perpendicular to the prevailing wind direction, i.e., the flight path. Poles must be secured to ensure they cannot move. Poles rot quickly and old or unfamiliar heliports should be checked very carefully before being used.

Finally, prepared landing sites that are old or abandoned should be destroyed.

Toe-In Landing Sites and Disembarking at the Hover

Toe-In Landing is classified as a Hover Exit. The pilot must be trained in the maneuver and passengers must be trained by the pilot (CARs). This technique may be illegal in some jurisdictions.

In mountainous terrain, a pilot may permit passengers to leave or enter the helicopter on mountain sides while the front part of the skids is resting against the ground. The pilot must ensure the safety of the landing site, particularly on steep slopes where considerable judgment

is required to ensure that the tips of the main rotor blades are a safe distance above the ground. Since both the pilot's hands are occupied with the controls, passengers must ensure that doors are securely latched before the helicopter departs and that no items are permitted to interfere with the control of the aircraft. In addition, passengers should control their own movements to avoid sudden shifts of weight.

Confirm with the pilot beforehand in which order he wishes passengers to embark or disembark, as it may affect the aircraft balance. Remember to ensure that the cabin door is firmly closed and that seat belts are inside the cabin when disembarking.

*If leaving machine at the hover,
get out and off in one smooth,
unhurried motion.*



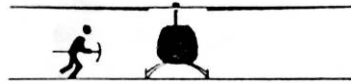
N.B. Toe-in landings are illegal unless the operator has an amendment to his Operating Certificate and Operations Manual which provides for such landings.

Cargo

Personal baggage and equipment should be properly secured. In fixed-wing aircraft, cargo carried inside the cabin with passengers should be secured by nets, strapping or other tie-down to prevent shifting in flight and possible injury or fatality to passengers in the event of a crash or hard landing. Cargo should not restrict the use of emergency or regular exits. It is the pilot's responsibility to ensure that the aircraft's total allowable payload is not exceeded and to ensure that the load is distributed so that the aircraft is within its centre of gravity limits; however, the pilot often has to rely upon the advice and knowledge of the passengers. Extra items should never be loaded on the aircraft without the pilot's knowledge and the weight of items should be determined as accurately as possible.

If legally permitted, externally loaded equipment must be tied on helicopter racks under the pilot's supervision to avoid loss of items or possible damage to the helicopter during flight by loose buoyant equipment being sucked into the main and tail-rotor blades. Use only

tie down ropes provided by the pilot as they will have been cut to specific lengths both for utility and safety reasons.



Carry tools horizontally, below waist level (never upright or over shoulder).



Hold onto hard hat when approaching or leaving machine, unless chin straps are used.

Hooking Up

Bulky items (e.g., fuel drums, drilling equipment) are frequently slung under the helicopter with lanyards and a net attached to a hook which can be released by the pilot. The pilot will provide adequate instructions on the correct procedure for arranging and hooking up such loads and the signals to be used (see Signals). Please review sections 29.9, 29.11, and 29.12 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8.

- All items must be securely held within the cargo net as loss during flight could cause the net and remaining items to be sucked into the main blades or tail rotor with disastrous results.
- Keep clear of approach and take-off paths when sling loads are being carried.
- Wear gloves to protect your hands, particularly since a static charge can build up in a light rain, snow or dust.
- If a helicopter is lifting a heavy load and appears to have difficulty getting airborne, NEVER try to assist by lifting the load. If the machine cannot lift it, it cannot fly with it.

In snow there are special considerations:

- The pilot must hover above the doughnut of blowing snow and may not have visual contact with individuals on the ground.
- Static electricity from sling gear can knock you down. Get briefed on grounding the helicopter.
- Allow plenty of time to prepare the aircraft for flight.



Loading assistants should always be supplied with plastic eye shields.

After hooking up cargo sling, move forward and to side to signal pilot (to avoid entanglement and getting struck by loaded sling).

Passengers are not permitted to travel in the helicopter during a slinging operation.

The following is a suggested check list for pilots to familiarize your staff with external load hook up procedure.

Non-Company External Load Assistant – Training Criteria

1. Describe in detail aircraft hook components and functions, including manual and electric release functions.
2. Describe in detail carousel hooks and function.
3. Explain extended line function and type to be used in current application.
4. Demonstrate correct method of closing both aircraft and carousel hooks.
5. Demonstrate downward tug on lanyard method to confirm hook is closed correctly.
6. Allow trainee to experience closing hooks and attaching lanyard without aircraft operating.
7. Explain radio and hand signals to be used on current assignment.
8. Explain pilot site lines during hookup phase.
9. Demonstrate correct method for hookup personnel to clear aircraft after hookup.
10. Explain personal protective equipment required during hookup operations.

11. Explain hazards to personnel and aircraft posed by unsecured material in the working area.
12. Explain in detail safety procedures required while working in the proximity of helicopters, including risks associated with fouled long lines.
13. Establish an emergency response plan.
14. Allow trainee to experience a minimum of three demonstration hookups with the aircraft operating.

Signals

Review section 29.5 of the Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation in Appendix 8 for specific regulations.

Hand Signals - Helicopter hand signals are shown overleaf. In the past, most helicopter or fixed-wing operators have not acquainted passengers with air-to-ground or ground-to-air signals that should be used for communication purposes. However, the hand signals are given here as inevitably, there will be times when it is advantageous to know them (e.g. when mobile radios are not available for slinging operations).

Air-to-Ground Signalling - Without adequate air-to-ground radio communication, the pilot has extremely limited ability to communicate with the crew on the ground, the most common signal being the 'wing-waggle' of the fixed-wing pilot to notify those on the ground that they have been sighted or that a message has been received.

The helicopter pilot must brief passengers on pick-up or emergency pick-up arrangements before they leave the aircraft, e.g. proceed for pick-up in the direction of the helicopter after three tight circles.

HELICOPTER HAND SIGNALS



**CLEAR TO
START ENGINE**



TAKEOFF
RIGHT HAND
BEHIND BACK
LEFT HAND
POINTING UP



HOLD-HOVER
PLACE ARMS OVER
HEAD WITH
CLENCHED FISTS



MOVE UPWARD
ARMS EXTENDED,
SWEEPING UP



**MOVE
DOWNWARD**
ARMS EXTENDED,
PALMS DOWN,
ARMS SWEEPING
DOWN



MOVE RIGHT
LEFT ARM
HORIZONTAL
RIGHT ARM SWEEPS
UPWARD TO POSITION
OVER HEAD



MOVE LEFT
RIGHT ARM
HORIZONTAL
LEFT ARM SWEEPS
UPWARD TO POSITION
OVER HEAD



**MOVE
FORWARD**
COMBINATION OF
ARM AND HAND
MOVEMENT IN A
COLLECTING
MOTION PULLING
TOWARD BODY



**MOVE
REARWARD**
HANDS ABOVE
ARM, PALMS OUT
USING A SHOVING
MOTION



**RELEASE
SLING LOAD**
LEFT ARM DOWN AWAY
FROM BODY, RIGHT ARM
CUTS ACROSS LEFT
ARM IN A SLASHING
MOVEMENT FROM
ABOVE



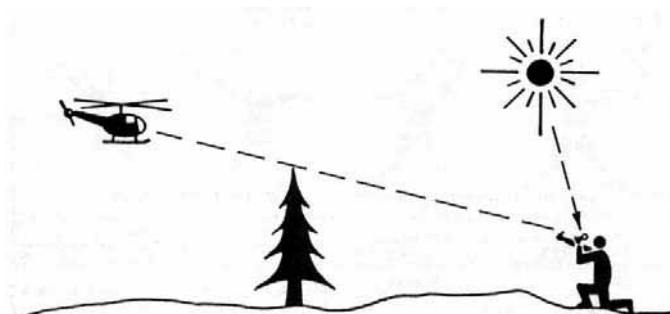
LAND
ARMS CROSSED
IN FRONT OF
BODY AND POINT-
ING DOWNWARD
WITH BACK TO
WIND



**SHUT OFF
ENGINE**
SLASH ACROSS
THROAT

Ground-to-Air Signalling - There are many established procedures for signaling aircraft among which the following are most common:

- **Bright Coloured Clothing** – fluorescent jackets or caps can be spotted far more easily than drab coloured bush gear.
- **Fluorescent Orange and Red Cloths** – these are generally made of nylon and should be at least 2 by 2 metres in size. When on a traverse, drop the folded cloth over your packsack if expecting a helicopter pick-up.
- **Pocket Flare Gun** – this is pen-shaped with a pocket clip and a spring-loaded mechanism which, when released, can discharge flares to a maximum height of 60-70 metres. It is particularly useful when a helicopter is trying to locate personnel in forests.
- **Heliograph Mirror** – most useful for attracting fixed-wing or rotary wing aircraft on sunny days. The mirror contains a small sighting hole to pin-point targets. Avoid use of the mirror when close to a helicopter.
- **Mirror, Brunton Compass Mirror, Metal Clip Board, etc.** – similar principal to the heliograph mirror but less precise. The best signaling procedure is to extend one arm with the thumb held vertically on target and, with the other hand, line up the reflection of the mirror held at eye-level on the thumb. The top of a small tree at greater distance can be used for greater sighting accuracy.



Signaling Helicopter with Mirror

- **Smoke Fire** – On bright days, smoke is more noticeable than fire, while on dull days or in twilight, the reverse applies. Smoke dissipates quickly in a strong wind and a small fire is useless in these conditions. Keep green boughs available to create smoke on a well established fire.

Three fires, about 20-30 metres apart at the apices of a triangle are an international distress signal and should be used only in an appropriate emergency. However, for practical purposes, a single column of smoke is as effective and is far easier to maintain.

- **Portable VHF Transceivers** – Two types of VHF hand-held radios are available for air-to-ground communications.

One less-familiar type makes use of the VHF-AM radio system installed in all aircraft. These radios are used in all airport air-to-ground and air-to-air communications. The flexibility of being able to talk to any aircraft flying overhead makes this system of communications very advantageous. These portable radios have crystal-controlled frequencies so a great range of frequencies is available. Each hand-held unit usually carries two to five different frequencies. The recommended frequencies to carry are:

- 122.5 MHz – Common air-to-air and air-to-ground “gossip” frequency, almost always monitored by aircraft.
- 121.5 MHz – EMERGENCY FREQUENCY. All aircraft including commercial flights monitor this frequency, so in an emergency, one can call for help. The frequency 121.5 MHz should **never** be used unless there is an absolute emergency and only to call for help.

The most popular type of radio system is the VHF-FM system. These radios are smaller than the VHF-AM sets and are much easier to license. Unless the pilot has extra hands available to hold onto his own portable set, an addition must be made to the aircraft’s present avionics system. This system is limited to use in aircraft which have the special VHF-FM package and thus does not have the flexibility of the VHF-AM systems.

Both radio systems, depending upon the qualities of the ground units, have very good range and resolution. VHF-FM is also very useful in line-of-sight, and ground-to-ground communications between field crews.



When directing pilot by radio, give no landing instructions that require acknowledgement as pilot will have both hands busy.

- **Signal Code** – Previously recommended ground-to-air signal codes, using visual elements laid out on the ground, are so rarely used that the cryptic messages are unlikely to be recognized by current pilots and are no longer recommended for communication purposes. These may be useful to attract attention if you are lost or stranded. During Search and Rescue, use a variety of ways to attract attention to yourself.

Emergency Equipment for Fixed-wing Aircraft and Helicopters

All aircraft, both fixed-wing and helicopters, should be equipped with the following emergency equipment:

- ELT, preferably equipped with both an impact and a manual switch
- Emergency rations of a suitable quantity to meet Transport Canada regulations for the number of persons being carried (only required when flying over sparsely settled areas as defined in Air Navigation Order (ANO) Series 5, No. 12).
- First aid kit
- Sleeping bags sufficient to accommodate all passengers.
- Tent large enough to accommodate all persons on board (in the Arctic only, north of treeline)
- Portable compass
- Axe
- Signalling mirror

- Gun (12-gauge shotgun is ideal) and ammunition (No. 4 shot, SSG and rifle slugs). Documentation is required.
- Hunting knife
- Fire makers (matches in waterproof container)
- Pyrotechnical distress signals
- Snare wire
- Fishing tackle and fishing net
- Cooking utensils
- Survival booklet (see Chapter 9)

Additional items in winter:

- Snowshoes
- Extra socks and mitts

Additional items in summer:

- Mosquito repellent
- Mosquito nets

Emergencies

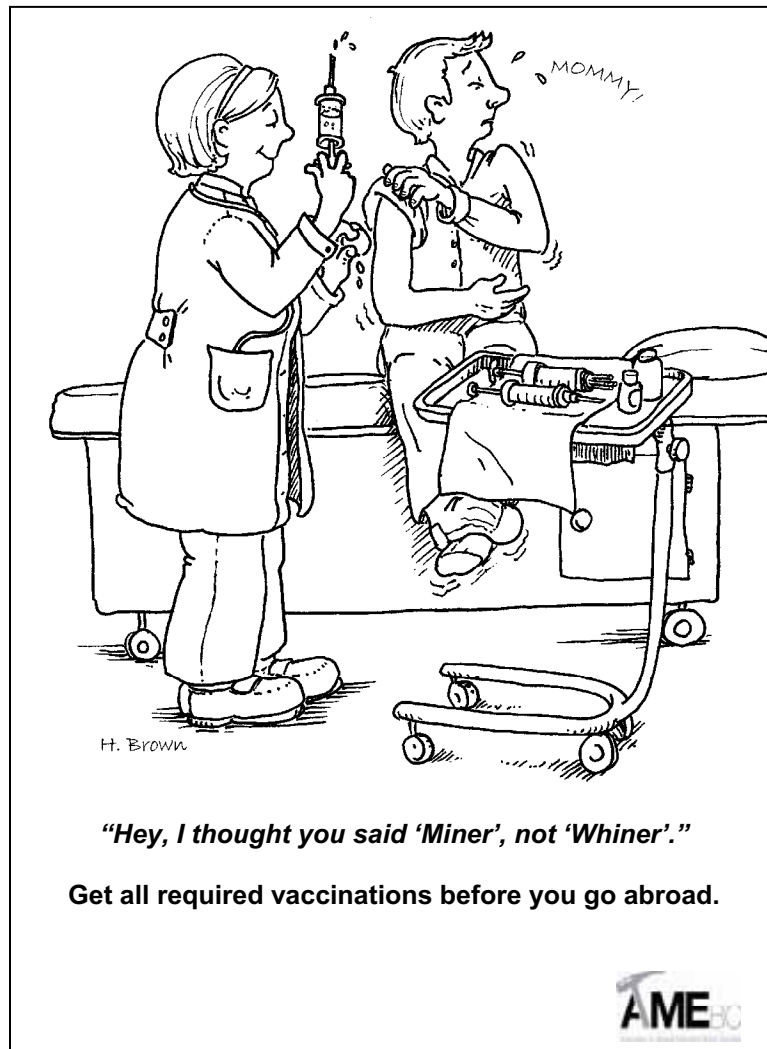
- In the event of an emergency, follow the pilot's instructions.
- In the event of a crash landing, do not attempt to leave the aircraft until it and the propellers or rotors have stopped moving. Then exit as quickly as you can and move to safe ground. If an aircraft is going to catch fire, it will usually do so within 60 seconds of impact.

Remember: No one is obliged to fly in charter aircraft when conditions are unsafe.

Airstrip Safety

The airstrip should be treated with caution. Although airplanes should be scheduled, there may be times when the airplane will be landing at unscheduled times. Before doing any work at the airstrip make sure to check with the camp manager to find out about flights. Listed below are general safety requirements for the airstrip:

- Always be aware of low flying airplanes over the airstrip (The pilot will usually make one pass over the airstrip before landing. If you are on the runway at this time, make sure that the runway is clear and leave the runway immediately).
- Always remain clear of the runway during take off and landing.
- Only approach the airplane once the pilot has given the ok signal.
- When loading and unloading be careful about driving around the airplane and under the wings.
- Remove any obstacles for the runway or notify the camp manager if there are any problems so the pilot can be informed.



Chapter 8

International and Long-Distance Travel

Know the country you will be working in, its customs, and safety risks. Consider obtaining a country risk analysis. Be fully prepared before you leave home by getting all required visas, immunizations, and/or medication. Certain countries (like Niger) will ask to see your yellow vaccination book, and you may be refused entry if you do not have all required vaccinations. Or, you may be required to undergo immediate immunization to enter. If so, you risk exposure to AIDS, hepatitis, etc., if contaminated needles are used. A travel medicine clinic can provide necessary immunizations and information about diseases, food and water safety, and if it is advisable to carry a travel medical kit.

- Consider making arrangements to be met by a guide at the airport.
- Consider hiring a professional driver. Foreign drivers may be automatically implicated in any accident.
- On property examinations or reconnaissance work, **always** be accompanied by a reliable, knowledgeable guide/companion, fluent in the country's language, practices and potential risks from wildlife and/or diseases. Use only approved or recommended transportation.
- Ask some knowledgeable locals about the country's other risks, e.g. using trains and buses for the first time. They may not go where they say they do, they may break down easily, or they may not be safe.
- If possible, do not use helicopters in foreign countries. In the 1990s, four Vancouver-based geologists died in accidents involving helicopters. If you must use a helicopter, first carefully check the records of the pilots and the company.
- Be aware of additional risks of traveling at night in cities, towns and in rural areas—on foot or by vehicle.
- Mosquito- and fly-borne diseases (malaria, dengue fever, encephalitis, etc.) are a major concern in the tropics and in some temperate regions. Take precautions by using DEET and permethrin products as necessary.

Hotel Security

Following a few general guidelines and using common sense will help reduce the chance of having problems with hotel security:

- Stay in the safest, most secure accommodation available.
- Do not provide your room number or address to strangers.
- If you need to exchange money, consider coming down after you check in so you will not be identified as a new arrival.
- Someone can break into the hotel window so try to get a room above the third floor and below the tenth floor for quicker fire escape.
- Power failures frequently occur in third world countries. Carry a flashlight.
- Remember the room telephone is not secure. Your conversations may be monitored.
- Don't leave personal documents or valuables lying around the room. They will disappear. Use the hotel safe.
- Consider placing a "Do Not Disturb" sign on your doorknob when you leave your hotel room to discourage a break-in while you are absent.
- Always hold onto all bags at all times in public places.

Other Tips

- **Public Telephone** – Learn how to use public telephones in various countries visited. Ask your long distance carrier for an international calling card that can be used at your destination, or ensure that you have a cell phone that operates in that country.
- **Copy of Passport** – Keep a photocopy of the information pages of your passport with you but separate from the passport. Leave a copy with your home office manager.
- **Spare Photographs** – Carry two or three spare passport photographs.
- **Itinerary** – Have an itinerary and leave a copy with appropriate persons. Inform your office or trusted local person if you change itinerary or you deviate from your itinerary.

- **Luggage** – Carry functional, but not expensive or fancy bags, as they tend to be broken into more often. Travel as light as possible, as it's less tempting to go through a small bag than a large one. An overnight bag is best as carry-on luggage. Do not use "club" baggage tags that identify you as a rich foreigner.
- **Money** – Have adequate financial resources with you – i.e. traveller's cheques, credit cards and cash. Try to have some local currency already with you when you arrive, especially if you are arriving at night. Have a number of small denomination notes. Exchange currency only at banks and other authorized places to avoid violating local currency laws. Carry money in a money belt and a minimum amount in your wallet. Carry as little cash and as few credit cards as possible.
- **Medicine** – Carry a prescription to accompany any medication, specifically those that contain narcotics. If necessary, carry your own needles with a doctor's note in the appropriate language.
- **Equipment** – Ask a travel agent or embassy for details about special regulations or requirements regarding electronic equipment, as some countries restrict their importation.
- **Food/Water** – Initially, eat only in better places. Avoid roadside kiosks. Eat food that is thoroughly cooked and served very hot. . Fried food generally has less potential for illness. Do not eat raw fruits or vegetables unless they have been washed and peeled using a clean knife. Drink carbonated bottled water and open the bottle yourself to ensure that it was sealed (the water should fizz suddenly). Consider carrying your own chopsticks or fork. Practise good personal hygiene. Carry and use hand sanitizer when you cannot wash your hands, especially before eating.

Kidnapping

Kidnapping is a danger in some countries. Again, know your country. Be wary of strangers. Conduct your business without drawing attention to yourself; try to blend in, e.g. if the people in the country do not wear shorts, don't wear shorts in public areas as it screams foreigner and draws unnecessary attention. Granted, in some countries, you just can't blend in!

- Vary your routine if in one location for some time.
- Be aware of the location of safe havens such as embassies, police stations (*in most cases*), government locations, petrol stations, or hotels.
- Be careful of unmarked taxis.
- Don't go into unsafe areas (cities, towns, or rural) particularly alone or at night.

If you are abducted:

(NOTE: With increased of hostility toward foreigners in many countries, there is a higher chance of abduction.)

- Do not struggle or resist unnecessarily.
- Avoid heroics and injury and do not provoke your captors.
- Do not attempt to negotiate your own release or promise that ransom conditions will be met.
- Do attempt to signal authorities that you have been abducted. Use pre-arranged signals, if possible.
- Do not attempt to escape. (Only 6% of kidnap victims are harmed and most of these while trying to escape.) But, be prepared to escape when your rescuers arrive.
- Take care of yourself, rest when you can and drink what you can, but avoid alcohol. Attempt to exercise and remain in physical and mental shape. You never know when action or what action will occur.
- After the initial tenseness of the situation has subsided, engage your abductors in rational, unemotional conversation. A rapport will develop, which may render less harm and quicker resolution.

Hijacking or Hostage Situation

If you are hijacked:

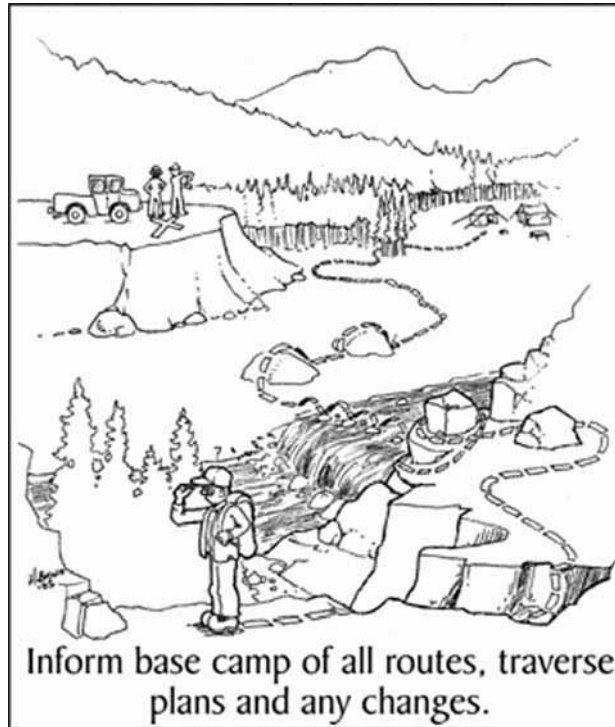
- Avoid heroics and debate. Remain calm and quiet. Keep a low profile. Minimize eye contact with all terrorists.
- If you are in charge of the vehicle being hijacked, hand it over.
- If you are not in charge of the vehicle being hijacked, do not get involved. Abide by the outcome.

- If reasonably able to do so, retain your identity documents.
- Do not pursue the hijacker(s), but attempt to remember as many details as possible. Write them down if possible.
- Report the hijacking to the nearest police as soon as possible.

Robbery, Extortion/Bribery, Violent Assault

If robbed, assaulted, or confronted with extortion/bribery:

- Avoid heroics.
- Calmly respond to robbery demands if no assistance is available.
- Do not succumb to an extortion attempt, nor pay a bribe.
- In a violent assault, adopt a passive, defensive attitude, protecting your head, neck, and upper body as much as possible.
- Report any such attempts to local police and appropriate authorities.



Inform base camp of all routes, traverse plans and any changes.



Chapter 9

Survival

Be Prepared

Many case histories of survival incidents indicate that previous preparation and rehearsal, both mental and actual, are the most effective means of producing the correct survival action in time of emergency. Many fatal accidents can be directly traced to a lack of proper preparation, usually related to a mental attitude called the “it can’t happen to me” syndrome. The following section deals mainly with **survival preparation** – that is, measures that can be taken prior to arriving in a survival situation. Specific **survival techniques** represent a lengthy subject that is treated in various published survival manuals, referred to later in this section.

- Ensure that all personnel are trained in survival techniques. Each individual should be supplied with a copy of a recommended survival manual.
- Each individual/party on a reconnaissance or isolated set-out should be equipped with a satellite telephone and a geographic positioning system (GPS) for emergency use.
- All vehicles should contain a survival kit sufficient for the number of passengers carried. Charter aircraft and boats are required by law to carry this kit. Demand to know its location. Insist that it be carried in the vehicle at all times (especially charter helicopters where it often gets tossed out on the landing pad). Specify in aircraft charter contracts the type and contents of the survival kit you require – **a good bush survival kit does not make a good arctic survival kit**. Listings of the contents of several types of survival kits are given in Appendix 5.
- Helicopter set-outs for a day’s work often place a person beyond walking distance to camp. Ideally, full scale survival kits including sleeping bags and tent/tarp should be set out at the pick-up point. This procedure also allows both the pilot and passenger to identify and agree upon the location of the pick-up site. In practice, this is not commonly done in which case persons traversing on the

ground must carry appropriate equipment and have the knowledge to enable them to survive an unexpected night out of camp.

- Sleeping bag – If you go on an aircraft or beyond walking distance from camp you should have it with you.
- At base camp, a dated log should be kept in conjunction with a map detailing locations being worked by each individual. It should indicate pick-up and drop-off points if an aircraft is being used. If all personnel are leaving camp, this information should be included in a daily radio log transmitted so that someone will know:
 - if they are missing.
 - where to look if they are missing.

Suggested Equipment to Carry in Pockets or Backpack

- Satellite telephone and Geographic Positioning System (GPS)
- Fire starting kit – matches in waterproof container, cigarette lighter, dry wood shavings or flammable material
- Pocketknife – large two-bladed jackknife or Swiss army knife. A strong, well-made solid-shank hunting knife is preferable.
- Compass and topographic map or air photograph of general area to be traversed. A compass with mirror such as the Brunton type can also double as a signaling device.
- Notebook and pencil to record notes and leave messages
- Food – nuts, raisins, prunes, dried fruit, chocolate, sugar cubes
- Safety glasses and polarized green-lensed plastic goggles if travelling over snow
- Fluorescent-red aircraft-signaling cloth – minimum size 2 x 2 metres
- Large plastic garbage bag for instant body shelter (preferably orange)
- Space blanket
- Small survival kit including nylon cord, wire, gill net, dried food, tea, spare large handkerchief, candle, aluminum foil
- Small first aid kit

- A small backpack survival manual if possible (e.g. the Collins Gem version of *The SAS Survival Handbook*; see Reference Material) in waterproof bag.

Don't Panic – The Psychology of Survival

Fear and ensuing panic in an emergency survival situation are your biggest enemies. The person who can recognize the symptoms and is well prepared to deal with pain, cold, hunger, thirst, fatigue, boredom, and loneliness, will be best able to cope with the normal fear and confusion which confronts anyone in an emergency situation. Remember that someone else on your crew knows your approximate position and that a search will commence as soon as you are overdue. During summer, a person properly equipped with a survival kit will not suffer from exposure and your greatest danger is injury to yourself or making your plight worse through panic.

Assisting the Search

The search will be from a helicopter or other aircraft and a person can be very difficult to see if he is in timber or if he is not moving. Therefore, apart from communicating by satellite telephone assisted by GPS, make yourself conspicuous by waving both arms in a clearing or on a ridge, by using fire, flare, signal mirror and/or signal flag, and by wearing bright-coloured clothing. If the helicopter lands and you have a rifle, wait for the blades to stop before you fire your shots. On bright days, smoke is more noticeable than fire, while on dull days or in twilight, the opposite applies. Smoke dissipates quickly in a strong wind and a small fire in these conditions is almost useless. In positioning your flag, or in timing your flares, remember that the pilot will be looking ahead or possibly to his side of the helicopter. If your intended pick-up site was above timberline, stay there as late in the day as you can, and then overnight below treeline or wherever you can keep dry and warm. The emergency equipment you carry is for situations such as this and you will certainly regret not having it when it is needed. Moreover, by not being able to signal your position, you will be wasting a great deal of money and time in the search. The following are a few general rules covering special situations:

- If you take the wrong route or suffer a crippling injury during your traverse and do not appear at your pick-up spot, do not attempt to retrace your steps unless you have ample time to spare. When the pilot realizes you are overdue, his first search will be along your planned route to see if you are injured and have lit a fire or made other signals. If you are not found, a crew will start following your planned traverse on the ground while the helicopter searchers try to analyze where you may have gone astray and anticipate where you may be. If you are in the wrong place and can walk, go to the most conspicuous point nearby, a ridge, lakeshore, river bar, or meadow, light a fire, prepare a smoke or flare signal, and wait.
- If you are in the correct place and the helicopter does not come – **stay where you are**. The helicopter may have suffered a breakdown and it may take a few hours or even several days to send a replacement. Your traverse is recorded at camp and everything possible is being done to bring you in. Depending on the time of the breakdown, a number of people may be scattered through the area or be stranded with the helicopter. If you went out in the morning with another person and his traverse is close to yours, you can try to meet up with him, but if you are unsuccessful in this, return at once to your own point. Never try to walk back to camp unless you are within 10 kilometres easy walking, know your position and route completely, have a map, and are in good condition. If you do leave your pick-up point for any reason, leave a prominent signal and a note at your pick-up point indicating your plans.
- If you are involved in an aircraft accident or breakdown – follow the pilot's orders. In his absence, the senior or most experienced person is in charge. An aircraft cannot always be spotted easily in the water, in thick timber, or if covered with fresh snow, and consequently appropriate signals should be prepared. If your aircraft is close to its flight plan route, you should be found quickly. If you are unlucky enough to be well off your planned route, stay with the plane and be prepared for a longer wait. If the aircraft will not be easily seen, you may have to make a decision to move to a more obvious or safer location, but this should only be done in special circumstances. Once again, leave a note with your

plans at the machine. If you are not found quickly, keep busy preparing signal fires and ration your provisions, bearing in mind that a full-scale search is being organized by the Air Rescue. The search will be conducted on clear evenings as well as in daylight and your signal fires are most important then. All helicopters and fixed wing aircraft are equipped with an ELT crash-position indicator and you should ensure that it is activated properly. As indicated in Chapter 7, you should obtain information from the pilot of each aircraft on your operation concerning the location of the ELT and its operating requirements.

Reference Material

These guidelines will give you the elements of preparation and survival, but a good survival reference manual should be left in camp. The two best survival manuals are:

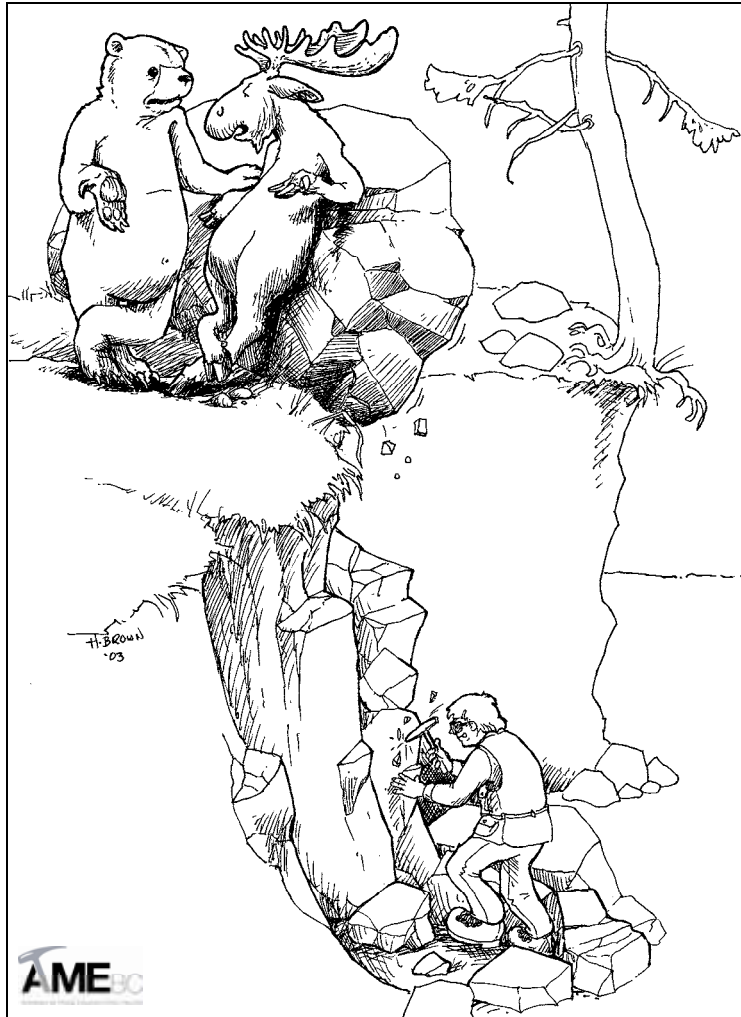
- *Down but not Out* – written by the RCAF Survival Training School staff and published by the Department of Defence of the Government of Canada. Unfortunately, it is out of print but can be obtained from libraries and secondhand bookstores.
- *Outdoor Safety and Survival* was compiled and published by: Parks and Outdoor Recreation Department, Ministry of Environment and Parks, Province of British Columbia, and is available from Crown Publications at www.crownpub.bc.ca.

Other useful sources of survival information are:

- *Mountaineering, The Freedom of the Hills* (7th edition, 2003).
- *The SAS Survival Handbook or How to Survive in the Wild in Any Climate on Land or at Sea* by John Wiseman (new edition, 2006).
- *Staying Alive in Avalanche Terrain* by Bruce Tremper.
- *Wilderness Survival Handbook* by Alan Fry.

A comprehensive catalogue is available at www.yukonbooks.com/shop/customer/home.php?cat=170.

Current courses and other survival information can be obtained on the internet by searching for Outdoor Safety and Survival BC on www.google.ca.



Chapter 10

Wild Animals

In terms of danger from wild animals or insects, western Canada is a very safe place to work. Despite the large number of encounters, actual attacks from animals are rare. The main threats posed to humans are: by:

- Bears, both black and grizzly
- Cougars
- Moose, mostly in rutting season (September)
- Animals with young
- Rattlesnakes
- Ticks
- Mosquitoes and blackflies

In most instances, attacks are provoked because the animal:

- Feels its safety or that of its young is threatened
- Is protecting food or territory
- Is surprised
- Has rabies (relatively rare in the wilderness) or other diseases

Working safely means **avoiding** these circumstances. A bite from any animal, no matter what the size or extent of injury, is potentially dangerous because of the possibility of rabies or severe infection. The victim should seek medical attention as soon as possible.

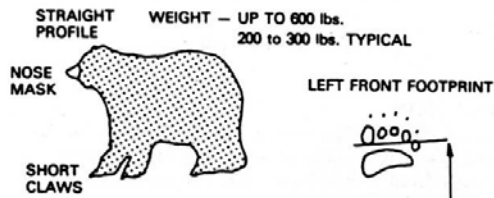
Bears

Bears present the most dangerous threat to workers in the bush. Provincial records for the period from 1985 to 2003 indicate 5 killed and 54 injured by grizzly bears and 8 killed and 56 injured by black bears. The chances of surviving an attack and minimizing injury are good provided you keep calm. Because of their size, grizzly bears seem the most formidable; however, black bears can be as unpredictable and dangerous and in BC are ten times more numerous than grizzlies.

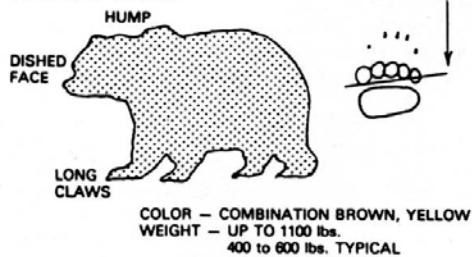
Identification

BLACK BEAR

COLOR — Black, BROWN



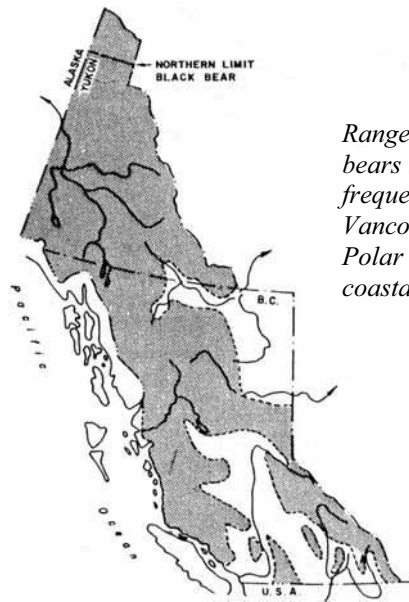
GRIZZLY BEAR



Identification of black and grizzly bears. Yukon bears may be on average only 2/3 the weight of their southern counterparts.

Habitat

- Alpine — treeless, high-elevation settings are extremely important to grizzly bears, but little frequented by black bears.
- Subalpine — fringe areas between forest and treeless alpine country offers little food for bears, and hence is not a preferred habitat except for trails.
- Forest — year-round home for black bears, but also frequented by grizzlies. Recent burns, clearings, highway edges, survey lines, etc. offer succulent new growth for food.
- Rivers and floodplains — generally have high bear activity in spring when bears descend from snowbound dens in search of food. During spawning season, fish are an important food source.



Range Chart (stippled area) for grizzly bears in BC and Yukon. Black bears frequent entire region, including Vancouver and Queen Charlotte Islands. Polar bears may be found in the north coastal area of Yukon.

Control Measures

- Avoid areas heavily used by bears or where there have been bear problems.
- Food storage should conceal odours, and if possible, be in bear-proof containers, preferably distant from quarters and general activity area.
- Minimize food waste.
- Completely incinerate all garbage and food wastes daily.
- Bears are attracted to the odours arising from scented cosmetics, hair spray, deodorant, etc., and perhaps toward odours of women in menstrual period. In the latter instance, scrupulous personal hygiene, use of tampons and extra caution are advised.
- Almost all dogs except well-trained bear dogs are detrimental in the bush, as they may encounter bears and lead them back to their owners.

- Under no circumstances should bears be fed, as has been the practice by certain visitors in park areas.
- Keep wildlife officials informed; they may wish to deter or relocate curious bears that enter the camp area **before** they become conditioned to garbage or terrorize the camp.

Safety on Trails and Traverses

How to Avoid Bear Encounters – Awareness

- Predict areas that you would expect to have high bear activity, e.g. burns, old camps and dumps, fish spawning areas, berry patches.
- Make sure that you are adequately trained and equipped to meet a bear.
- Carry a spray can of Counter Assault or similar bear repellent containing capsaicin, a red-pepper derivative which has been proven effective in deterring bears in a non-toxic, non-lethal manner. Keep the spray can in an accessible place and be prepared to use it as required. Practise using the spray, and be aware of wind direction so you are not inundated by the spray.
- Making noise alerts a bear to your presence. Carry a small bell on pack, shirt-cuff or pant-cuff. Air horns are recommended in areas where bears are numerous.
- Yell several times before entering heavy brush.
- Look ahead for bears.
- Keep a running track of climbable trees.
- Be alert to wind direction – expect to see bears upwind.
- Fly your traverse if possible to check ahead for bears before you hike.
- Be alert to strange smells – bears do smell quite strongly, particularly when excited.
- Be alert for unusual actions and behaviours of other animals.
- Be alert to signs, e.g. droppings, footprints, uprooted logs, dug holes, carrion, scratch or bite marks on trees.
- Never approach a bear cub even if it appears to be alone. If you come across a cub, retreat in the same direction from which you came.

What to Do if a Bear is Encountered

Upon seeing or hearing a bear, you have several choices depending on the situation. If the bear is **unaware** of you and **feeding**, you might be able to detour downwind by moving when the bear's head is down. If you cannot do this undetected, alert the bear to your presence by moving upwind; it is important to let the animal sense you by smell first. If the bear is aware of you but is **distant** you should stay calm and continue walking, angling away. In other situations where the bear is **closer**, you may choose to climb a tree if one is available. You must climb at least 4 metres above the ground, but remember, black bears are good climbers and a tree may not offer an avenue of escape from an aggressive animal. Assist the bear in identifying you and thus de-emphasize the threat you may represent. Remember that although bears are wild and often unpredictable, they rarely attack unless they feel threatened or provoked or perceive you as a meal. Stay calm.

Like other mammals, bears have evolved postures and other signals to communicate aggression and reduce the need for violent confrontation. Knowledge of these signals can help you interpret what the bear's next move will be and what action, if any, you should take.

A bear standing erect on its hind legs or waving its nose or head is not threatening; it is merely trying to identify you. Assist it by talking soothingly, slowly waving your arms. Bears will often retreat once they know what you are.

If the bear decides you are a threat that is too close, it may engage in any number of low intensity aggressive signals. For instance, it may turn sideways, perhaps pretending to feed, giving you an idea of its size. It may urinate, expecting to have to run or fight. The hair may lift on the back and neck making the bear appear larger and you may hear "woofs" or a low growl. Such deep growls would indicate to another bear that the threatening animal had a large chest and was therefore powerful. More intensive aggressive signals include chomping jaw actions, paw stamping and swatting vegetation.

While making threats, the bear's ears will point forward and it will watch closely for your response. **Never** attempt to imitate the aggressive attitude. Drop an article of clothing to distract the bear and either stand your ground or retreat **slowly**, talking in a calm but authoritative voice. Never run from or scream at a bear – it may provoke or excite the animal and heighten the possibility of attack. Make every attempt to leave an avenue of escape open to a bear – it will feel threatened if cornered.

Expect a variety of responses; from a retreat, to circling downwind of you, to a slow approach or a charge. The bear will likely move off, but either expect it to turn around to check that you aren't following or to see it again at a different location.

In the unlikely event that the bear still feels threatened, it may start figure-8 movements, stiff-legged walking and perhaps some almost random movements, always watching for your response.

From Government of Yukon. Wildlife Branch, A field guide to Yukon Bears for the Exploration and Placer Industries. Used with permission.

Approaches toward you are unnerving but rarely result in contact. Bears frequently bluff their way out of what they think is a threatening situation by making a false charge and then veering away or stopping suddenly. In most cases, the bear's ears will be up, it will be trying to look large, and may make a lot of noise. Its objective is to scare you. The bear that has intentions of mauling you usually will not bother with noise and size displays. It will usually have its ears back and will approach at a fast walk or run (up to 50 kilometres per hour). When this happens, you have a difficult decision to make – whether to play dead, fight back, use bear spray, or use your firearm.

The following tips for playing dead, fighting back, and using bear spray are from the Government of Yukon bear safety website at www.environmentyukon.gov.yk.ca/fishwild/bearsafety.html and are Copyright © 2005, Government of Yukon.

Play dead

- If the bear seems to be attacking in self-defence, the best thing to do is play dead so that the bear no longer feels threatened.
- Don't play dead before the bear contacts you – especially when a bear is approaching at a distance – or you may actually encourage the bear to attack.
- Play dead by dropping to the ground, face down, knees drawn up to your chest, and hands clasped over the back of your neck. Your backpack may help protect you.
- If playing dead works, the bear will make brief contact with you, and then will leave when it's convinced you're not dangerous. In this case, play dead as long as possible and don't move until the bear leaves the area.

Fight back

You should fight back if you are attacked by any of the following:

- any black bear
- any grizzly that stalks, or attacks in circumstances that do not involve cubs, a carcass, or surprise at close range
- any bear that breaks into a tent or building

These bears are motivated by food rather than self-defence. You need to fight back with all your energy with whatever you have. Kick, punch or hit the bear with a rock, chunk of wood, or whatever is handy [e.g. rock hammer]. A bear's nose is a good place to strike.

Using bear spray

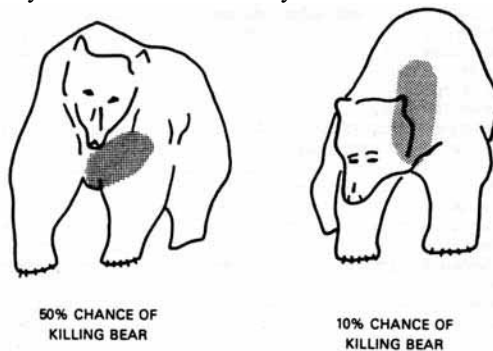
If a bear approaches slowly or follows at a distance, fire two or three short bursts of spray between you and the bear while you back away. The spray will create a cloud of deterrent, which may stop the bear. But make sure you have enough left to spray the bear in the face at short distance if it keeps coming.

If a bear is charging, stand your ground, fire a couple of short bursts to create a cloud in front of you, and then save remaining spray for use at close range if necessary.

Using a Firearm

If you are carrying a firearm, do not use it until you are sure you have no other alternative. A wounded, adrenaline-charged bear is so dangerous that shooting should be the absolute last resort. Shotguns with heavy gauge shells are recommended.

Wait until the **attacking** bear is within 20 metres or closer if a shot gun is used, and preferably within 15 metres before squeezing the trigger, because the bear may be bluffing. If it is not, the close range will increase the chance that your first shot will be disabling. The first shot **has** to be your best. Be certain that no one is in the line of fire. Bears attack on all fours, walking or running in a low crouch. They do not charge on just their hind legs. The figure below shows where to shoot a bear if you are forced to destroy it.



Areas of killing or disabling bears

Note particularly that the front and top of the head are not suitable targets when a bear is coming at you, as the brain is only the size of an orange.

If you have to shoot a bear, contact the Fish and Wildlife Branch or Conservation Officer Service in the area, identifying the sex, species (grizzly or black bear), and location of the kill, together with the circumstances concerning the shooting of the bear. Follow their instructions when disposing the carcass.

If you wound a bear, you have the responsibility to try and kill it. Under no circumstances should you attempt this alone. Be extremely careful, particularly if you must follow the bear into brush where it can squat and be very hard to see until you are only a few metres away. Wounded or frightened bears almost invariably head for dense brush where they feel most at home, where their superior senses of hearing and smell are more useful than your superior eyesight, and where you will usually have difficulty walking and handling a firearm. No one without a suitable firearm should help track down a wounded bear.

If Mauled

In the unlikely event you have been mauled, stay still, listen and try to assess the injuries you have received. While most bears move off, they may not travel far or quickly. After about five minutes, cautiously look around. Rationally decide your best course of action based on the nearest radio, the nearest help, bright clothing, first aid, matches, and amount of blood lost. The first priority is to stop the bleeding. Apply pressure to the wound and look for something to wrap it with. Wrap firmly, but loosen it if you get a 'pins and needles' feeling.

You should sit and think. Don't move until the blood has clotted. Drink the liquid in your daypack to help your body restore blood lost. If you have lost a lot of blood, you may be too dizzy to walk for help. If so, move a short distance, light a fire and sit down. After resting, gather more firewood, spread out your aircraft signal and prepare to spend the night.

At this time, we hope that you will be comforted to know that you took the following precautions before leaving camp:

- **Your personal first aid kit is adequate.**

- **You have a flare and a fluorescent-range fly sheet to alert aircraft.**
- **You have a buddy with you or working close by.**
- **You or your crew leader set up frequent radio-check times and they should start looking for you soon.**
- **Someone knows your exact travel route and timetable.**
- **You have matches, emergency food and a space blanket in your survival kit.**
- **The rest of your crew are well trained and care for your welfare.**

An investigation should follow any bear attack. No other crew members should visit the site before conservation officers.

For More Information

Two videos, “Staying Safe in Bear Country” and “Working Safe in Bear Country” are available from Magic Lantern Communications Ltd., phone 1-800-263-1818 or email west@magiclantern.ca. Another excellent video, “Bear Aware”, was produced for the Ministry of Forests. The Government of Yukon bear safety website at <http://www.environmentyukon.gov.yk.ca/fishwild/bearsafety.html> is also an excellent source of information.

Moose

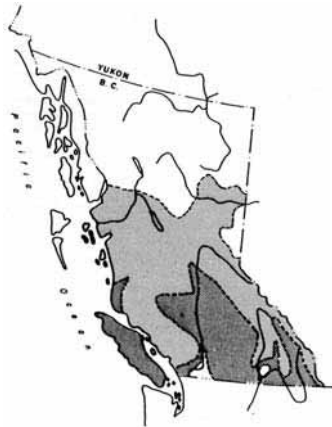
Moose frequent large areas of both British Columbia and Yukon, are commonly sighted, and seldom are perceived as a threat to humans. However, charges from moose do occur, particularly from a cow moose protecting a calf (in spring), from an ornery bull, or a bull in rutting season (September). Although moose appear large and ungainly, they can move extremely quickly. If you encounter a moose, it is best to back off slowly and detour around it, keeping a nearby tree in mind if escape is necessary.

In relatively densely timbered areas, you may avoid injury from an attacking bull moose by using closely spaced trees as a barrier. Stand behind trees spaced about one foot apart, i.e. too narrow a space to permit access by the moose because of the spread of its antlers.

Extra caution is required when driving – in the period from 1969 to 1997, motor vehicle accidents in BC involving moose accounted for 19 fatalities.

Cougars

The cougar is the largest cat native to British Columbia and weigh on average between 45 – 55 kilograms. They are elusive and possess remarkable hunting skills. Cougars normally avoid humans. While there are few documented instances of cougar attacking humans, the frequency of attacks is increasing. These attacks are usually attributed to old or young starving cougars, or to cougars which are defending their young. If you work where you know cougars are common, it is wise to carry a heavy walking stick to use if defensive action is required. Provincial statistics from 1970-2004 indicate 6 fatalities and 40 injuries from cougars.



Distribution of cougars in British Columbia. Heavy stipple indicates moderate to plentiful in abundance; light stipple indicates few or very few.

If you encounter a cougar two situations may arise:

- You are being watched – face the cougar, stand as tall as you can and try to appear as large as possible – open your jacket. Back away slowly, still facing it. Do not crouch down or turn your back on it and **DO NOT RUN**. Climbing a tree will not help as they are excellent climbers and can easily drag you from the tree. Some say

that staring down a mountain lion is folklore that actually works. So long as you make eye contact, the cat is unlikely to charge. You may be able to diffuse the situation even further by yawning and showing the cat that you are bored with it!

- The cougar is running at you – if unarmed there is probably little you can do, but put your pack out in front of you to protect yourself, or perhaps protect yourself with an axe, club, or hammer. Try to inflict pain on the animal with a large stick or rock as their pain threshold is very low. Aim for the face and eyes. You must never run away as this behavior triggers their instinct to chase. Throw rocks or branches at it. If you ward off an attack, treat any injury, assess the situation and rationally plan your next move. Keep cool.

If you come across a kill, leave it alone. Do not bend over to examine the carcass. Leave the area calmly, but as quickly as possible. Dogs and children are more susceptible to attack and should be watched at all times. Report all attacks to a Conservation officer of the BC Fish and Wildlife Branch.

Rattlesnakes

Rattlesnakes, preferring dry desert-like areas, range into the southern interior of British Columbia. They favour a habitat in dry rocky areas, in grasslands, at the base of rockslides, in sagebrush country, or where there are boulders and scattered shrubs for cover. They are rarely found above the 2,600 metre elevation. During hot summer months rattlesnakes are most active at dusk and early evening, but they can be seen any time of day or night. In winter, they congregate in dens part way up a rocky slopes to hibernate. Rattlesnakes are not particularly aggressive and unless startled or irritated, usually will not strike. Newborn rattlesnakes can deliver a lethal bite and are not able to make a rattling sound until after the first molt. One new rattle is created with each molt so older snakes have many rattles. However, some large snakes do not bother to rattle before striking.

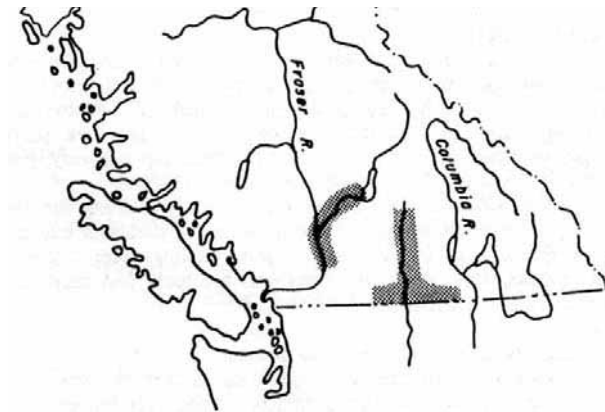
Avoid rattlesnake bites by taking precautions:

- Be familiar with the various species of snakes that live in the field area where you work so you can recognize them.
- Learn where to expect to find snakes in your work area.
- Wear “high-cut” rather than “low-cut” leather work boots. Strikes are commonly to the lower part of the legs. Wear long pants that are not tucked in. Often, fangs are caught by loose clothing and never pierce the skin of the victim.
- Be alert to the potential presence of snakes behind rocks or other shady places.
- Keep your camp free of debris and clutter so snakes have no place to shelter from the sun.
- Keep your food carefully stored to avoid mice infestations. Snakes feed on mice and will follow them into camps.
- Keep a container (garbage can with lid) and a long blunt hooked stick available to use to confine a snake and then relocate it.
- If working where rattlesnakes are common and only in an environment where it would take more than two hours’ travel to a medical facility, you may want to carry a commercial snakebite “Extractor” kit. These kits are not very effective and only extract a maximum of 30% of the venom. They do, however, have an important calming effect on the patient. Keep a list with the telephone numbers of hospitals in the area that have anti-venom in stock and can treat snakebite. You must take a snakebite victim to a place where treatment is available and it may not be widely stocked.

Treatment of Snakebite

Bites from BC snakes can produce severe discomfort and inconvenience but are almost never fatal. (The first fatality in 50 years was reported in 1981.) However, rattlesnake venom is necrotic and can cause severe tissue damage that may result in paralysis or amputation. As venom is transported in the lymphatic system, every attempt should be made to cut down the rate of lymphatic flow. There is **no reason to kill the snake** for identification, as there are no other venomous snakes in BC.

- Wash the wound immediately with soap and water (to decrease tissue damage) and cover with a sterile dressing.
- Remove any constricting jewelry.
- Keep the victim quiet and reassure the victim.
- Immobilize the injured area by wrapping a pressure bandage around the limb gently as if wrapping for a sprain. This will restrict the flow of venom through the lymphatic system.
- Keep the limb or injured area below the level of the heart if possible.
- The patient must be transported to medical attention as soon as possible in a horizontal position. If it is necessary to walk, do so slowly and rest frequently. Rapid transport to a medical facility is the best first aid for snakebites.
- DO NOT apply ice to the bite area.
- DO NOT apply a tourniquet or restrictive bandage.
- DO NOT cut (excise) the wound and only use an extractor kit for suction when in an area where access to a medical facility is more than two hours away.



Range of northern Pacific rattlesnake in British Columbia.

Bugs

Ticks

Of the 20-odd species of ticks in British Columbia, only three normally bite humans. They cannot run, jump or fly, but are dependent on blood for their existence. They are commonly found in most parts of BC south of Prince George. Most tick bites are harmless but some ticks cause paralysis and some carry diseases.

Lyme disease is a serious disorder spread by the bite of an infected deer tick or nymph (*Ixodes pacificus*). Lyme disease alone is reason enough to prevent tick bites. Other diseases that ticks carry are less widespread.

Early detection and treatment of Lyme disease is crucial. See your doctor as soon as possible if you experience any of the following symptoms within days or weeks following a tick bite.

- Fever and headache, muscle and joint pain, fatigue or weakness of muscles of the face
- Skin rash, especially a rash resembling a bulls-eye. The location may or may not appear at the site of the bite.
- Paralysis starting at the lower extremities and working upwards. It may develop within hours or over days.

The Rocky Mountain or **paralysis wood tick** ranges into eastern BC and the BC interior dry belt. It is most abundant between March and June. During this period it is present on almost all scrub vegetation and grass. It does not drop out of large trees. Symptoms occur after the tick has been feeding for about five days and generally begin with:

- Numbness in the feet and legs, which progresses to the hands and arms.
- Often there is paralysis of the throat muscles or difficulty in swallowing.
- The tongue may be affected causing inability to speak properly.
- There is no pain and seldom fever.

Tick paralysis is a condition that establishes itself only when the (infected/female) wood tick is allowed to remain attached or goes unnoticed. Complete recovery follows removal of the *entire* tick if paralysis has not spread too far.

The Pacific Coast tick is common on vegetation along the Pacific Coast during the wet season. It does not cause paralysis but its bite may be painful and develop into a slow healing ulcer. The third group of ticks—soft ticks—have bites that are toxic and may cause a severe shock-like reaction.

Precautions to Undertake in “Tick Season”

- When possible, avoid open grass areas surrounded by trees.
- Do not leave clothing on the ground or draped over bushes.
- Resist the urge to stretch out on or near vegetation; take rest or lunch breaks on bare rocks or surfaces that are free of plants.
- Wear high boots, long pants (tucked in boots), long sleeved shirts (shirts tucked in) when required to work or cross through such areas.
- Apply insect repellent containing 5% permethrin to your clothing and insect repellent containing up to 35% DEET to your exposed skin. Reapply as required.
- Make frequent “tick checks” of all members of the party (especially those at the front of a hiking party).
- Before going to bed, remove all clothing, and check each piece of clothing for ticks. Then carefully and thoroughly check your body. Ticks prefer the groin and the head, especially the base of the neck and behind the ears. (They have been found inside the ear canal and the nostrils.) Check hair, scalp, and arm pits. A little mutual grooming “monkey style” will go a long way in detecting the presence of ticks.
- If you find one tick, there are usually others. Recheck thoroughly.

Removal of Ticks

- Gently grasp the tick as close to the mouth part as possible with sharp pointed tweezers or forceps. Pull gently and slowly over a

period of one to two minutes while lifting the tick up off the skin. Try to remove the entire tick, including mouth parts and a tiny cone of white cement (often assumed to be a piece of the victim's skin).

- DO NOT "TWIST" or jerk the tick, as mouth parts may break off in the wound. This will increase the possibility of infection, should the tick carry diseases.
- DO NOT APPLY a lit cigarette, drops of gasoline, acetone, grease, etc., to the tick. These actions may cause the tick to spew out infecting microbes into your bloodstream.

After Removal

- Wash the area thoroughly with soap and water and apply a mild antiseptic.
- Consult a doctor if any symptoms develop.
- If working in an area known to have Lyme disease, you can send an extracted living tick for analysis by placing it and a damp cotton ball (to keep it alive) in a container with a tight fitting lid. Send it to:

BC Centre for Disease Control
Vector-Borne Diseases Laboratory
655 West 12th Ave
Vancouver BC V5Z 4R4

Mosquitoes

Mosquitoes and blackflies are a notorious nuisance in northern latitudes, especially when conditions are cool and wet. To avoid mosquito bites:

- Use repellent containing from 15% to 35% DEET (N, N-diethyl meta-toluamide) on your skin. Higher concentrations may cause reactions as it is absorbed through your skin.
- Treat your field clothing with permethrin products to repel insects, flies, ticks, leeches, etc. Wear treated bug-jackets and head-nets to reduce insect bites where the numbers of insects indicate needed protection.

- Avoid using cosmetics or soaps with fragrances.

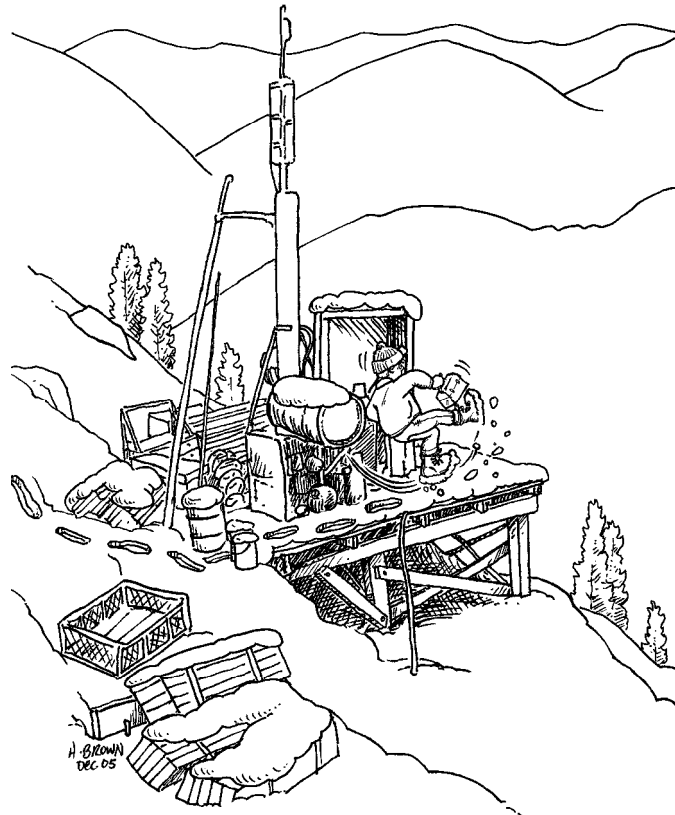
West Nile Virus

As of late 2005, there has been no reported incidence of West Nile fever in BC and Yukon. Since 1999 when the disease was first found in North America, it has spread across the USA and through most of southern Canada. It is expected that West Nile virus will soon be detected in BC.

- West Nile virus is transmitted to humans through the bite of an infected mosquito and, very rarely, through blood transfusion and/or organ transplant. One cannot recognize mosquitoes that carry West Nile virus so it is prudent to prevent mosquito bites by using appropriate insect repellent containing DEET.
- About one in five people bitten by an infected mosquito will develop symptoms of the disease. One percent of infected individuals will develop severe symptoms that may include encephalitis, meningitis, and/or paralysis.
- People with weakened immune systems are more vulnerable to West Nile virus.

Symptoms of West Nile Fever

- Fever
- Muscle weakness
- Stiff neck
- Confusion
- Severe headache
- Sudden sensitivity to light



**Ensure good footing.
Slippery floors can lead to serious falls.**



Chapter 11

Underground Workings, Drilling Rigs, and Trenching

Underground Workings

Great caution must be exercised before and during entry when investigating inactive or abandoned underground workings. Under Section 1.12.2 of the Health, Safety and Reclamation Code for Mines in British Columbia (the Code, see Appendix 8), all underground workers must be under the supervision of the holder of a valid underground shift boss certificate.

Prior to Entry

Before beginning exploration of any type of underground workings, a **Notice to Start Work** (Section 10(1) of the British Columbia *Mines Act* and section 6.2.1 of the Code) shall be sent to the District Inspector of Mines and no work shall commence until approval has been given (see Appendix 8).

In addition, the District Inspector may be able to provide information on the present conditions of the workings and if they have been inspected recently. Further, he may be able to show copies of old mine plans.

Hazards in Underground Workings

Dangerous atmospheres may be encountered in old underground mine workings, e.g. oxygen deficient, flammable or explosive and toxic gases. In some old workings, exposure to dried bat droppings may cause a lung infection called histoplasmosis. **Poor ground conditions** and **high water** are additional hazards.

Crew members must be trained in **survival mine rescue** (see Section 3.8.2 of the Code) and proper ground sounding and scaling techniques. For information on available training programs and independent training agencies, contact the nearest office of the Ministry of Energy, Mines and Petroleum Resources Mining and Minerals Division (see Appendix 6).

Remember that old adits, particularly in the warmer parts of the Cordillera, can be a haven for certain wild animals and snakes.

Equipment

Crews must carry minimum safety equipment as follows and be oriented to its uses and emergency response procedures.

NO ONE WORKS ALONE, and no one shares required personal safety equipment.

Per Crew

- Oxygen detector
- Toxic gas detector
- Flammable gas detector
- Safety line (20 metres)
- Two scaling bars
- Bear deterrent

Per Crew Member

- Safety belt complete with safety lanyard (2 metres) and self-rescuer
- Hard hat, boots and gloves
- Battery-powered underground cap lamps
- All equipment used in underground coal adits must be intrinsically safe.

Standby

One crew member is to be stationed at the portal and given a firm indication of the time to be spent underground by the investigating crew and a map that indicates where they will be exploring. This person must be familiar with the SAR plan and be able to implement it should the need arise.

Entry

- Initial investigation should be staged – examine state of ventilation, condition of tunnel back and sides, and presence of

water, and advance when safe to do so – check back to portal at frequent intervals.

- No sampling or breaking of rocks is to be done on initial exploratory inspection through the workings.
- If old timbers have collapsed or rock has fallen from backs or raises, retreat immediately.
- Even solid-looking timbers may be completely rotten and have no strength – check with scaling bar.
- If there is **any** indication of a dangerous atmosphere (e.g. oxygen deficient, toxic, flammable or explosive) retreat immediately and abandon all plans for further immediate investigation.
- Underground ventilation can change from day to day and oxygen content can drop to zero in a horizontal distance of 10 metres.
- When underground, do **not** separate.
- Sampling of mineralized structures and wallrocks may be undertaken only after determining that the workings are safe – use common sense.

Continued Investigation

Any extraction of rock requires a certified shift boss to be on site. If significant underground sampling is deemed to be necessary, the services of a certified shift boss should be considered. Such retired qualified miners may live in communities near old mining areas – check with the local Inspector of Mines.

Diamond and Percussion Drills

The Canadian Diamond Drilling Association governs the rules of good diamond drilling practices at a drill site. Drill sites are also regulated by Section 9.3.1 of the Code (see Appendix 8). All drilling companies must have safety and WHMIS (Workplace Hazardous Materials Information System) binders at the work site. Ask the drilling company to supply a copy of the safety binder to the site project manager. Always ensure that the driller and the drillers' helper are aware of your presence at the drill site. Regular safety meetings involving drill crews, pilots, and geological staff must be scheduled.

The principal hazards to exploration personnel when working at a drill are as follows:

- Loose clothing caught in the drill can cause serious or fatal injuries.
- Lack of fitness, particularly with drill helpers, can lead to serious injuries.
- Slippery floors in the drill shack can cause serious falls. Ensure good footing. Report slippery floors to the driller.
- Noise can cause hearing loss, although few exploration personnel are exposed to the prolonged noise levels experienced by drillers. Wear hearing protection when at the drill site as well as hard hat and safety glasses.
- Sampling in dusty environments, particularly around percussion rigs, can cause breathing problems. Wear PPE – Protective Personal Equipment.
- Licking core without knowing what drill additives are used can cause potential problems, as several additives are poisonous. Water is available at the drill site to wet the core for examination.
- Objects may fall from the drill mast or upper deck. Hard hats must be worn in the close vicinity of the drill shack.

The following procedures should also be followed:

- The driller is responsible for your safety at the drill shack – follow directions.
- Have the driller temporarily shut down when time is required to discuss work progress.
- Avoid exposure to hazards – loiter elsewhere.
- A diesel permit is required (see section 4.7.1 of the Code) if such equipment is operated underground and a **Notice to Start Work** (see *Mines Act* Section 10(1) and Section 6.2.1 of the Code) must be filed with the District Inspector of Mines.

Trenching

Provincial and territorial safety regulations require that adequate sloping, shoring and bracing be provided in excavations and the pertinent regulations should be consulted and followed to avoid serious

accidents and fatalities. Most commonly these are caused by collapsing ground, which has resulted in partial to total burial and death by suffocation, fractures, sprains, and contusions.

Obvious safety precautions should be followed including the wearing of hard-toe boots, goggles, gloves, hard hats, etc. during sampling or mapping. In British Columbia, a **Notice to Start Work** must be filed prior to undertaking any trenching and specifications must be stated including the estimated depth of trenches. This provides the District Inspector with the opportunity to consider and advise of any specific requirements which must be met before the work proceeds.

Regulations to be followed during trenching and excavating in British Columbia are contained in sections 4.17 and 9.3.3 of the Code (see Appendix 8).

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Appendix 1

Fatalities in Mineral Exploration in Western Canada (1982-2004)

Cause / Relationship	Number of Accidents	Fatalities
Helicopter crashes*	4	9
Canoe-related drownings	2	5
Fall from pick-up truck	1	1
Fall from cliff	1	1
Fall into crevasse on glacier	1	1
Crushed by overturned ATV	1	1
Allergic reaction – wasp sting	1	1
Drill helpers attacked by bears	2	2
Miner crushed by rock while scaling **	1	1
Total	14	22

Compiled by the Health & Safety Committee, AME BC

**Excludes 3 pilots*

*** In 2002, the Health & Safety Committee started monitoring accidents associated with exploration drilling and underground exploration.*

Lost Workday Accidents in Mineral Exploration in Western Canada (1982-2004)

Cause/Relationship	Number of Accidents	Percent of Total Accidents	Lost Workdays	Percent of Total Lost Workdays
Canoes	2	0.6	30,000 ⁽¹⁾	38.6
Slips, Falls	170	46.3	14,872 ⁽¹⁾	19.1
Vehicles	41	11.1	13,261 ⁽¹⁾	17.0
Aircraft	6	1.7	12,150 ⁽¹⁾	15.6
Allergic Reactions	2	0.6	6,031 ⁽¹⁾	7.8
Improper Lifting	43	11.9	352	0.5
Cuts	33	9.2	301	0.4
Falling Objects	11	3.1	245	0.3
Eyes	19	5.3	124	0.2
Animal Attacks	1	0.3	94	0.1
Infections	8	2.2	73	0.1
Burns	7	1.9	59	0.1
Tree-Falls	2	0.6	46	0.1
Tendonitis	12	3.3	78	0.1
Frozen Feet	2	0.6	18	0.0
Drill Compressor Explosions	2	0.6	15	0.0
Fingers	4	0.3	45	0.0
Other	2	0.6	48	0.1
Total	367	100.0	77812	100.0

Compiled by the Health & Safety Committee, AME BC

⁽¹⁾ Reflects time charge of 6,000 person days per fatality (American National Standard)

Appendix 2

Fatalities in Mineral Exploration in Western Canada (1946-2004)

	Total Fatalities
Avalanches	31
Snow (27)	
Mud (4)	
Aircraft Accidents	30
Helicopters (24)	
Fixed-Wing Aircraft (6)	
Drownings	22
Aircraft Crashes (8)	
Canoe capsized in lake – life jackets worn – death from hypothermia (4)	
Attempting to cross creeks (4)	
Canoe capsized in river – no life jackets worn (3)	
Canoe capsized in lake – no life jackets worn (2)	
Fall through ice (1)	
Asphyxiations	9
Tunnel, trench (7)	
Pump House (1)	
Shaft (1)	
Falls	8
Cliffs (4)	
Crevasses on glaciers – inadequate rescue equipment (4)	
Vehicles	5
Lightning strikes	3
Bear attacks	4
Lost – died of exposure	2
Tree falls in gales	2
Wasp sting	1
Rock fall	unknown
Firearms	unknown
Fires	unknown
Total	117

Based on documented cases and data from personal contacts by Dave Barr, 1946-2004, mostly in western Canada. Excludes non-mineral industry-related personnel, e.g. at least six pilots and one horse-packer killed by grizzly bear in Yukon.

Appendix 3

Accidents in North America Mountaineering

	USA 1951-2004	CANADA 1959-2004
SUMMARY STATISTICS		
Number of accidents reported	6,000	939
Total number of individuals involved	10,992	1,962
Number injured	5,073	701
Number killed	1,339	285
	Number of Persons Involved	
TERRAIN		
Rock	4,237	503
Snow/Ice	2,584	504
Other, unknown	22	9
ASCENT OR DESCENT		
Ascent	2,853	578
Descent	2,199	362
Other, unknown	255	12
MOUNTAINEERING EXPERIENCE		
None or little	1,724	299
Moderate (1 to 3 years)	1,544	354
Experienced	1,797	433
Unknown	1,958	535
IMMEDIATE CAUSE OF ACCIDENT		
Fall/slip on rock	2,958	283
Slip on ice or snow	950	205
Falling rock, ice, or object	601	135
Exceeding abilities	525	30
Avalanche	278	125
Exposure	264	13
Illness (incl. pulmonary edema, frostbite)	362	26
Stranded	323	52
Failure of rappel/error	363	45
Loss of control/glissade	192	16
Fall into crevasse/moat	153	50

Nut/chock pulled out	191	9
Failure to follow route	171	29
Other, unknown	807	82
CONTRIBUTORY FACTORS		
Climbing unroped	979	163
Exceeding abilities (inexperience)	881	200
Inadequate equipment/clothing	651	68
No/inadequate protection	673	96
Weather	452	64
Climbing alone	383	69
No hard hat	316	29
Darkness	134	20
Party separated	110	10
Other	755	200

Adapted from Accidents in North American Mountaineering, 2005 edition, published by the American Alpine Club.

Discussion

Although the above table refers to mountaineering and rock climbing accidents, it is worthy of careful study by all who work in the mountains. A few points require emphasis:

- Mountain accidents are dangerous. If you are involved in an accident, Canadian statistics consistently suggest you have about a 15% chance of being killed.
- Although slips on rocks and snow account for most accidents, falling rock and avalanches are also important causes, particularly in Canada.
- Note that exceeding abilities (i.e. inexperience) is the second most important contributory cause of accidents and is fourth on the list of direct causes. **The point throughout these safety guidelines that experienced help is essential on difficult or suspect terrain cannot be overemphasized.**
- Climbing unroped is obviously an important factor in accidents. **Proper use of the rope is necessary on steep snow, rock, and all glaciers.**

Appendix 4 Safety Check List

Designated safety coordinator: _____

- ☐ Safety procedures/requirements discussed with field personnel
- ☐ Copies of Safety Guidelines issued to field personnel
- ☐ Copy of latest Health & Safety Committee Annual Report read by field personnel
- ☐ Each proposed project checked to ensure compliance with minimum industrial First Aid requirements
 - ☐ First Aid Attendant
 - ☐ Equipment, including oxygen
- ☐ Number of personnel with First Aid training and in possession of firearms certification
- ☐ Evidence of recent medical/dental check provided by field personnel
- ☐ Regular Safety Review arranged in exploration camps
- ☐ Personal equipment owned by field personnel checked by project manager or designee to ensure it is adequate for jobsite
 - ☐ Boots, including adequate soles
 - ☐ Raingear
 - ☐ Headgear
 - ☐ Sleeping bags
 - ☐ Field knives
 - ☐ Gloves
- ☐ Equipment issued by Company to field personnel, as required
 - ☐ Goggles
 - ☐ Hard hats
 - ☐ Any other required PPE
 - ☐ Ear protection
 - ☐ Chainsaw pants
- ☐ Emergency/standard equipment issued to personnel for day pack
 - ☐ First aid kit
 - ☐ Satellite phone
 - ☐ Ground Positioning System (GPS)
 - ☐ Signal flares
 - ☐ Bear scares/repellent
 - ☐ Fire starter
 - ☐ Waterproof matches/butane lighter
 - ☐ Emergency rations
 - ☐ Survival manual, survival kit⁽¹⁾
 - ☐ Insect repellent
 - ☐ Sun screen
 - ☐ Space blanket
 - ☐ Map
 - ☐ Compass
 - ☐ EpiPen
 - ☐ Sunglasses
- ☐ Job site equipped with rifle/shotgun, ammunition, and person(s) fully certified and trained in use of firearms

⁽¹⁾ See Safety Guidelines for Mineral Exploration in Western Canada, Appendix 5.

Appendix 5

Recommended Survival Kits

Arctic – 1 Person (5 days)

- ☐ Arctic winter clothing and boots
- ☐ 1 Pop up survival tent
- ☐ 1 Satellite phone
- ☐ 1 List of emergency numbers
- ☐ 1 Ground Positioning System (GPS)
- ☐ 1 First aid kit
- ☐ 1 Pair of sunglasses
- ☐ 1 Sportsman space blanket
- ☐ 1 5-Star Sleeping bag
- ☐ 1 Sterno Stove
- ☐ 1 Cutlery set
- ☐ 10 metres Snare wire
- ☐ 1 Gill net
- ☐ 1 Head net
- ☐ 1 Fishing kit
- ☐ 1 Whistle
- ☐ 1 Mini flare gun (9 flares)
- ☐ 1 Parachute flare
- ☐ 1 Heliograph mirror
- ☐ 1 Hatchet, 1-Hunting Knife
- ☐ 10-metre Cord
- ☐ 1 square metre Polyethylene
- ☐ 1 Insect repellent
- ☐ 1 roll Toilet paper
- ☐ 4 boxes Windproof matches
- ☐ 1 Candle holder
- ☐ 6 15-hour Candles
- ☐ 1 roll Aluminum foil
- ☐ 1 Survival book
- ☐ 1 Pencil and paper
- ☐ 1 2000-calorie Food Pak
- ☐ 4 Freeze-dried foods
- ☐ 10 pkgs. Coffee
- ☐ 10 pkgs. Tea
- ☐ 20 pkgs. Coffee-mate
- ☐ 20 pkgs. Sugar
- ☐ 5 pkgs. Hot Chocolate
- ☐ 10 pkgs. Salt

Bush (Winter & Summer) – 1 Person (5 days)

- ☐ 1 Satellite phone
- ☐ 1 Ground Positioning System (GPS)
- ☐ 1 Sportsman space blanket (summer)
- ☐ 1 5-Star Sleeping Bag (winter)
- ☐ 1 Sterno Stove
- ☐ 1 Cutlery set
- ☐ 10 metres Snare wire
- ☐ 1 Fishing net
- ☐ 1 Head net (summer)
- ☐ 1 Whistle
- ☐ 1 Hunting knife
- ☐ 1 Mini flare gun (9 flares)
- ☐ 1 Heliograph mirror
- ☐ 1 Axe
- ☐ 10-metre Cord
- ☐ 4 boxes Windproof Matches
- ☐ 1 Insect repellent
- ☐ 1 roll Aluminum foil
- ☐ 1 roll Toilet paper
- ☐ 1 Survival Book
- ☐ 1 2000-calorie Food Pak
- ☐ 2 Freeze-dried foods
- ☐ 10 pkgs. Coffee
- ☐ 10 pkgs. Tea
- ☐ 20 pkgs. Coffee Mate
- ☐ 20 pkgs. Sugar
- ☐ 5 pkgs. Hot Chocolate
- ☐ 10 pkgs. Salt
- ☐ 1 EpiPen

Prepared by: AME BC Health & Safety Committee
800-889 West Pender Street, Vancouver BC V6C 3B2 www.amebc.ca/healthsafety.htm

Appendix 5 – Recommended Survival Kits Cont’d.

Vehicle Travel Survival Kit

Clothing

- ☐ long underwear cut wristlet and anklet
- ☐ 2 pair clean wool socks
- ☐ wool pants
- ☐ layer type wool shirts and sweaters
- ☐ boots, not to be worn in warm car
- ☐ wool toque
- ☐ 2 pair clean mitts
- ☐ in winter, a warm sleeping bag for each occupant in case of a long wait for help in sub-zero weather

Equipment

- ☐ communication (cell, radio, and/or satellite phone),
- ☐ spare tire
- ☐ spare fuses
- ☐ screwdrivers
- ☐ pliers
- ☐ gas line
- ☐ de-icing fluid
- ☐ tire chains
- ☐ tow rope
- ☐ extension cord
- ☐ jumper cables
- ☐ extra gas
- ☐ engine oil
- ☐ anti-freeze
- ☐ shovel
- ☐ axe
- ☐ sharpening stone
- ☐ roll of brass wire
- ☐ wheel wrench
- ☐ shelter material - parachute and/or polyethylene sheet
- ☐ tent and/or canvas sheet
- ☐ stove, heat source
- ☐ candles
- ☐ fire extinguisher, mounted on side
- ☐ first aid kit
- ☐ flashlight, warning light or road flares
- ☐ barbecue starter fluid and dry kindling
- ☐ ready to eat foods and at least one thermos of hot soup or beverage
- ☐ Road salt or sand for winter conditions

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Appendix 6

BC Ministry of Energy, Mines and Petroleum Resources Mining and Minerals Division Offices

Southwest Region (Victoria)

7th Floor, 1675 Douglas St.
PO Box 9320 Stn Prov Govt
Victoria, BC
V8W 9N3
Phone: 250-952-0492

South Central Region

162 Oriole Road
Kamloops, BC
V2C 4N7
Phone: 250-371-6069

Southeast Region (Cranbrook)

2nd Floor, 42 8th Avenue South
Cranbrook, BC
V1C 2K3
Phone: 250-426-1557

Geological Survey and Development Branch

5th Floor, 1810 Blanshard St.
PO Box 9333 Stn Prov Govt
Victoria, BC
V8W 9N3
Phone: 250-952-0429

Central/Northeast Region

350-1011 4th Avenue
Prince George, BC
V2L 3H9
Phone: 250-565-4240

Northwest Office (Smithers)

3726 Alfred Avenue
Smithers, BC
V0J 2N0
Phone: 250-847-7383

Southeast Region (Fernie)

Bag 1000
401 4th Avenue
Fernie, BC
V0B 1M0
Phone: 250-423-1709

Mineral Development Office

300 – 865 Hornby Street
Vancouver, BC
V6Z 2G3

Appendix 7

Procedures in the Event of a Serious Accident or Fatality

- ☐ Render all possible first aid.
- ☐ Arrange for local transfer of injured personnel, as required, to the nearest hospital.
Hospital Tel. No. _____
Air Charter Tel. No. _____
- ☐ If necessary, phone Medevac (in British Columbia, phone BCAS at **1-800-561-8011**) to coordinate air and land transfers of sick or injured personnel requiring transfer from one area to another (see p. 46).
- ☐ Phone RCMP in the event of any fatality.
Tel. No. _____
- ☐ Report accident to the Employer.
Day Tel. No. _____
Night Tel. No. _____
- ☐ Phone District Inspector of Mines.
Office Tel. No. _____
Home Tel. No. _____
- ☐ Report accidents to the nearest Workers' Compensation Board office (in British Columbia, reports must be submitted within 3 days of a claimed injury; fax reports to 604-233-9722 or 1-888-922-8803 or mail reports to PO Box 8940 Stn Terminal Vancouver, BC V6B 1H9). Check the appropriate Workers' Compensation Board's regulations concerning investigation and investigation requirements.
WCB Tel. No.
Lower Mainland, Vancouver Island, Terrace 1-888-967-5377
BC Interior and North 1-888-922-6622
Other: _____

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Appendix 8

Regulations Governing Mineral Exploration in BC

DISCLAIMER:

Although the Health & Safety Committee of AME BC has made every attempt to ensure that excerpts of laws and regulations quoted in these guidelines are current and accurate representations, the laws and regulations printed in the guidelines are not presented as official representations, and have not received official endorsement. For official interpretations of laws and regulations, please contact the relevant agency.

Workers' Compensation Act of British Columbia Occupational Health and Safety Regulation

<http://regulation.healthandsafetycentre.org/s/home.asp>

Part 4 General Conditions**Working Alone or In Isolation****4.21 Procedures**

- (1) The employer must develop and implement a written procedure for checking the well-being of a worker assigned to work alone or in isolation under conditions which present a risk of disabling injury, if the worker might not be able to secure assistance in the event of injury or other misfortune.
- (2) The procedure for checking a worker's well-being must include the time interval between checks and the procedure to follow in case the worker cannot be contacted, including provisions for emergency rescue.

(3) A person must be designated to establish contact with the worker at predetermined intervals and the results must be recorded by the person.

(4) In addition to checks at regular intervals, a check at the end of the work shift must be done.

(5) The procedure for checking a worker's well-being, including time intervals between the checks, must be developed in consultation with the joint committee or the worker health and safety representative, as applicable.

(6) Time intervals for checking a worker's well-being must be developed in consultation with the worker assigned to work alone or in isolation.

Note: High risk activities require shorter time intervals between checks. The preferred method for checking is visual or two-way voice contact, but where such a system is not practicable, a one-way system which allows the worker to call or signal for help and which will send a call for help if the worker does not reset the device after a predetermined interval is acceptable.

4.22 Training

A worker required to work in the circumstances described in section 4.21(1) and any person assigned to check on the worker must be trained in the written procedure for checking the worker's well-being.

4.23 Annual review

The procedure and system for checking a worker's well-being must be reviewed at least annually, or more frequently if there is a change in work arrangements which could adversely affect a worker's well-being or a report that the system is not working effectively.

Ergonomics (MSI) Requirements

4.47. Risk identification

The employer must identify factors in the workplace that may expose workers to a risk of musculoskeletal injury (MSI).

Part 7 Noise, Vibration, Radiation and Temperature

Division 1 – Noise Exposure

7.2 Noise Exposure Limits. An employer must ensure that a worker is not exposed to noise levels above either of the following exposure limits:

- (a) 85 dBA Lex daily noise exposure level;
- (b) 140 dBA peak sound level.”

[Enacted by B.C. Reg. 382/2004, effective January 1, 2005.]

Part 8 Personal Protective Clothing and Equipment

General Requirements

8.2 Responsibility to Provide

(2) An employer is responsible for providing, at no cost to the worker, all other items of personal protective equipment required by this Regulation.

Footwear

8.23 Slippery surfaces

- (1) If a workplace has slippery surfaces, appropriate non-slip footwear must be worn.
- (2) Caulked or other equally effective footwear must be worn by workers who are required to walk on logs, poles, pilings or other round timbers.

Part 16 Mobile Equipment

General Requirements

Note: Mobile equipment required to meet the requirements of the *Motor Vehicle Act* or the *Industrial Transportation Act* is subject to this Regulation for matters not specifically governed by those Acts and the regulations made under them.

16.2 Application

This Part applies to mobile equipment used by or around workers.

Note: Mobile equipment required to meet the requirements of the *Motor Vehicle Act* or the *Industrial Transportation Act* is subject to this Regulation for matters not specifically governed by those Acts and the regulations made under them.

16.3 Operation and maintenance

(3) Maintenance records for any service, repair or modification which affects the safe performance of the equipment must be maintained and be reasonably available to the operator and maintenance personnel during work hours.

(5) Servicing, maintenance and repair of mobile equipment must not be done when the equipment is operating, unless continued operation is essential to the process and a safe means is provided.

(6) Mobile equipment used off maintained roads must be appropriate and safe for the intended use considering factors such as the nature of the travel surface, the slope of the travel surface, and the activities to be undertaken.

16.4 Competency of operators

(1) A person must not operate mobile equipment unless the person

(a) has received adequate instruction in the safe use of the equipment,

(b) has demonstrated to a qualified supervisor or instructor competency in operating the equipment

16.5 Operator's responsibility

The operator of mobile equipment must operate the equipment safely, maintain full control of the equipment, and comply with the laws governing the operation of the equipment.

16.6 Supervisor's responsibility

A supervisor must not knowingly operate or permit a worker to operate mobile equipment which is, or could create, an undue hazard to the health or safety of any person, or is in violation of this Regulation.

16.7 Standards

(b) Four Wheel All-Terrain Vehicles: *ANSI Standard SVIA-1-1990, American National Standard for Four Wheel All-Terrain Vehicles -- Equipment, Configuration, and Performance Requirements*

16.9 Lights

(1) Mobile equipment used during the period from 1/2 hour after sunset

to 1/2 hour before sunrise, or when persons or vehicles are not clearly discernible at a distance of 150 m (500 ft), must have and use lights to adequately illuminate

16.10 Rear view mirrors

(1) Mobile equipment must have a mirror or mirrors providing the operator with an undistorted reflected view to the rear of the mobile equipment or combination of mobile equipment, except as provided in subsections (1.1), (1.2) and (2).

Seat Belts

16.32 Provision

(2) Seat belts must be maintained in good condition.

16.33 Use

(1) If mobile equipment has seat belts required by any law in British Columbia, the operator and passengers must use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.

Operating Requirements

16.34 Start of shift inspection

- (1) The operator must inspect the equipment before the start of operation on the shift and thereafter as required to ensure the safe operating condition of the equipment.
- (2) The operator must report defects and conditions affecting the safe operation of the equipment to the supervisor or employer.
- (3) Any repair or adjustment necessary for the safe operation of the equipment must be made before the equipment is used.

16.44 Securing loads

- (1) When material or equipment is being transported it must be loaded or secured to prevent movement of the load which could create a hazard to workers.
- (2) To protect the crew of a vehicle transporting a load which might shift on rapid deceleration of the vehicle, a means of load restraint must be provided which

- (a) will prevent significant load shift relative to the carrier under emergency stopping conditions, and
- (b) meets a standard acceptable to the Board.

Tire Servicing

16.47 Training

- (1) The employer must establish and implement safe work procedures for servicing mobile equipment tires, rims and wheels, including safe procedures for
 - (a) inspecting tire, rim and wheel components,
 - (b) mounting a tire to the rim and wheel, and inflating a tire,
 - (c) installing and removing tire assemblies from mobile equipment, and
 - (d) demounting tires from the rim and wheel assemblies.
- (2) Workers assigned to work on tires, rims and wheels must be trained in and follow the safe work procedures established under subsection (1).

Note: The following requirements for all-terrain vehicles are in addition to the other requirements for mobile equipment in this Part which also apply to ATVs. Any vehicle used off maintained roads, including an ATV, is required by section 16.3(6) to be appropriate and safe for the intended use.

All-Terrain Vehicles

16.49 Prohibited use

An all-terrain cycle must not be used in any occupational, industrial, or commercial workplace.

16.50 Modifications

A modification to an ATV which may affect its structural integrity or stability must be certified by a professional engineer.

16.51 Operator's manual

- (1) The operator's manual for an ATV must be kept in a secure place with the vehicle or at another location readily accessible to the operator.

(2) The operator must use an ATV in accordance with the instructions in the operator's manual.

16.52 Use on sloping ground

(2) If the manufacturer has not set limits for operation of the ATV on sloping ground, 5% is the maximum allowable slope unless the employer has developed and implemented written safe work procedures appropriate for any steeper slope on which the equipment is to be used.

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

16.53 Operator training

(1) The employer must ensure that each ATV operator is properly trained in the safe operation of the vehicle.

(2) The training program for an ATV operator must cover

- (a) the operator's pretrip inspection,
- (b) use of personal protective apparel,
- (c) operating skills according to the ATV manufacturer's instructions,
- (d) basic mechanical requirements, and
- (e) loading and unloading the vehicle, if this is a job requirement.

16.54 Personal protective equipment

(1) An ATV operator and any passenger on an ATV must wear eye protection as required by Part 8 (Personal Protective Clothing and Equipment), and hearing protection meeting the requirements of Part 7 (Noise, Vibration, Radiation and Temperature).

(2) An ATV operator and any passenger on an ATV must wear

- (a) clothing suitable for the environmental conditions, and
- (b) when necessary to protect against the hazards presented at the worksite, suitable gloves and clothing which covers the ankles and legs and the arms to the wrists.

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

16.55 Loading and unloading

(1) Loading and unloading of an ATV onto or off a carrier vehicle must be done in a safe manner.

(2) If ramps are used when loading or unloading an ATV, they must be

placed at a suitable angle, be sufficiently wide and have a surface finish which provides an adequate grip for the ATV's tires.

Part 17 Transportation of Workers

Marine Craft

17.17 Safety standards

A vessel used to transport workers must meet generally accepted standards for safety and capacity based on the use of the vessel and the conditions in which the vessel could be expected to operate.

[Enacted by B.C. Reg. 381/2004, effective January 1, 2005.]

17.18 Operation

If the operator of a vessel transporting workers is not required to hold a certification under the *Canada Shipping Act*, the operator must

- (a) have successfully completed a course on navigation and ship safety acceptable to the Board, or
- (b) have other combination of training and experience acceptable to the Board.

[Enacted by B.C. Reg. 381/2004, effective January 1, 2005.]

17.22 Communication

- (1) A vessel used to transport workers must be equipped with a two-way communication system of a design effective in the area of operation.
- (2) The two-way communication system must be maintained in good operating condition, be able to establish contact with persons necessary to effect emergency response, and be immediately accessible in the event of an emergency.

[Enacted by B.C. Reg. 381/2004, effective January 1, 2005.]

17.23 Vessel preparation

Before transporting workers on a vessel, the operator of the vessel must ensure that the vessel is capable of safely making the passage, considering the

- (a) stowage and securing of all cargo, skiffs, equipment, fuel containers and supplies,

- (b) ballasting, and
- (c) existing and forecast weather conditions.

[Enacted by B.C. Reg. 381/2004, effective January 1, 2005.]

17.24 Maintenance and inspection

- (1) A vessel must be inspected before initial use to ensure that it is fit for safe operation, and after that at intervals that will prevent the development of unsafe conditions.
- (2) Defects must be reported immediately, in writing, to the supervisor, employer or owner and those defects which affect the safe operation of the vessel must be remedied before the vessel is put to further use.

[Enacted by B.C. Reg. 381/2004, effective January 1, 2005.]

Part 19 Electrical Safety

Working on Low Voltage Electrical Equipment

19.10 Disconnection and lockout

- (1) Low voltage electrical equipment must be completely disconnected and locked out as required by this regulation before starting work on it.
- (2) Except as specified in subsection (3), if it is not practicable to completely disconnect low voltage electrical equipment, work must be performed by qualified and authorized workers and in accordance with written safe work procedures which
 - (a) require the use of appropriate electrical protective equipment, including rubber gloves and cover up, and other necessary live line tools,
 - (b) provide that, if practicable, uncontrolled liquid is not permitted close to any worker working on the equipment, and
 - (c) if applicable, control the use of metal ladders, wooden ladders with wire reinforced side rails, metal scaffolds or metal work platforms.
- (3) Work must not be done on energized parts of electrical equipment associated with lighting circuits operating at more than 250 volts-to-ground without the prior written permission of the Board.

Part 21 Blasting Operations

Storage

21.16 Detonators

- (1) Detonator products must not be kept in a store or receptacle in

which explosives or safety fuses, fuse lighters, igniter cords or connectors are stored.

(2) At the loading site, detonator products must be stored separately from other explosives, and in a crush resistant box which is clearly identified.

21.17 Worksite storage

Explosives at the worksite must be guarded or contained in secured day boxes until used or returned to storage magazines.

21.18 Communication

(1) The employer must ensure that the location of a magazine in which explosives are stored, and any restrictions on access or activity around the magazine area, are clearly communicated to all workers.

(2) A day box and receptacle used for day storage of explosives on a work site must, when they contain explosives, display signs indicating the presence of explosives in a conspicuous manner, and the signs must be removed when they are empty.

(3) A vehicle containing explosives while in a workplace must display signs indicating the presence of explosives in a conspicuous manner, visible from all sides of the vehicle, and the signs must be removed when the vehicle no longer contains explosives.

21.19 Magazine condition

(1) The interior of an explosives magazine must be kept scrupulously clean and must be constructed, covered or lined to prevent the exposure of any ferrous metals or gritty materials.

(2) Precautions must be taken to exclude moisture from an explosives magazine.

(3) Any article or substance likely to cause a fire or explosion must be kept out of and at a safe distance from an explosives magazine.

21.20 Cord

(1) Detonating cord must be stored separately, or with explosives other than detonators.

(2) Igniter cord must be stored separately from fuses, detonators, or

explosives.

21.21 Separate handling

Blasting explosives and detonator products must be kept and handled separately until the last most practicable moment, before bringing them together.

Transportation

21.22 Vehicle operation

- (1) A vehicle being used to transport explosives must be in sound mechanical condition, suitable for, and capable of, safely transporting explosives.
- (2) Passengers, other than those assigned to assist in handling explosives, are not permitted on a vehicle transporting explosives.

21.24 Transportation of explosives

- (1) Explosives carried in a vehicle must be in a fully enclosed, locked, fire resistant fixed container or compartment, separate from the passenger compartment.
- (2) Electric detonators must be transported in their original containers, with their leg wires shunted, as shipped by the manufacturer.
- (3) Detonators must be adequately separated from other explosives during transport.

Note: Options for separation include a solid wood or other suitable barrier partition 15 cm (6 in) thick, extending at least 15 cm (6 in) above the highest level to which explosives are packed in the vehicle, or a minimum distance of 60 cm (2 ft) between containers, or as permitted in Schedule IV of the Explosive Regulations under the *Explosives Act* (Canada).

21.29 Safe operation

A person operating a vehicle that is transporting explosives

- (a) must operate the vehicle in a safe manner, consistent with prevailing road and weather conditions, and
- (b) must not drive faster than 90 km/h (55 mph).

[Amended by B.C. Reg. 312/2003, effective October 29, 2003.]

The transporting vehicle must not exceed 90 kilometres per hour (55 mph) on the highway.

21.30 Vehicle load limit

A vehicle transporting explosives must not be operated or permitted to operate if the load to be transported exceeds 80% of the manufacturer's rated carrying capacity for the vehicle.

21.31 Firefighting equipment

(1) A conveyance transporting explosives must be equipped with at least 2 fire extinguishers, of a type capable of quickly extinguishing gasoline, oil, or electrical fires.

(2) The fire extinguishers must be readily available for use and must have

(a) a minimum 5 BC rating for a vehicle with up to 2 000 kg (4 400 lbs) gross vehicle weight (GVW) rating, and

(b) a minimum 10 BC rating for a vehicle with more than 2 000 kg (4 400 lbs) GVW rating.

Handling Explosives

21.37 Defective explosives

Explosive materials or accessories which have deteriorated, or are believed to be defective, must not be used and must be handled and disposed of in a safe manner following the manufacturer's recommendations.

21.40 Ignition sources prohibited

(1) Smoking is prohibited within 15 m (50 ft) of where explosives are stored, being handled, or are in loaded holes.

(2) Open flame ignition sources must not be permitted within 15 m (50 ft) of where explosives are stored, being handled, or are in loaded holes, unless the blaster of record gives consent.

Part 29 Aircraft Operations

General Requirements

29.3 Pre-job planning and training

The employer must

- (a) provide written safe work procedures for workers who are exposed to hazards from aircraft operations,
- (b) ensure that workers are provided with adequate pre-job instruction and that the instruction is documented, and
- (c) ensure that workers can demonstrate the ability to safely perform their tasks as required.

29.9 Airlifted loads

- (1) The employer must ensure that airlifted loads are not flown over workers.
- (2) Workers must remain clear and in recognized safe areas when there is a hazard from airlifted loads.

29.11 Rotorwash

The employer must ensure that helicopter rotorwash will not expose workers to undue risk.

29.12 Unstable materials

The employer must ensure that work areas are planned and maintained to avoid placing workers in hazardous proximity to unstable materials.

Health, Safety and Reclamation Code for Mines in British Columbia

www.em.gov.bc.ca/Mining/Healsafe/mxready/mxcode01.htm

Part 1 Application of Code and General Rules

1.8.1 The manager shall

- (1) except for protective footwear and prescription eyeglasses, supply properly fitted personal protective equipment as required by the code,
- (2) ensure that workers are instructed in the use and maintenance of the equipment, the reasons for it, and also on its location and limitations, and
- (3) ensure that the equipment is adequate for its purpose.

1.8.2 All persons shall wear the personal protective equipment as required by the code.

1.11.1 The manager shall ensure that

- (1) workers are adequately trained to do their job or are working under the guidance of someone who has competency both in the job and in giving instruction, and
- (2) ensure that all employees receive thorough orientation and basic instruction in safe work practices.

Part 2 Occupational Health

Definitions:

“*dust exposure occupation*” means employment

- (2) where a person is normally required to work more than 20% of his working time in any one month
 - (a) underground in a mine,
 - (c) in crushing plants, assay grinding rooms, or coal cleaning plants

2.3.3 The manager shall ensure that all dangerous or potentially hazardous materials are stored in designated storage areas, acceptable to an inspector, which are well ventilated to prevent any accumulation of dangerous fumes and so arranged that incompatible materials, which

could produce a harmful reaction if combined, are adequately separated.

2.6.1 Any machinery or equipment which, when operating, exposes the operator or persons in the vicinity to noise levels in excess of those prescribed in Table 2-2, Part 2, for unprotected ears, shall, if practicable, be fitted with a properly maintained muffler or other noise reducing device.”

Table 2-2, Part 2 is reprinted below:

Examples of equivalent levels to 85 dBA for 8 hours:

Length of Exposure	Average Noise Level
16 hours	82 dBA
12 hours	83 dBA
10 hours	84 dBA
8 hours	85 dBA
4 hours	88 dBA
2 hours	91 dBA
1 hours	94 dBA
½ hours	97 dBA
¼ hours	100 dBA

2.9.1 Where the equipment, work procedure, or working condition in a work area has caused injurious inflammation of muscles, tendons, or bursae of the upper limbs of the persons doing the work, and it is demonstrated to be from repetitive or forceful use, the chief inspector shall, where practicable, require implementation of one or more of the following preventive measures

- (1) modification of work procedures or equipment to reduce physical demands on affected body areas, or
- (2) a rescheduling of work to permit safe adjustment to unaccustomed task requirements.

Part 3 Personnel Safety and Emergency Preparedness

3.1.1 No person shall enter, remain, or be knowingly permitted to enter or remain in any mine if, in the opinion of management, his ability is so impaired as to endanger his health or safety, or that of another person

3.1.2 No person shall possess intoxicating liquor, or illegal drugs in or about a mine.

3.2.3 When a worker is working alone and may not be able to secure assistance in the event of an injury or other misfortune, the manager shall ensure that a means exists for checking the well-being of the worker and that the interval between checks does not exceed 2.5 hours.

3.6.1 The manager shall provide and maintain first aid supplies and services as required by the Workers Compensation Board.

3.8.2 Survival Rescue Procedures

(1) The manager of an underground mine shall establish a training program in survival mine rescue, including the use of approved self-rescue apparatus, and the use of fire fighting equipment in place at his mine.

(2) All persons, employed at the mine or not, shall be instructed and trained in these procedures before entering the underground mine.

3.9.1 Fire Fighting

(1) The manager shall ensure that fire fighting equipment is provided and maintained at all locations at the mine where fire may endanger life.

(2) Unless specified otherwise in this code, The British Columbia Fire Code 1998 and subsequent supplements and revisions shall apply in determining the level of fire fighting equipment and maintenance as prescribe in subsection (1).

Part 4 Building, Machinery, and Equipment

4.7.1 Trackless diesel-powered equipment for use in

(1) Underground coal mines shall comply with CSA Standard CAN/CSA-M424.1-88, "Flame-Proof Non-Rail Bound Diesel-Powered Machine for Use in Gassy Underground Coal Mines" except where such equipment is not used for cutting, digging and loading of coal the manager shall provide procedures submitted to the chief inspector.

4.17.1 All excavation work shall be carried out in accordance with the written instructions of a professional engineer where

- (1) the excavation is more than 6 m deep,
- (2) timber shoring is used in excavations exceeding 3.7 m in width, or
- (3) improvements or structures adjacent to the excavation could endanger persons, or
- (4) the excavation is subjected to vibration or hydrostatic pressure.

Part 6 Mine Design and Procedures

6.2.1 (1) The manager shall give 10 days notice to an inspector of intention to start work in, at, or about a mine, including seasonal reactivation.

Part 8 Explosives

8.4.2 A vehicle used to transport explosives shall

- (1) have a separate compartment for the explosives which prevents them from coming into contact with any metal that could produce a spark,
- (2) be constructed so that the explosives cannot fall from the vehicle,
- (3) when carrying explosives, be provided with orange diamond-shaped placards and clearly visible signs marked "Explosives" in letters not less than 150 mm in height which are posted on the front, rear, and sides of the vehicle,
- (4) not be refueled when carrying explosives, except in an emergency,
- (5) have its engine shut off while loading or unloading explosives except where the vehicle uses an engine-powered device for loading and unloading the explosives,
- (6) only be operated by an authorized person, and
- (7) be equipped with suitable fire extinguishing equipment.

8.4.3 A vehicle used to transport explosive material at a mine shall only carry detonators when the detonators are separated from other explosives by a solid partition of wood 15 centimetres thick and extending at least 15 centimetres above the highest level to which explosives are packed in the vehicle.

Part 9 Exploration

9.3.1 In addition to complying with the emergency preparedness provisions of Part 3 of the Code

- (1) active exploration sites of mechanical disturbance shall be equipped with a minimum Level-2 first aid kit, a stretcher and an epinephrine auto injector, and have provision made for continuous and consistent emergency communication, and
- (2) at exploration drill sites, at least two members of the drill crew shall have a valid Worker's Compensation Board Level 1 or equivalent first aid certificate unless the work site is accessible in all weather conditions and within 5 minutes of a facility where there is a qualified first aid attendant.

9.3.2 All persons employed at an exploration site shall be trained in accordance with Section 1.11, including where applicable

- (a) safety with respect to wildlife,
- (b) wearing of appropriate clothing,
- (c) use of personal protective equipment,
- (d) need for and use of suitable equipment to avoid becoming lost,
- (e) safety procedures to be adopted for boat handling operations, and
- (f) safe practices when working in or around aircraft, including effective communication.

9.3.3 Pits, Trenches & Excavations

- (1) No person shall be permitted to enter any excavation over 1.2 metres in depth unless
 - (a) the sides of the excavation are sloped to a safe angle down to 1.2 metres from the bottom of the trench, or
 - (b) the sides have been supported according to the requirements of Part 4 of this Code.
- (2) When it is required for persons to enter an excavation the minimum width of an excavation shall be such that a person is able to turn around without coming into contact with the sides.
- (3) Excavated material shall be kept back a minimum distance of 1 metre from the edge of any trench. excavation, and 1.5 metres from any other excavation.

- (4) A qualified person shall inspect an excavation immediately before any person is allowed to enter, and any hazard shall be made safe before persons are allowed to conduct other work in the excavation.
- (5) Sloping of the sides of excavations may be undertaken instead of shoring only where the protection afforded to personnel is equivalent to that provided by shoring.
- (6) Where excavation walls are sloped as a substitute for shoring, the walls shall be sloped at angles, dependent upon soil or rock conditions, which will provide stable faces. In no case shall such a slope be steeper than a ratio of one horizontal to one vertical.

When shoring is installed or removed, the work procedure shall ensure that persons are not exposed to undue risk.

9.3.6 Use and Storage of Explosives

- (1) The use and storage of explosives shall be pursuant to the provisions of Part 8 of this Code.
- (2) Blasters shall have a valid blasting certificate granted pursuant to Part 8 of this Code.

9.12.1

- (1) An exploration camp required to support future exploration activities shall be left in a clean and safe condition and where practicable secured from wildlife access at the end of each field season.
- (2) An exploration camp not required to support future exploration activities shall be dismantled, removed and the site reclaimed, unless otherwise exempted in writing by an inspector.
- (3) Before leaving a camp for the season or reclaiming a camp site, all refuse shall be removed or burned and buried so that it will not attract wildlife, refuse pits shall be backfilled, and food and explosives removed from the site.

Aircraft Regulations

Canadian Aviation Regulations 2005-1

Transport Canada. *Canadian Aviation Regulations*.

www.tc.gc.ca/civilaviation/RegServ/Affairs/cars/Part7/menu.htm

Part VII - Commercial Air Services

Requirements for Air Operator Certificate

700.02 (1) No person shall operate an air transport service unless the person holds and complies with the provisions of an air operator certificate that authorizes the person to operate that service.

(2) Subject to subsections (3) and (4), no person shall, unless the person holds and complies with the provisions of an air operator certificate that authorizes the person to do so, operate an aeroplane or helicopter to conduct aerial work involving

- (a) the carriage on board of persons other than flight crew members;
- (b) the carriage of helicopter Class B, C or D external loads;
- (c) the towing of objects; or
- (d) the dispersal of products.

Aircraft Requirements

700.05 (1) Subject to subsection (3), no Canadian air operator shall operate an aircraft in a commercial air service unless

- (a) a certificate of airworthiness that meets the requirements of Article 31 of the Convention has been issued for the aircraft

Flight Time Limitations

700.15 (1) Subject to subsection (2), no air operator shall assign a flight crew member for flight time, and no flight crew member shall accept such an assignment, if the flight crew member's total flight time in all flights conducted by the flight crew member will, as a result, exceed

- (a) 1,200 hours in any 365 consecutive days;
- (b) 300 hours in any 90 consecutive days;
- (c) 120 hours in any 30 consecutive days or, in the case of a flight crew member on call, 100 hours in any 30 consecutive days;
- (d) where the flight is conducted under Subpart 4 or 5 using an aircraft other than a helicopter, 40 hours in any 7 consecutive days;

- (e) where the flight is conducted under Subpart 2 or 3, or is conducted using a helicopter, 60 hours in any 7 consecutive days; or
- (f) where the flight crew member conducts single-pilot IFR flights, 8 hours in any 24 consecutive hours.

Division II - Standards for Flight Time and Flight Duty Time Limitations and Rest Periods

720.15 Flight Time Limitations

The standards for increasing the flight time limitations for flight crew members are:

- (1) Where the flight is conducted under Subpart 2 or 3 of Part VII of the *Canadian Aviation Regulations* or with a deHavilland DHC-6 aircraft not conducting a scheduled passenger service or with a helicopter not conducting a scheduled passenger service or heli-logging, for any 6 non-overlapping periods of 30 consecutive days within a 365 consecutive day period, the maximum flight time in any aircraft shall not exceed:
- (a) where the flight crew member conducts single-pilot IFR operations, 8 hours in any 24 consecutive hours;
 - (b) 60 hours in any 7 consecutive days;
 - (c) 150 hours in any 30 consecutive days;
 - (d) 210 hours in any 42 consecutive days;
 - (e) 450 hours in any 90 consecutive days;
 - (f) 900 hours in any 180 consecutive days;
 - (g) the accumulated 30-consecutive day, 42-consecutive day and 90 consecutive day flight times may be reset to zero if the flight crew member is provided with at least 5 consecutive days free from all duty; and
 - (h) 1200 hours in any 365 consecutive days.

Canadian Transportation Accident Investigation and Safety Board Act

<http://laws.justice.gc.ca/en/C-23.4/SOR-92-446/index.html>

Mandatory Reporting - Reportable Aviation Accidents and Incidents

6. (1) Subject to subsection (5), where a reportable aviation accident or incident takes place, the owner, operator, pilot-in-command, any crew member of the aircraft and, where the accident or incident involves a loss of separation or a risk of collision, any air traffic controller having direct knowledge of the accident or incident shall report to the Board as much of the information listed in subsection (2) as is available, as soon as possible and by the quickest means available.

(2) The report referred to in subsection (1) shall contain the following information:

- (a) the type, model and nationality and registration marks of the aircraft;
- (b) the names of the owner, operator and, where applicable, the hirer of the aircraft;
- (c) the name of the pilot-in-command;
- (d) the date and time of the accident or incident;
- (e) the last point of departure and the point of intended landing of the aircraft, including the date and time of the departure;
- (f) where the aircraft is not missing or is not inaccessible,
- (i) the location of the accident or incident by reference to an easily defined geographical point, or by latitude and longitude,
- (ii) the number of crew members, passengers and other persons that were killed or sustained a serious injury,
- (iii) a description of the accident or incident and the extent of any resulting damage to the aircraft, the environment and other property, and
- (iv) a description of any dangerous goods on board, or released from, the aircraft;
- (g) where the aircraft is missing or inaccessible,

- (i) the last known position of the aircraft by reference to an easily defined geographical point, or by latitude and longitude, including the date and time of that position,
 - (ii) the number of crew members and passengers on board the aircraft,
 - (iii) a description of any dangerous goods carried on board the aircraft, and
 - (iv) the action being taken to locate, or gain access to, the aircraft; and
 - (h) the name and address of the person making the report.
- (3) In addition to the reporting requirements set out in subsection (1), the person making the report shall, in a form approved by the Board, submit to the Board within 30 days after the accident or incident all the information required by subsection (2), unless otherwise exempted by the Board pursuant to subsection (4).
- (4) The Board may exempt a person from submitting the information referred to in subsection (3) where the Board has gathered the information through its own investigation of the accident or incident.
- (5) Where any person required to do so pursuant to subsection (1) makes a report to the Board, no other person referred to in that subsection is required to make a report.

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