Polar Continental Shelf Project

OPERATIONS MANUAL

Natural Resources Canada
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Canada

Polar Continental
Shelf Project

OPERATIONS MANUAL

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INTRODUCTION

This manual is based upon many years of Arctic knowledge and experience to provide you, the user, with guidelines and information on what Polar Continental Shelf Project (PCSP or Polar Shelf in short) expects of you, and what you can expect from Polar Shelf. It is impossible to deal with all eventualities, but we try to highlight the most important features of our Arctic operations to make it easier for you to do your work, and for us to help you get it done.

PCSP provides logistics support to scientific research parties working in the Canadian Arctic. This manual deals with problems and dangers you may encounter, as well as with routine matters. PCSP staff can help you get to the Arctic, into the field, conduct your research, and return home safely. PCSP makes it easier for a scientist to do her/his work without becoming an expert in field logistics. This requires the observance of procedures that Polar Shelf has developed based upon its own experiences in the Arctic dating back to 1959.

Ultimately, it is your responsibility that you and each member of your team is properly trained and prepared for working in the Arctic and that you and each member of your team accept responsibility for your personal health, safety and preparedness.

If you do not wish to, nor cannot, respect PCSP's rules, operating procedures and requirements, which have been designed to help guard your health and safety, please seek logistics services elsewhere as PCSP reserves the right to withhold or withdraw its support if its rules and procedures are not respected.

The Arctic is considered by many as a hostile, difficult, hazardous and unforgiving environment. It can be as hostile and unforgiving as you make it. If you make a slight mistake, you may get away

with it, you may not. If you make a serious mistake, you will have serious problems. Careful planning is essential to the success of any project in the Arctic.

Further detailed information about PCSP and its activities, links to other useful sites including those related to funding programs and other logistics service providers, are available on PCSP's web site at

http://polar.nrcan.gc.ca

Other recommended reading:

Field Safety Guide for Field Operations

History of PCSP

Polar Continental Shelf Project's twin missions are to provide logistics support to researchers and to help Canada exercise its sovereignty in its Arctic region.

Services

- Air and overland transport
- Navigation and positioning systems
- Radio and satellite telephone communications network
- Arctic expertise
- Accommodation and supplies

Polar Shelf delivers support services to scientists working throughout the Canadian Arctic. Its navigation and positioning systems serve both coastal and inter-island areas. Through long-term chartering of aircraft with experienced pilots, Polar Shelf responds to the Arctic researchers' greatest expense and concern - safe, efficient air transport.

Polar Shelf also makes some special field equipment available on loan, provides room and board at its Resolute base, and, with its radio and satellite telephone communications network, keeps in touch with chartered aircraft and field camps, reports weather, helps coordinate scientific operations, and greatly enhances safety in the field.

Client Groups

Polar Shelf supports more than 120 field parties each year. The majority originate from Canadian government organizations (federal and territorial) and Canadian universities, and the rest from diverse agencies at the national and international levels. The scientific projects in which these field parties are engaged cover virtually every discipline from archaeology to zoology.

The Reason Why

What brought all of this about? The story begins in 1957, with the launch of the Soviet satellite *Sputnik*. Although the Arctic's economic and strategic value had long been recognized, the sudden onset of the space race turned out to be the first in a series of events that triggered Canadian scientific exploration in the Arctic.

Shortly after *Sputnik* was launched, the United States asked Canada for Arctic gravitational data required for its space program, and Canada agreed to make the information available.

In 1958, the same year the U.S. submarine *Nautilus* completed the first under-ice crossing of the Arctic Ocean, the first United Nations Conference on the Law of the Sea extended the resource and exploration rights of maritime nations on their continental shelves to a depth of 200 metres.

In a matter of months, Canada found itself with dramatically increased claims to resources, commitments to scientific assistance, and jurisdictional responsibilities in a region that, for all we knew of it, might as well have been on the dark side of the moon. In 1958, Canadians looking for information about the polar continental shelf had to rely on three limited sources: foreign maps, the federal government's multidisciplinary Canadian Arctic Expedition, carried out during World War I, and the preliminary findings of Operation Franklin in 1955.

In the spring of 1958, in answer to a recommendation drafted during a special meeting of interested government agencies, Cabinet established Polar Continental Shelf Project. Since beginning fieldwork in 1959, Polar Shelf has built up a logistics support network that stretches from Alaska to Greenland, from the Arctic Circle to the North Pole, and has played a major role in advancing science and sustaining Canada's sovereignty in the Arctic.

CHAPTER 1

How Can Polar Shelf Help You?

This chapter expands on how PCSP can help you plan and execute your project. It tells you about the services, equipment and facilities available.

1.1 Facilities and Services

1.1.1. Location of Base

PCSP maintains a base at Resolute Bay on Cornwallis Island, bordering Barrow Strait and the Northwest Passage. PCSP's base is located at the airport so that aircraft may taxi directly from the runway to the PCSP complex. (*For further information about Resolute Bay and other northern communities, please visit the Links section of PCSP's web site.*)

The facilities at the base are summarized below; more details follow in the text:

Capacities	Resolute
sleeping (persons)	50
dining (persons)	55
Garage Storage	3-bay hangar
dry labs	3
reading rooms	4

1.1.2. Who is in charge?

The on-site Logistics Manager is responsible for operations at the PCSP base. This person is aware of field parties arriving at and departing from the base and what equipment is to be issued to each project and also assigns accommodation and working space at the base. He/she is in charge of scheduling all aircraft, realizing that in coordinating field camp moves, not all requests can be satisfied at one time due to such factors as weather and research priorities. PCSP's Logistics Managers report to the Director of PCSP.

1.1.3. Buildings

The base is fairly self-contained. Resolute has three main buildings. These are

1) the main living accommodation housing sleeping areas, washing and restroom facilities, reading rooms, a recreation area, a dining room and kitchen, and staff quarters;

2) the working facility, with garage, stores, storage areas, dry labs, work areas, a helicopter shop, a darkroom, and the base office; and,

3) the old accommodation building, which is now used for operational purposes only and is a restricted area (staff only).

Each sleeping room has two beds, a desk or table, and a clothes closet. The bed has a mattress and pillow with a pillow cover. You must bring your own sleeping bag with you; sheets and blankets are not provided. You will need a sleeping bag in the field, and in addition, you cannot travel on a PCSP aircraft without one. This is for safety reasons in case you are forced down.

There are washers and dryers at the base. The washing and showering facilities are complete, and one bathtub is available. Bring your own towel and washcloth and all your personal toiletries as they are not provided by PCSP and may not be available at the settlements.

There are also work and laboratory areas at the base in the working accommodation. Laboratory areas should be requested when you initially request PCSP support. Lab areas can be set up with balances or minor lab equipment which the scientist must supply. Work areas for repair or maintenance of equipment are usually available on short notice.

The garage is equipped for servicing such equipment as snow machines, ATVs, generators, vehicles, etc. There is a drill press at each base. A forklift is available to load and unload aircraft. There are trucks for local support which are issued only upon request to the Logistics Manager. The PCSP mechanic does not loan tools - please bring your own. The mechanic's shop and other working areas at the base are restricted to PCSP staff.

1.1.4. Food Services

A cook and assistant cook generally comprise the kitchen staff at the bases. Mealtimes are 0700-0800 for breakfast, 1200-1300 for lunch and 1700-1800 for dinner. Meals may be kept in the warmer or set aside for the microwave if prior authorization is given to the cook by the Logistics Manager. If you have legitimate reason to be late for a meal, please inform the Logistics Manager and appropriate arrangements will be made.

All food for your field camp must be brought to the base with your initial shipment, or at appropriate times during the field season, as determined by you. PCSP is prepared to receive shipments during

the field season and will get them to your camp on "the next available flight"; please ensure all shipments are organized well in advance of your arrival as there is no guarantee your food will arrive on the same flight with you. Food will not be issued from PCSP's kitchen except in an emergency.

1.1.5. General Rules at the Base

Smoking is not permitted in bed or in the dining area.

No noise is allowed after 2300 in the sleeping areas.

Boots must be removed at the entrance to the building.

If a pair of shoes or slippers is desired for indoor use, they can be left in the mudroom. Snow or mud should be scraped off outer gear before entering the mudroom.

The office at the base is staffed between 0700 until 2000. If you wish to meet with the Logistics Manager, it should be arranged between 0830 and 1530 as he/she is occupied with radio skeds at other times.

1.1.6. Medical Services and Medevac Procedures

There is a nursing station at Resolute. Doctors are not present. The closest doctor to Resolute is in Iqaluit. You must bring with you an adequate supply of all medicines that you will require.

Emergency contact names and phone numbers should be provided to PCSP for each member of your team in advance of your arrival in the field.

If you come under the PCSP umbrella as a member of a project supported by PCSP, an aircraft will be dispatched in the case of a medical problem. If an expedition does not fall under PCSP's

umbrella and contact is made with PCSP for a medical evacuation (medevac) or other emergencies, PCSP offices in Resolute will first contact the local nursing station to seek a release number, then the RCMP to determine if they are aware of the situation, and to determine what action might be undertaken. If no release number is forthcoming from the nursing station and no RCMP action is planned, PCSP will take no action. PCSP will contact a local air carrier on behalf of the concerned party to arrange for services, but will not be responsible for any related expenses. Anyone outside of PCSP's aegis is responsible for their own actions and all associated expenditures.

1.1.7. Electrical Power

The Resolute base is serviced with electricity. It is nominally 110 volts, but if you have equipment that is sensitive to fluctuations in voltage and reliability, it is advisable to take precautions.

PCSP has generators of various outputs for use in the field. These may be issued if requested in your application for support to PCSP.

1.1.8. Fuels and Lubricants

Fuels are available through the base.

Diesel is used in heating stoves and some generators. It is available in bulk or 205 litre (45 gallon) drums. A full drum weighs 190 kg. (420 lbs).

Gasoline is used in trucks, snow machines, some generators and ATVs. It is available in varying amounts, up to 205-litre (45-gallon) drums. A full drum weighs 182 kgs. (400 lbs.).

Naphtha or white gas is available at Resolute. It is not generally available at Co-ops. It is available in one-litre, 22-litre or 45-litre containers. One litre weighs approximately one (1) kg. It is used for cooking or for catalytic heaters.

Propane is available at PCSP Resolute in 11-kg (25-lb.) and 45-kg (100-lb.) tanks. The larger tank weighs 81 kgs. (180 lbs.).

All fuel containers must be returned to the PCSP base. ALL FUEL SPILLS MUST BE REPORTED TO THE LOGISTICS MANAGER IMMEDIATELY. PCSP can provide fuel spill kits to field camps or advise on where to find these kits. All field camps should be equipped with a spill kit.

LEFTOVER FUELS MUST NEVER BE DISPOSED OF THROUGH DUMPING OR BURNING. SOME CAN BE USED UP IN FIXED-WING AIRCRAFT. OTHERWISE, ALL UNUSED FUEL MUST BE BACKHAULED TO THE PCSP BASE OR A CENTRAL STAGING AREA IN PROPER CONTAINERS FOR SAFE DISPOSAL. CONSULT PCSP LOGISTICS MANAGERS FOR ADVICE.

1.1.9. Surface Vehicles

Trucks, both 4-wheel- and 2-wheel-drive, are available at the base for local use, at the discretion of the Logistics Manager. A photocopy of a valid driver's licence is required before access to PCSP vehicles is allowed.

Snow machines and ATVs may be made available in limited numbers if requested at the time of application for PCSP support. These are to be used for work purposes only.

1.1.10. Labour

PCSP does not have personnel available for casual labour. Staff will do all they can to help you, but no casual help is available in the field.

1.1.11. Loan of Equipment

Various types of equipment are available on loan, and should be requested in your application for support to PCSP each fall; any equipment requested afterwards will be issued solely on a cost-recovery basis if available.

Please note that PCSP does NOT issue firearms.

Sleeping bags, towels, personal clothing, food, and general camping gear are not available through PCSP. Remember that all equipment must be checked out with PCSP before you leave for the field. If you are unsure or unfamiliar with the operation of any piece of equipment, ask staff for a briefing. It should be noted that **YOU** are financially responsible for any loss or damage of equipment issued to you by PCSP through misuse, abuse or neglect.

1.1.12. Recreation

There are pool tables, shuffleboard, TVs and VCRs at Resolute. The base also has some exercise equipment for your use; you can arrange access to this equipment through the Logistics Manager.

1.1.13. Storage

Space is available for storage of field equipment from one season to the next. Equipment left over a number of seasons should be inventoried and a copy of the inventory list left with the Logistics Manager. If equipment has not been used and has been stored for a number of seasons without prior approval of the Logistics Manager, it may be shipped back to the owner at his/her expense.

Storage space is available in the working building in the form of caged enclosures on the upper level. These may be shared with other scientists, but will be locked in your absence and a key left with the storesperson. Space is assigned by the storesperson.

1.1.14. Finance/Charge Accounts

PCSP allocates some logistics support from its own operating funds and some support on a cost-shared or cost-recovery basis.

If there is a possibility of a project using more support than that allocated, or if all support is going to be on a cost-recovery basis, then the following procedures should be followed.

For NRCan projects, PCSP will prepare an expenditure adjustment (EA) and forward it to you.

For all other projects, an account must be set up in order for us to invoice you. In order to set up an account, a Credit Agreement form, which PCSP will provide, must be completed and returned to us as soon as possible. Please note that consideration for credit cannot be given without this form. If you are exempt from paying the Canadian Goods and Services Tax (GST), you should also complete and return a GST certificate to PCSP.

PCSP will invoice you for any charges; payment is due 30 days from the date of the invoice. Interest will be charged on overdue accounts at the Bank of Canada rate plus 2 percent. Interest accrues on the 31st day.

Note: If you do not agree with the charges on the invoice, please phone the contact named on the invoice.

If you intend to purchase any materials or supplies via the radio network while you are in the field, you should open a charge account at the Co-op before you leave town. The Logistics Manager can then pick up your supplies and charge them directly to your account.

1.1.15. Opening and Closing Schedules

The opening and closing of the base each field season is determined by annual user requirements and costs. In general, it opens in late March and closes early September. Overwinter accommodation is not available.

1.1.16 Applying for PCSP Support

PCSP operates on an annual planning cycle. Applications packages are posted on PCSP's web site each September; forms and procedures can change year-to-year and only the most current forms must be used - and only these will be accepted by PCSP. The applications package provides guidance on how PCSP makes its logistics decisions and allocations and provides direction on selection criteria.

The deadline for applications is generally mid-November (the explicit date is noted when the call for application is posted in September); any applications **received by** PCSP after midnight of the deadline date will **NOT** be accepted.

Applicants are advised in writing of all decisions with regard to PCSP support by mid-March at the latest. This is done through a Letter of Support explaining which services are being provided, who will pay and what associated costs might be. As well, project agreement and credit forms and other administrative forms are distributed and must be completed and submitted to PCSP prior to your arrival in the field.

1.2 Aircraft Operations

1.2.1. Types of Aircraft

Polar Shelf's field program may be supported by several types of aircraft, such as de Havilland DHC-6 Twin Otters, Hawker Siddley 748s, Lockheed C-130 Hercules, Bell 206B helicopters, Bell 206-L-1s, Bell 204s, Bell 205s and Bell 212 helicopters.

AIRCRAFT DATA

Twin Otter (Wheel-skis): Fuel consumption - 340 litres per hour; Air speed - 210 kph; Maximum load - 952 kg; Landing strip required 305m x 30m; Range - 1125 km (full load, full fuel); Loading door dimensions 142cm x 127cm; Maximum length and width of a single object - 487cm x 122cm.

Twin Otter-Tundra tires: Fuel consumption - 340 litres per hour; Air speed - 225 kph; Maximum load - 1134 kg; Landing strip required 244m x 18m; Range - 1287 km (full load, full fuel), Loading door dimensions - same as above.

HS-748: Fuel consumption - 1100 litres per hour; Air speed - 362 kph; maximum load - 4310 kg; Landing strip required 1066m x 28m; Range - 1930 km; Loading door dimensions - 152cm x 137cm.

Bell 206B helicopter (Skid gear): Fuel consumption - 100 litres per hour; Air speed - 160 kph; Maximum load - 181 kg; Range - 450 km. (Note an extra 68 kg can be slung).

Bell 206B helicopter (Floats): Fuel consumption - 100 litres per hour; Air speed - 140 kph; Maximum load - 2 hours fuel=113 kg, 1.5 hours fuel=158 kg; Range - 400km. (Note an extra 158 kg can be slung).

Bell 206L helicopter (Skid gear): Fuel consumption - 127 litres per hour; Air speed - 185 kph; Maximum load - 2 hours fuel=300 kg, 1.5 hours fuel=345 kg; Range - 530 km.

Bell 206L helicopter (Floats): Fuel consumption - 127 litres per hour; Air speed - 160 kph; Maximum load - 258 kg; Range - 466 km.

Bell 204B helicopter (Skid gear): Fuel consumption - 318 litres per hour; Air speed - 168 kph; Maximum load (full fuel)-816 kg; Range - 400 km.

Bell 212 helicopter (Skid gear): Fuel consumption - 409 litres per hour; Air speed - 177 kph; Maximum load (full fuel)- 1270 kg; Range - 600 km.

Beechcraft King Air 200 - Jet Prop (Wheels): Fuel consumption - 365 litres per hour; Air speed - 495 kph; Maximum load - 1452 kg; Landing strip required 762m to 914m; Range 2897 km; Entrance door dimensions 68cm x 130cm; Maximum length and width of a single object - 390cm x 65cm. Passenger capacity 10 - 13.

Beech 99 (Wheels): Fuel consumption - 365 litres per hour; Air speed - 386 kph; Maximum load - 1270 kg; Landing strip required 762m; Range - 1287 km; Entrance door dimensions 135cm x 130cm; Maximum length and width of a single object - 560cm x 125cm. Passenger capacity 15.

NOTE: All payloads include passengers whose average weight is assumed to be 82 kg. As well, data reflects performance of aircraft under ideal conditions.

1.2.2. Aircraft Support

Polar Shelf cannot meet the total demand for aircraft support for all projects. It is likely you will be required to share the costs of logistics support with PCSP, either partially or in full.

Please note that allocated aircraft hours include ferry time to and from your field location(s).

If you are assigned flying time at no charge on PCSP aircraft, these hours are not yours to reassign to any other party or to assist another project.

Under no circumstances should you arrange schedules or any casual charters with any carrier and charge the bill to PCSP. All chartering and scheduling (or related changed) of aircraft organized by PCSP must be done by PCSP staff only. Any arrangements made without the involvement of PCSP staff will not be honoured nor paid for by PCSP.

1.2.3. Aircraft Costs

PCSP operates, in part, on a cost-shared basis. Cost sharing for services ranges from zero to 100 percent.

Details of allocated hours for your project are outlined in your letter of support. Depending on aircraft availability, it is possible to use additional flying hours on a cost recovery basis. All contractors and users from agencies outside of Canada and the private sector will be charged for all flying hours and other services.

1.2.4. Briefings

Briefings of passengers are required prior to use of all aircraft, both fixed- and rotary-wing. Such briefings are a contractual obligation.

Every flight should begin with a thorough pre-flight briefing that includes smoking regulations, the location and operation of seat belts, normal and emergency exits, survival gear, fire extinguishers, first aid kits, and the Emergency Locator Transmitter (ELT), and action to be taken in the event of an emergency. A whirling propeller can kill you, so learn the procedures for safely approaching, boarding and leaving an aircraft.

1.2.5. Who is in Charge of Aircraft?

The pilot of the aircraft at all times has the authority on matters of safety. Close cooperation between flight crews and scientists is achieved when there is a good understanding by the crews of what is required and a good understanding by the scientists of the capabilities of the aircraft and its crew. A scientific party may have an exact landing location in mind as being best suited to its needs. It may or may not be possible for the aircraft to land at that site. The final decision always rests with the pilot. The scientific party should always be equipped with the latest maps, charts and air photos of its area(s) of operation.

1.2.6. Loads on Aircraft

All aircraft are limited to a maximum weight and centre of gravity range. It is dangerous to overload an aircraft or to concentrate the weight too far forward or aft. All items shall be weighed on a scale, not estimated. Do not try to cheat on weights. As well, advise the pilot of any dangerous materials you wish to carry.

1.2.7. Safety around Aircraft

It is most important to develop good habits around aircraft.

- Do not approach any aircraft from the rear. Stay in the pilot's line of vision and approach the aircraft only after the pilot has given a signal to approach.
- Watch your head, whether approaching a helicopter or a fixed-wing aircraft.
- Whether or not the props are turning, stay away from them.
- Always crouch down when you walk under the main rotor blades of a helicopter.
- Always leave the machine going downhill and approach it going uphill.
- Unless permitted by the pilot, do not smoke on an aircraft.
- Follow the pilot's directions on where to sit in the aircraft. Proper distribution of weight in the cabin is critical.
- Fasten your seat belt securely. In a helicopter, do not unfasten your seat belt until the machine has landed and the pilot has given you the signal that it is safe to get out of the aircraft. As you leave a helicopter, it is wise to buckle up the seat belt behind you so that no end is left dangling outside.

- Close and open doors on helicopters with care; they are fragile. Broken hinges and locks are common on these machines. Close the door firmly but do not slam or bang it shut.
- Hand-carried items should be held securely at all times. Long objects should be carried parallel to the ground. Light-weight materials should be secured prior to engine start-up; the up-draft of helicopter main rotor blades can lift amazing loads off the ground and into the blades, causing severe damage.
- In the unlikely event that you are in a forced landing in any aircraft, the pilot will advise when and how it is safe to leave the machine.
- Pieces of plastic flagging tape or ribbons attached to radio antenna will serve as wind-socks for a pilot coming into your camp.
- Signal mirrors are an invaluable method of attracting the attention of pilots in the air when they may be looking for your camp.
- Always carry your sleeping bag in the aircraft with you in case of emergency. Always carry emergency rations with you.
- Wear ear plugs when flying in aircraft.

1.2.8. Search and Rescue (SAR)

The Arctic islands, together with the large areas of permanently frozen seas around them, constitute an inhospitable and unpopulated part of Canada. The Department of National Defence maintains search and rescue units having the primary role of responding to air and marine disasters. Hercules aircraft and parachute jumping teams are based in Edmonton. In the Arctic, PCSP aircraft often

are the first to be aware of an emergency and are dispatched by a Logistics Manager; such operations are generally coordinated with National Defence personnel.

With respect to PCSP aircraft, search and rescue will begin as soon as an aircraft is known to be in distress or two hours after it fails to land on schedule. If the missing aircraft is in an area that can be reached by a Twin Otter or helicopter, these will participate in the SAR mission. A pilot should not have deviated from a flight plan or a proposed track between two points, so that the search aircraft can proceed directly to the last reported position of the stranded aircraft. Pilots should report to base every hour in flight, or upon every landing or take-off. Any deviations from an original flight plan should be reported by radio to the Logistics Manager. During a search and rescue mission, continuous radio watch will be maintained; it is necessary that all field parties stay off their radios except in the event of a new emergency until the SAR mission has been completed. If an aircraft is forced down due to weather conditions, the pilot should report his/her position to the Logistics Manager. Most aircraft used by PCSP now use a data tracking system which updates information accessible to the Logistics Manager about the aircraft's location and flight path every seven minutes.

Canada uses a Search and Rescue satellite system (SARSAT) through which a satellite picks up signals from an emergency locator transmitter (ELT) set off in a distress situation; the signal is processed, and the resultant location is passed to the search team(s) concerned.

1.2.9. Insurance

PCSP requires all its users to assume responsibility for notifying helicopter pilots of any cargo of value exceeding the $50,000 limit. You know what is going onto the helicopter and you are responsible for your equipment.

1.3 Vehicles

1.3.1. All-Terrain Vehicles

PCSP may issue you a four-wheel ATV if you request one in your application for support. You should practice before actual field use. You must wear protective clothing while riding an ATV; this should include a good helmet, boots, gloves and eye protection. Helmets with visors are issued with the ATV. They are not recreational vehicles to be used in the field for racing over the tundra. Casual/recreational use of field vehicles is not permitted. These vehicles are for summer field use only. Whenever you leave your field camp or the PCSP base on one of these vehicles, tell someone where you are going and when you expect to return. Always travel in teams or groups of two people at minimum, and always keep a radio or satellite phone with you as a communications link in case of problems.

1.3.2. Snow Machines

You can apply to PCSP for the use of a snow machine for your winter/spring project. Snow machines are not available for recreational/casual purposes. Ensure that each machine has a tool kit, spare drive belt and spark plugs in it and that you are properly dressed in warm clothing, mitts, mukluks, and goggles. Always travel in teams of two or more, and always keep a radio or satellite phone with you to report any trouble.

1.3.3. Sleds and Trailers

Banana, komatuks, pulka sleds, or heavier magnesium sleds, may be issued for towing by snow machines. They carry the equivalent of a drum of fuel (i.e., about 400 lbs.). ATV trailers carry about the same load. Do not overload them. Requests for sleds and trailers should be made at the time of annual application to PCSP.

1.3.4. Trucks

Four-wheel- and two-wheel-drive trucks are stationed at the base. They are used to meet you at the airport, to move your material around the base, to load and unload aircraft, and for many other purposes. A truck may be made available to you with permission from the Logistics Manager.

1.4 Communications and Mail

1.4.1. Base and Field Party Communications

Communications are essential to safe operations in the Arctic. PCSP is prepared to issue a radio and satellite phone to any scientific party coming under its umbrella and it is **MANDATORY** that they be used to report to our base. Each field camp must contact the PCSP base at least once every 24 hours or PCSP will initiate a search at **your expense**. If a radio schedule (sked) is missed because a party is unavailable all day, contact should be made with base immediately upon return to camp. If you know in advance you will miss a sked, advise the Logistics Manager.

Through the twice daily schedules, scientists report the weather and other operational information to the base at 1230h and 0000h UTC (0730 and 1900 Resolute time). Those parties operating outside of range of Resolute radio operations must call the base by satellite phone at least once daily between 1930 and 2000 (Resolute time).

Parties operating without PCSP support must have a licence and an assigned frequency to operate a radio in Canada. These may be obtained through Industry Canada (Application for Licence to Install and Operate a Radio Station in Canada and/or Mobile Radio Station Licence Application). If your party is within the

PCSP program and a PCSP radio has been issued to you, a separate licence is not required. PCSP holds the licence and you are covered under its umbrella.

PCSP generally uses the SBX 11 or 11A radios. These are small, effective and highly portable radios. They are used with an inverted V or dipole antenna, easily erected in the field. If you are working out of Resolute, each radio will be checked out with you at the base before you go to the field. The antenna should be set up perpendicular to the direction of communication and raised as high off the ground as possible. Any portion of antenna may serve as a receiving aerial but the full unbroken length is usually needed for transmitting. Each field party member is obligated to treat the radio gear with care. IT MAY SAVE YOUR LIFE.

The call sign for Resolute is XMH-26. Field stations usually use a call sign that indicates their geographic location.

Whenever isolated letters or groups of letters have to be pronounced separately, e.g., to identify unusual words or in conditions of difficult communications, the following phonetic alphabet should be used:

Alpha	Bravo	Charlie	Delta
Echo	Foxtrot	Golf	Hotel
India	Juliet	Kilo	Lima
Mike	November	Oscar	Papa
Quebec	Romeo	Sierra	Tango
Uniform	Victor	Whisky	X-ray
Yankee	Zulu		

Remember, you must talk to PCSP on the radio or by sat phone at least once every 24 hours. At those times, you will pass on weather reports as required, tell us that all is well, pass along any

messages and consult with the PCSP Logistics Manager about the day's plans. If we have no report from you in 24 hours, we will send out a search aircraft at your expense.

1.4.2. Frequencies

PCSP radios operate in the High Frequency (HF) range. With HF, your communication may well be heard hundreds of miles away. The primary frequencies for communications between PCSP and field parties are 4472.5 and 4441.0 kHz. The antennae that are supplied with PCSP radios will operate on either frequency.

If you wish to use a frequency that has been assigned to a private company or an individual, or if you wish to install a PCSP frequency in your own radio, prior written approval must be obtained from the holder of the frequency.

1.4.3. Radio Schedules

The following daily schedules are in place at this time:

Resolute - 0730 and 1900 Resolute time

Sat phone - between 1930 and 2000 Resolute time

On the radio, you will be contacted in the order that your camp has been put into the field. You must make every effort to adhere to the programmed schedule. If you miss a radio sked for reasons beyond your control, call at the earliest opportunity. If you cannot make contact with base or any other party, check your batteries and antenna and keep trying or call in by sat phone.

If you have a message (traffic) or PCSP has a message for you, you will normally be asked to wait until the end of the sked to allow parties without traffic to withdraw.

Do not switch off the receiver as soon as you have sent or received a message. Listen for a few minutes in case someone wants to get in touch with your camp.

1.4.4. Radio Watch

The radios are monitored by PCSP's Logistics Manager from 0700 to approximately 2000h. If aircraft are flying outside of these hours, the Logistics Manager either maintains flight watch, or the pilot communicates with Air Radio at a settlement.

1.4.5. Beacons

ADF (automatic direction finder which allows an aircraft to "find" the location of the source of the frequency; these have largely been replaced by GPS) beacons are available through Polar Shelf if your camp is located in a very remote region where it may be difficult for a pilot to find you. Such beacons are used at camps or fuel caches on Arctic Ocean ice. Frequencies and identifiers for such beacons are issued by Industry Canada.

1.4.6. Loss of Communications

Radio waves are propagated in all directions and may be received at a distant station after travelling along one of two paths. If they travel directly along the surface of the earth they are known as ground waves and transmission is limited to a few miles. In the skywave path, energy travels obliquely upward to one of the electrically charged surfaces in the ionosphere and is reflected back to Earth's surface. Because of the unsteady position and character of the reflecting layers in the ionosphere, the length of path of skywaves is not constant or predictable. Communications usually

depend on the skywave because it is by this path that radio energy is carried the greatest distances. A radio "blackout" occurs when the ionized layer in the ionosphere dissipates or changes its character so that it no longer reflects the radio waves back to Earth. The character of this ionized layer is modified by sunspot activity; the greater the activity, the greater the incidence of blackouts.

Radio conditions in the Arctic can vary without warning and blackouts may last several days. At times, no stations can be reached during the regular radio skeds. There must be considerable cooperation among field parties to relay information between camps that can hear each other. PCSP may not be able to read field camp "A" but "B" may be able to read "A" and base and act as intermediary. PCSP at times receives advance notices of potential disturbances in the Earth's magnetic field and predictions of radio blackout activity and may be able to provide some advance notice of blackouts to you. However, this is generally not possible. In the event of blackouts, it is essential to contact PCSP by satellite phone.

1.4.7. Telephones

PCSP Ottawa	613-947-1650
Resolute Office	867-252-3872

1.4.8. FAX & EMAIL

FAX machines may be used for transmissions south if sent COLLECT. It is a simple procedure to make such arrangements on the machine.

PCSP FAX numbers are:

PCSP Ottawa	613-947-1611
Resolute	867-252-3605

EMAIL addresses:

PCSP Ottawa	pcsp@nrcan.gc.ca
PCSP Resolute	pcspres@nrcan.gc.ca

1.4.9. Mailing Address

PCSP picks up mail at the Resolute post office most days and sorts it for the next PCSP flight to your camp. Mail sent from your camp is taken to the post office prior to the next flight south. It is mandatory to send a list of names of all members of your party to PCSP before you go to the field; it helps get mail and messages to the proper locations. Mail should be addressed as follows:

Your name
c/o your party chief's name & project number
c/o Polar Continental Shelf Project
Resolute, Nunavut X0A 0V0

1.4.10. Stamps

Before proceeding to the field, all field personnel should ensure that they have a sufficient supply of envelopes and stamps. Take a good supply of stamps with you. PCSP cannot supply postage for your mail.

1.4.11. Telephone Calls to Your Office

PCSP is prepared to pass telephone messages to your office or home, if you send them COLLECT. Satellite phone charges, apart from calls to/from PCSP base, are billed to your project.

1.5 Freight

1.5.1. Shipping and Receiving

PCSP is prepared to receive and store shipments of freight at the base if those shipments are prepaid. We are not prepared to pay any charges nor accept COD shipments. Shipments should be addressed as follows:

Your name
PCSP project number
c/o Name of principal investigator
c/o Polar Continental Shelf Project
Resolute Bay, Nunavut X0A 0V0

Every effort should be made to keep individual unit weights below 90 kgs. All freight arriving at the base will be stored indoors if possible. Shipments should be sent in sufficient time before your arrival. If you wish to enquire whether your shipment has arrived, please do so and if necessary tracers can be put in motion to locate any missing gear.

Any equipment, instruments, samples, etc., that cannot be left in PCSP storage, are returned south at the end of every season. These shipments are generally by air freight. Some shipments are by return sealift. Sealift out of Resolute or the eastern Arctic will get your gear into Halifax or Valleyfield, Quebec, and forwarding instructions will have to be given at the time of hand-over to the beach-master at the port of embarkation.

You should box, strap and weigh your shipment before you leave the North. Do not leave the job for someone else. You must arrange for the retrograde shipments to be sent COD. PCSP staff will get the shipment to the carrier.

1.5.2. Shipping Hazardous Goods

It is illegal to pack hazardous goods in baggage or to carry them on board an aircraft. Do not pack matches in your luggage - carry them on your person. Check with the flight crew or with the airline agent before packing or carrying gases, corrosives, aerosols, flammable liquids, poisons, explosives, ammunition, magnetic materials, or any other material or substance of which you are uncertain. Most materials can be shipped if packaged and labelled properly and if someone knows about them. NEVER ship firearms with cartridges in the magazine.

PCSP staff can advise you as to the best practices/procedures to adopt in shipping/handling dangerous goods.

CHAPTER 2

Advice to the Arctic Researcher

Always follow the Golden Rule of Arctic safety -- **NEVER WANDER OFF ALONE IN THE FIELD** - if you do, you are asking for trouble.

2.1 Clothing and Equipment

It is better to wear a number of thin items of clothing, which trap air between layers, rather than bulky items which restrict movement and are not as heat efficient. Keep all clothing clean and dry; dirt and grease break down the insulating properties of materials. It is important to prevent sweating as this takes heat away from the body and freezes when activity ceases. Tight clothes restrict circulation and chill you; layered clothing allows more freedom of movement and can be adjusted to conditions to avoid overheating. You should always be able to peel off a layer or undo the neck or sleeve. Never wear waterproof clothing that will not breathe; the trapped body moisture reduces insulation.

Wear two pairs of socks; the top layer should be a larger size than the inner pair so that there will be no wrinkling and pinching of the feet.

You should consider some of the following equipment for the field: (No brands of clothing will be recommended.)

Parka, Anorak: For winter use, you need a warm, insulated, loose-fitting parka with a hood. If you are going to work around fuels, the outer cover of the parka should be of static-free material. For summer use, an anorak or shell, over layers of clothing will be required. A southern style ski jacket is also comfortable in the Arctic summer. These outer garments should be windproof but should allow moisture to migrate outward. Brightly coloured material will help pilots to spot you.

Boots: For extended periods of outdoor work in the winter, mukluks with inner felt liners are recommended. Spare screens and insoles should be carried. Steel-capped work boots should not be worn outdoors in the winter; they are extremely good heat-sinks and not well insulated. For summer use, get a good pair of hiking boots. You may wish to take a pair of rubber boots in your pack for summer use. Insulated rubber boots are preferred by some scientists as an all-round summer boot. Bring waterproofing with you.

Mitts, Gloves: A windproof leather mitt over a wool glove or mitten allows freedom to work in cold weather. If you handle fuels in cold weather, dedicate a pair of mitts to that job because fuel breaks down the insulating properties of cloth and leather. If you are handling instruments, it is possible to cut off the tips of the fingers of gloves so that there is dexterity in the fingers but the rest of the hand remains warm.

Trousers: Wind pants with liner material over any trousers, or wind pants without a liner over wool trousers are recommended for winter fieldwork. In winter, it is not advisable to tuck the pantlegs into boots as snow will work into the boot top. Blue jeans are popular attire for summer field work. Any material that is rugged and can be washed easily is satisfactory.

Sleeping bag: This is an essential part of your kit. It must be with you on any flight aboard a PCSP aircraft. It is needed at PCSP's bases because we do not supply sheets or blankets. It is also needed in all field camps. A good Arctic-approved bag is required for winter operations.

Vest: A down-filled vest is a useful garment for cool or windy days.

Underwear: Two pairs of winter underwear, woollen or thermal, are recommended. The two-piece style allows you to adapt to conditions. Be sure to take long underwear with you in the summer too. Pyjamas, worn under trousers, can provide extra warmth on a cool day.

Shirts, Sweaters: Wool or flannel shirts with chest pockets are preferred. For those allergic to wool, a cotton or synthetic shirt can be worn under a wool shirt/sweater. A loose-fitting wool sweater over a shirt and worn under an anorak will keep you warm.

Socks: Several pairs of heavy wool socks should be part of your kit. Stretch socks that fit all sizes of feet are not the best, snug fitting socks mean cold feet and possible frostbite. If you wear two pairs of socks, the second should be one size larger than the first. Your socks must fit comfortably, but not so loose that they wrinkle or fold; this will cause pressure points that restrict circulation, and could lead to blisters and/or frostbite.

Headgear: A tremendous amount of heat is lost from head and neck areas. A hat should be worn most of the time. A windproof hat will protect the head and ears from heat loss, and, combined with a balaclava, will protect the face and neck. The parka hood is ideal protection in strong winds. An earband may be useful. Hard hats may be required on some jobs. Heat loss from an uncovered

head may be one-third of total body heat production at 15°C (60°F), one half at 5°C (40°F), and three-fourths at minus 15°C (5°F).

Extra equipment: Every person has a list of items they traditionally take with them. These include a scarf for windy days, sunglasses, a pocket knife, signal mirror, airphotos, charts and maps, personal toileteries, camera gear, film, towels and washcloths, prescription medicines (filled for the entire time that you expect to be in the Arctic), mosquito headnet (if working in the Mackenzie Delta), insect repellent, writing materials, stamps, and playing cards. Above all, there is no substitute for common sense - bring lots of it along!

2.2 First Aid

Safety considerations must at all times take precedence. Ultimately, you are responsible for your own safety - do some homework in advance to learn the "rules of the road".

First aid is the immediate and temporary care given to the victim of an accident or sudden illness. Its purpose is to preserve life, assist recovery and prevent aggravation of a condition, until the services of medical personnel can be obtained. It is MANDATORY that everyone take at minimum a basic and preferably advanced course in First Aid before going to the Arctic. You should read and carry with you a First Aid book. You should also read "Down But Not Out", a good book on survival.

Here are a few items o help your party think and practice safety:

a) Each field party must have at least two qualified first aid attendants who hold current "First Aid" certificates.

b) Every field party must carry a Standard Field Party First Aid Kit. Each small party detached from the main party should be equipped with an Intermediate First Aid Kit.

c) Parties working in very remote areas where casualty evacuation may be a problem should obtain special drug kits. These kits, which are intended to be used only with the radio advice of a doctor, contain supplies that will allow treatment of some conditions while the patient awaits evacuation to a hospital.

d) First Aid supplies should be assigned to a person holding a current First Aid certificate. That person should also be trained in, and capable of, providing artificial resuscitation, controlling haemorrhaging, and administering other emergency lifesaving first aid as may be indicated.

e) Special medication requires special handling. It is advisable to have duplicate supplies of special medicines - one package with you in the field, the other left at the PCSP base. A bee-sting kit should be carried if you are allergic to bee-stings; there are bees as far north as Alert.

2.3 Provisions

Every expedition must be self-sufficient. It is unlawful to hunt game for food. Fish may be taken if a fishing permit has been obtained from the RCMP or from a Wildlife Officer.

If you do bring boxes of food and plan to leave them at the base for future resupply, organize them in such a manner that you can call on the radio for certain numbered boxes on each supply run.

Stores in northern communities carry a limited selection of foodstuffs and hardware.

2.4 Licences and Permits

It is essential that you investigate, well in advance, the licensing and permitting requirements that may govern your research in the Arctic. Your field activities may require an environmental assessment (EA); the Environment Canada web site has links to the relevant legislation and what does or does not require an EA.

You will need to have made these arrangements before arriving in the field; you will not be permitted to conduct your program without showing proof of the proper authorizations. PCSP's web-based applications package provides information about licences.

2.5 Isolation

One hazard or hardship worthy of comment is that of isolation and your interaction with others. There is no quicker way to turn off a tent mate than to leave your gear spread around the tent. Respect the territory of the other person. Let him/her have his/her space. If you suspect that you will be homesick in two weeks, do not plan a two-month stay in the field. If you are not getting along with your buddy, do not go your own way and leave each other alone in the field. You must make every effort to get along. If you cannot, you may be forced to request that you be removed from the field. If this happens, and there are only two of you in your party, remember that your colleague must leave as well. If he/she is working on a thesis, then he/she deserves consideration.

2.6 Waivers

All personnel who are not Canadian federal government employees and who travel in PCSP aircraft or operate a vehicle such as a truck, snowmobile or ATV must sign a Waiver and Release absolving

PCSP, the Department, and the Crown of all responsibility while travelling in, or using, PCSP services, equipment or facilities. Copies of the forms are sent with PCSP's letter of support with the request that they be signed and sent to PCSP prior to your arrival in the field.

2.7 Firearms In the Field

Firearms serve one purpose: protection against rabid animals and hostile bears. Polar bears are not usually aggressive, but they are fearless and curious. In its search for food, a bear might pick up the scent of garbage and wander into camp. There is also the remote possibility of an attack outside the field camp area.

Grizzly bear encounters in the western Arctic are common, and must be taken seriously. Try to avoid attracting bears to your camp.

In the vast majority of cases, bears can be scared away by flare guns, loud noises or vehicles. A bear that insists on staying around a camp becomes a danger to personnel and equipment and may have to be removed. You should attempt to scare the bear away rather than kill it. You may have to move your camp. The presence of a bothersome bear should be reported to the Logistics Manager; he/she may advise the local Wildlife Officer who can take further action.

Sport or meat hunting is not permitted for non-residents. All parties should be equipped with firearms. It is strongly recommended that there be two firearms with every party, including fly-camps. If one rifle misfires, the second can be a life-saver. In order to acquire a Firearms Acquisition Certificate, it is mandatory that a firearms safety course be taken in advance.

All firearms must be kept free of excess oil or grease; this is particularly important in cold weather. A very thin coating of oil is all that is required to prevent rusting. Check the action on the firearm as soon as you get to camp. In fact, it is good practice that everyone in your party fire sufficient rounds to be comfortable with the use of the firearm. Bringing a firearm gradually into a heated area will prevent condensation and possible freezing if the firearm is taken outdoors. A rifle of at least .308 or .30.06 power, or a 12-gauge shotgun with rifled slugs, is needed for bear protection. Please note that the carrying of firearms by visitors to National Parks or National Park Reserves is prohibited. Carrying restricted weapons, such as pistols or revolvers, is illegal anywhere in Canada, except under authority pursuant to Section 106.2(1) of the Criminal Code. Permits may be obtained by Canadian nationals from their local police agency. Foreign nationals not resident in Canada are not eligible for such a permit. PCSP does not issue firearms

2.8 Sanitation

Strict attention should be paid to sanitary habits and use of camp sanitary facilities. It is important that each individual maintain a high standard of personal hygiene.

Sanitation in and around a camp is paramount to good health. There is a great temptation to step outside the tent and relieve yourself, but it is aesthetically more pleasing and a lot healthier if this is not done. Keep a clean camp and everyone will be happier. Establish a "latrine" area over a nearby hill or ridge and set up a flag signal that tells everyone when the area is occupied.

In winter, some snow contamination around camp is unavoidable but efforts should be made to keep pollution to a minimum. In a camp on the ice, soot from stoves will accelerate melting in the summer, while engine oil and fuel spills will produce meltwater ponds. All spills should be picked up and deposited in an empty fuel drum. An ice camp in particular should be kept clean from surface pollutants as this is your source of drinking water and it could become contaminated.

2.9 Rabies

The Arctic fox sometimes follows the polar bear to pick up scraps of food. Normally the fox is shy and will run if confronted by humans. Occasionally a fox will get rabies. Before it goes into a coma and dies, it becomes completely fearless and will attack anything within its reach. A bite will spread the disease. Rabies in humans can be deadly.

If a fox or other wild animal is observed to behave strangely, (e.g., runs in circles or staggers around as though drunk), you should attempt to kill the animal before it attacks. If the animal is heading toward a person, he/she should avoid being bitten by letting the animal bite a ski pole or any similar object. An animal that has been killed should be turned over to the RCMP or a Wildlife Officer. When handling any dead animal, avoid contact with your skin - wear gloves.

Do not attempt to make pets of animals near camps; they may have, or could contract, rabies.

2.10 Garbage

Keep your camp clean and organized. Take all solid garbage back to base with you. The policy is "one bag (drum) in, one bag (drum) out". A clean camp discourages bears.

The disposal of litter and garbage is a major problem, but the days of leaving drums and other material at a campsite are gone. There is increased sensitivity toward the problem of litter and this sensitivity is backed by laws and regulations that govern disposal and levy penalties. Litter may seem to be a minor issue in your research, but it can have a major impact on our public image.

If PCSP needs to return to your field site to clean up your garbage, you will be billed for any and all associated costs.

Litter around camp is more than an eyesore. It gets blown about by the wind and there is a strong possibility that light objects will fly up into the blades of a helicopter. When the blade is chipped or dented, the helicopter is grounded until new blades are shipped to the site.

NEVER spill fuels onto the land, the ice or in open water.

Ensure you have a spill kit with you; kits are available from PCSP.

2.11 Wildlife

As researchers, you are required to observe all game laws and to avoid disturbing wildlife. It is important in bear country to maintain clean camps and incinerate all garbage and refuse. If possible, camps should not be located on beaches. Give a bear a wide berth whenever possible. Do not feed the bears and do not be a "brave" photographer. If chased, throw off your parka or pack to distract the bear - this may buy you a bit more time. The best advice is to avoid bears; stay calm and be prepared if you cannot avoid them.

There are only 17 species of mammals in the Canadian Arctic. You may encounter or see caribou, polar bear, grizzly bear, muskox, Arctic wolf, Arctic fox, lemmings and Arctic hare. Traditionally, caribou have been one of the most important resources supporting Inuit life. Wolves will generally detour around camps. Muskoxen will protect themselves if you try to get too close. They will go into a defensive formation to protect their herd members. If the animal starts to rub a foreleg on a gland on their nose, you must retreat slowly, for they are preparing to attack.

Compared to southern latitudes, bird life in the Arctic is sparse. Very few birds overwinter. Many Arctic species depend on the sea for survival with great colonies nesting on the ledges of coastal cliffs near fish-producing waters. Ducks and geese are most frequently seen.

The Queen Elizabeth Islands do not support a great variety of fish species. Arctic char is the most important of these to the native peoples. Char spawn in the fall, migrate seaward in mid-June and return to freshwater from early August to early September. Char are fished from the ice in October, November, March, April and May. It is illegal for a non-native or non-northerner to fish in the Northwest Territories or Nunavut without a licence. A licence may be purchased from a local Wildlife Officer.

2.12 Environment

Every effort should be made to minimize the human impact of scientific investigations and campsites on the environment. When leaving a campsite, make every effort to return it to its natural state (e.g., rocks used for wind shelters or to hold down tents should be scattered around, snow mounds should be flattened, garbage should be burned then buried in a suitable manner).

Non-burnable garbage must be taken out of the field with you when you leave.

2.13 Campsite Selection

The selection of campsites needs careful planning to combine safety considerations, ecological acceptability, easy access to the study area, and ready access by aircraft.

Here are some suggestions – never camp in a ravine or creek bottom because a sudden shower or warm weather may release a lot of water into your campsite unexpectedly. Camping in a ravine may not only pose a water hazard, but almost certainly has the added inconvenience of poor radio or satellite telephone reception. For the best radio reception you want to be on flat land or on a hilltop. On glaciers, check that the area is free of crevasses. The scenery may be fantastic, but never camp near the snout of a glacier; the katabatic winds will tear your tents apart. If you can do so, camp on the leeward side of a ridge out of the wind. On sea ice, camp in a stable area on multi-year ice or on landfast ice. Always look for a source of water when you select your campsite.

Organize material in your camp so that you can locate it after a snowstorm. Pile things in one location and cover them with a tarp. Poles or 2 x 4s can mark the four corners of your cache. Pile material up on empty drums if you are leaving a cache over winter.

In case of an emergency evacuation of your camp, the following priorities should be followed: first, evacuate personnel, then scientific data and finally, equipment, based on value, weight and bulk. On the ice, fuel, tents, food, generators, and radios should be separated so that the breakup of camp by ice fracture will not become a disaster. There is usually some warning for the breakup of an ice camp so that emergency procedures can be taken.

2.14 Safety Tips

1. Always prepare yourself for a possible emergency whenever you leave camp. Protective clothing and emergency equipment left at home is of no help to you.
2. Dress for the occasion; do not overdress, for this can be just as hazardous as underdressing. Dress in layers.
3. Tell someone when and where you are going and when you expect to return. Make a plan and stick to it!
4. Never leave camp or travel alone. Never stray out of sight of camp - people have been lost this way. Use the buddy system.
5. Do not fight the environment. Conserve your energy. Learn to live with the land and the climate.
6. Know basic First Aid. Only by chance will a doctor be available in an emergency. You must be prepared to make decisions and take action that will sustain life, your own as well as others. It may take four or five hours or more for a PCSP aircraft to get to the scene of an emergency; weather could prevent help arriving for even longer periods. All personnel must understand that they are responsible for their own safety.
7. Use your head. Take time to think, plan, organize. Analyze the weather, the terrain. Plan your best possible course of action for the day. Your brain is your best survival gear - use it, don't lose it!
8. Never attempt to operate an unfamiliar piece of equipment. Read the instructions first. Admit that you are inexperienced and seek help.

9. Ensure you fill stoves, lamps or heaters with the proper fuels, or the result could be an explosion. Always fill stoves and lanterns outside the tent. Avoid lighting a stove near tent walls. Stoves can flare up and sometimes leak fuel.

10. Do not touch cold metal with your bare hands or your tongue. They may stick to the metal, and you will lose skin trying to get free.

11. Be careful handling fuels. Contact at low temperatures will induce frostbite. Fuel on clothing reduces their insulation value.

12. Sea ice is dangerous. It takes several years of reading the ice and working on it to be able to pick a landing spot. Always camp on multi-year or landfast ice.

13. In your personal survival equipment, carry signalling devices such as a whistle or mirror. Carry a chocolate bar or some form of fast energy food in your pocket.

14. Drink enough water to keep body fluids at the proper level. The Arctic is a desert and you need to drink more water than you might expect.

15. Do not sleep in your cooking tent, particularly in the winter. Cooking produces moisture which condenses upon cooling and makes for uncomfortable conditions and cold sleeping bags. Also, never keep food in your sleeping tent - it attracts bears.

16. Never point a firearm at anyone and never ship a loaded firearm anywhere.

17. You will not be allowed to board a PCSP aircraft without a sleeping bag. Carry one with you at all times.

18. Do not form instant opinions about the Arctic climate and its apparent dangers. The Arctic climate can be kind, but anyone caught unprepared is in extraordinary danger.

19. NEVER leave camp or attempt to travel during a storm or whiteout conditions. Stay put and wait it out!

2.15 Courtesy

The unexpected arrival of a group in a small community may be disruptive. It is strongly recommended that notice of your arrival be given to the local settlement manager or secretary several weeks in advance.

Avoid marked sites where scientific experiments are in progress. Avoid protected areas. In the vicinity of scientific stations, avoid interference with scientific work; this work represents someone's professional work, and has cost a great deal of money.

Do not enter unoccupied buildings or refuges except in an emergency.

2.16 Bear Deterrent

There have been many recent developments in bear detection and deterrent approaches and systems, including electric fencing, alarms and bear sprays. It is advisable to carry a firearm in areas of high concentration. For advice on the latest developments or for specific information, contact the territorial wildlife officer at the community closest to your research area.

Tips for operating in bear areas:

- remember that polar bears behave unpredictably, therefore expect anything and be prepared for it;

- avoid contact with bears if possible; there is no point in risking your life;
- do not sleep in the open, without a tent;
- minimize the number of tents in a camp. A few large tents are better than a lot of small tents. Place them in line or in a semi-circle with enough space between them for easy escape by a bear that may wander through camp;
- maintain areas for cooking and food storage at least 100 to 200 metres away from sleeping areas. NEVER keep food in your sleeping tent;
- burn garbage several hundred meters away from camp in an area visible from camp;
- keep a clean camp - grease and greasy foods will attract bears; they can smell cooking food for miles;
- never leave camp alone;
- a dog can serve as a useful bear alarm. The dog probably will alert you to the presence of a bear, but will not frighten it away;
- most bears are frightened by helicopters or snow vehicles. When chasing a bear on a snow vehicle, stay about 30 meters behind it to give the impression that it can outrun you. If it is crowded, it may turn to fight. If no vehicle is available, fire shotgun shells or flares overhead, or to one side. When the bear approaches to within 50 meters, a warning shot behind or beside it might scare it. Do not fire between its legs because a ricocheting bullet could badly injure the animal;

- bears are inquisitive. Give them a chance. Shoot to kill only as a last resort. If the bear continues to approach, keep making noise, but do not run. Stand your ground. Be prepared to shoot only if the bear charges. Run only if you are sure you can make it to safety.
- a bear will exhibit signs of annoyance by making a hissing sound, lowering its head while facing you, or making a small rush (4 to 10 paces in your direction) then stopping. At, or before, any of these signs, there is still time to back out of the situation. You will probably require at least 50 meters distance from the bear. BACK OUT SLOWLY, facing the bear. At ranges of less than 50 meters, it may be better to stand your ground. A bear usually charges at high speed, and low crouched over the ground, like a cat rushing a bird;
- it is important that your first shot drops a charging bear, since there may not be time for a second shot. Aim for the main front shoulder area or low neck-shoulder region where a hit will break important bones and drop the bear.

2.17 Wind Chill

Your body continually produces and loses heat. You become cold when your body loses heat faster than it can produce it. Wind increases heat loss. The rate of heat loss increases as the speed of the wind increases.

Annex A, a wind chill chart from Environment Canada, shows the combined effect of wind and temperature as an equivalent temperature acting on exposed flesh. Any protective clothing will protect bare flesh from the wind and elements. Clean, dry, properly fitted

clothing protects a person more than tight-fitting clothing or boots soaked in fuels or sweat. Wet clothing allows as much heat loss as exposed flesh.

2.18 Hypothermia

Hypothermia is the lowering of body core temperature that places the body in a general state of shock. This depresses normal body functions. The head and neck are the most critical heat loss areas. Once cooling begins, the body temperature falls steadily and unconsciousness can occur when the core temperature drops from the normal 37°C (98.6°F) to approximately 32°C (89.6°F). Cardiac arrest is the usual cause of death when the core temperature cools to below 30°C (86°F).

Caused by exposure to cold, hypothermia is aggravated by dampness, wind, exhaustion and lack of food and water. Symptoms include uncontrollable fits of shivering, apparent exhaustion, slurred speech, lack of mental sharpness and frequent stumbling. It may be difficult to convince the victim that there is something wrong because the symptoms are frequently seen as fatigue only.

To avoid hypothermia, stay dry, beware of the wind, dress for the occasion (i.e., in layers). Add clothes in severe cold, take off clothes when exerting oneself, use rain gear when necessary. Most hypothermia cases develop in relatively warm temperatures between -2°C and +10°C when there may be a false sense of security and comfort. The process of staying dry is the secret to avoiding hypothermia.

What do you do if hypothermia is suspected? First, stop what you are doing, get out of the wind and establish camp if you have been on the move. Secondly, dress the sufferer in dry clothing, put her/him into a dry sleeping bag and, if shivering is intense, someone

should get into the bag with the victim to transfer body heat gradually. Thirdly, give the victim some quick energy food or a hot, sweet drink.

Fatigue, wet clothing, increasing wind speed, inactivity and lack of energy food lead to or increase the rate of onset of hypothermia. Good physical condition, proper food, adequate clothing and shelter will help to prevent hypothermia.

2.19 Frostbite

Frostbite refers to the freezing of living tissue. Nose, cheeks, ears, chin and toes are usually the first parts of the body that are affected. You are usually unaware of the condition until someone tells you that your skin is white. Frostbite may affect the tips of fingers if gloves are worn instead of mitts, or feet if boots are laced too tightly. Deep freezing of human tissue can result in death of the tissue (gangrene) which requires immediate medical attention. As soon as your face, hands or feet become so cold that they stop hurting, it is time to seek assistance. Be careful not to touch cold metal or other objects with your bare skin because bare flesh may stick to the surface and freeze.

The accepted treatment for frostbite is simply a slow warming of the frozen areas at room temperature. Do not rub the affected area with snow; that will do more harm than good. Put your hands up into your sleeves, in your armpits or in your crotch. Cover your nose or cheeks with your warm hand. Never rub the affected area. Get your feet into something warm. Once the frostbite has cleared up, there will be skin damage which may result in flaking of the skin or infection. Use a bandage with sulpha powder, boracic acid, or vaseline to prevent further complications once the original danger is past.

2.20 Dehydration

A proper diet feeds the heat generating processes in our bodies; consumption of water can cut down the danger of dehydration. A person bundled up in layers of clothing cannot feel her/his perspiration readily as it is absorbed by the clothing; therefore she/he may not be aware of loss of liquids and salts. Water deficiency in the cold can lead to hypothermia. Loss of liquids and salts from the body can lead to dehydration.

You should drink more water than normal. Do not, however, count tea and coffee as water intake. Do not eat snow or ice; you expend more energy melting it in your mouth than you gain. Watch the colour of your urine; a light amber colour indicates that your water level is adequate while a dark amber colour indicates that you are getting dehydrated.

2.21 Ethical Principles

It is incumbent upon all researchers working in the Arctic to adhere to ethical principles in the conduct of their research. The Association of Canadian Universities for Northern Studies (ACUNS) has published a booklet which is required reading for anyone intending to conduct studies of any nature in the Arctic, including those who may not be working out of a settlement, and those involved in natural science as opposed to social science. Keep in mind that you will be working in someone else's backyard. There is an obligation to respect native culture and ownership of the land under the various land claims agreements. As a scientist, you must meet, and be seen to meet, all the ethical, environmental and legal requirements and regulations. If you do not do so, you may not be allowed to undertake your research.

The ethical principles focus on those aspects of science that affect local people, communities and environments. Even where research does not involve local people in an obvious way, it may still have an impact on the land, water, or wildlife of the region, and may thus affect the people indirectly. The word "community" is not restricted to a settlement alone. The land that supplies resources for the settlement, and the people who live on the land, are part of the community.

The principles proposed in the ACUNS booklet are intended to promote cooperation and mutual respect between researchers and the people of the North. The booklet is available from:

Association of Canadian Universities for Northern Studies
www.acuns.ca

2.22 Weather Observations

PCSP Resolute has a satellite weather receiving station that gives real time pictures from orbiting satellites; this information is used to plan daily aicraft operations and to identify sea ice conditions. If you are expecting an aircraft at your camp, or if an aircraft will be flying in the vicinity of your camp, you will be asked for weather information during PCSP's radio skeds. This will involve basis weather such as cloud ceiling, visibility, precipitation, and wind speed and direction. It is important that you be as accurate and knowledgeable as possible. Weather observation guides are available from PCSP. During the radio sked, PCSP can provide a general forecast for your area so that you can plan your daily activities accordingly.

Whiteouts are a phenomenon in the Arctic that can affect operations any time of the year. Ice crystals in the air eliminate definition of the horizon. This can pose a serious hazard to a pilot who

can lose depth perception. People on the ground can lose a sense of direction in these conditions. It is important that when whiteout conditions exist or are approaching, you must remain in camp and wait it out; even attempting to travel a few metres can result in disorientation. Similar caution must be exercised in foggy conditions.

Annex A.

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

Frostbite Guide

Low risk of frostbite for most people

Increasing risk of frostbite for most people within 30 minutes of exposure

High risk for most people in 5 to 10 minutes of exposure

High risk for most people in 2 to 5 minutes of exposure

High risk for most people in 2 minutes of exposure or less

where
T_{air} = Actual Air Temperature in °C
V_{10} = Wind Speed at 10 metres in km/h (as reported in weather observations)

Notes:

1. For a given combination of temperature and wind speed, the wind chill index corresponds roughly to the temperature that one would feel in a very light wind. For example, a temperature of -25°C and a wind speed of 20km/h give a wind chill index of -37. This means that, with a wind of 20 km/h and a temperature of -25°C, one would feel as if it were -37°C in a very light wind.
2. Wind chill does *not* affect objects and does *not* lower the actual temperature. It only describe how a human being would feel in the wind at the ambient temperature.
3. The wind chill index does not take into account the effect of sunshine. Bright sunshine may reduce the effect of wind chill (make it feel warmer) by 6 to 10 units.