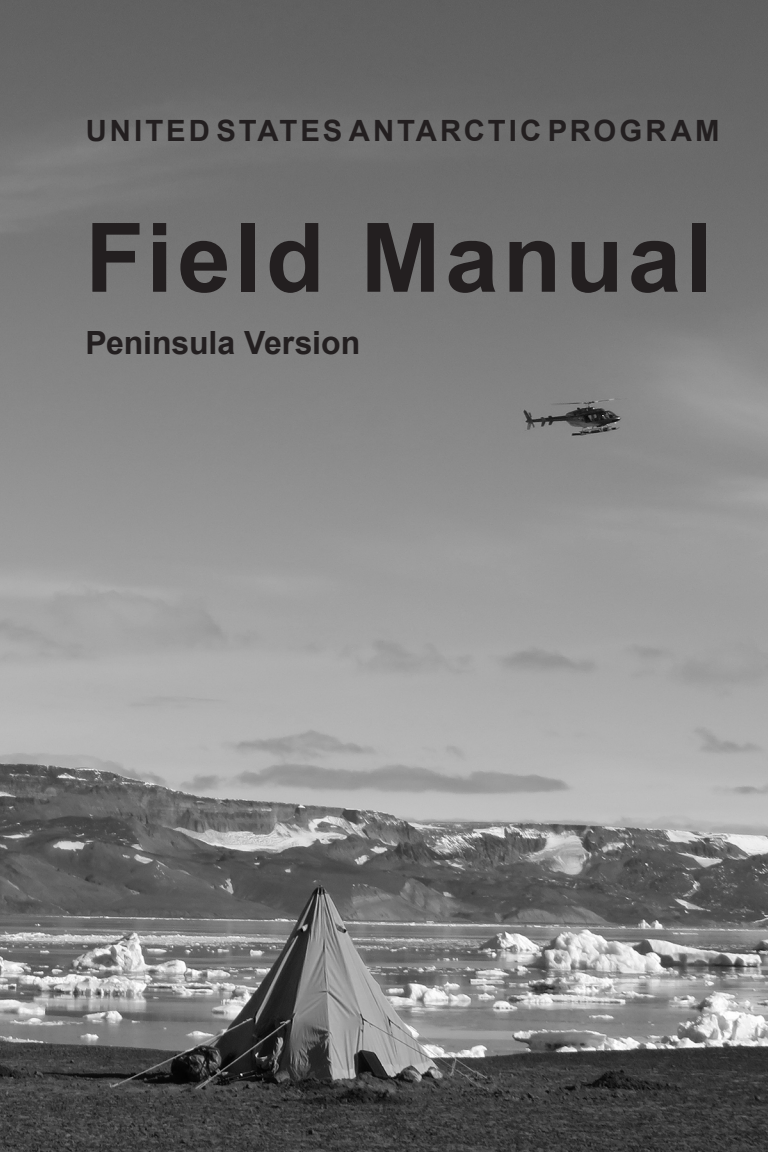
UNITED STATES ANTARCTIC PROGRAM

Field Manual

Peninsula Version



This Manual was prepared for the National Science Foundation's Office of Polar Programs (NSF/OPP) by Antarctic Support Contract (ASC) field support personnel and grantees. It brings together decades of first-hand Antarctic field experience with the United States Antarctic Program (USAP).

November 2020; Publication Number ASC-20-026

Suggestions and corrections are encouraged and should be sent to Cara Ferrier at cara.ferrier.contractor@usap.gov. Written and compiled by Cara Ferrier, Jennifer Blum, and Daniel Powers. Edited by Jim Mastro. Design and layout by Valerie Carroll and Jim Mastro. Illustrations by Mimi Fujino. Maps by Polar Geospatial Center (www.pgc.umn.edu), using data from the USAP's Environmental Research & Assessment, Antarctic Digital Database.

Front cover photo by Amy Westman Belcher. Back cover photo by Cara Ferrier.

Table of Contents

Program Information

National Science Foundation Introduction 1
First Aid Emergency Response Checklist 2
USAP Risk Models 3
USAP Operational Risk Management 3
USAP 6-Step Risk Assessment 3
Checklists 4
Field Camp Put-In Procedures 4
Field Camp Daily Tasking 5
Field Camp Pull-Out Procedures 6
Camp Gear Return Procedures 6
Environmental Guidelines 8
Antarctic Specially Managed Areas (ASMAs) 8
Antarctic Specially Protected Areas (ASPAs) 8
Sites with Visitor Guidelines 11
ACA Permits 11
Specimen Collection and Permits 12
Environmental Training 12
Spill Prevention and Clean-Up 13
Camp Waste Management 13
Hazardous Waste 14
Human Waste 14
Interactions with Animals 15
Non-Native Species 15
Sample Site Markings 16
Environmental End-of-Season (EOS) Report 16
EOS Report Form Instructions 17
Emergency Management 18
Emergency Response Timeline 20
Peninsula Survival Bags 21
Survival Caches 22
Survival Cache GPS Waypoints 22
Survival Cache Barrel Contents 23

Communications

Communication Equipment 26
VHF Radios 26
VHF Radio Operations 26
Frequency Assignments: LMG and NBP 27
Frequency Assignments: Palmer Station 27
Phonetic Alphabet 28
Iridium Satellite Phones 28
Iridium Dialing 28
Iridium Text Messages 29
Iridium Email 30
Iridium Troubleshooting 30
Frequently Used Iridium Numbers 31
Communication Requirements: Day Trips 32
Communication Requirements: Overnight/Multi-Day . . . 32

Field Camp Operations

Field Camp Safety 35
Extreme Cold Weather Clothing 35
Footwear 36
Gloves and Mittens 36
Small Boat Ride Clothing 37
Camp Put-In 37
Loading Cargo from Small Boat to Shore 38
Moving Cargo from Shore to Camp 38
Tasks Before the Vessel Can Depart 38
Campsite Location 39
Wildlife, Vegetation, Sensitive Areas 39
Topography and Weather 39
Travel Time Between Research Site and Boat Landing . . . 39
Camp Layout 40
Survival Cache and Emergency Shelter 40
Shelters 41
Establishing Wind Direction 41
Anchoring the Tent 41
Erecting Tents at Snow Camps 45

Erecting Tents on Sea Ice 45
Erecting Tents on Soil 45
Camp Medical Protocols 45
Camp Hygiene 46
Drinking Water 46
Fire Prevention 47
Rest/Duty Cycles 47
Lifting and Carrying 48
Camp Pull-Out 49
Field Team Tasks on Vessel 49

Field Gear

Pre-Deployment Requirements 51
Stoves 51
Stove Safety 51
Carbon Monixide Risks 52
Carbon Monoxide is Dangerous 52
MSR® Whisperlite™ Gas Stove 53
MSR® Whisperlite™ Stove Troubleshooting 54
Coleman® Gas Stove 55
Coleman® Gas Stove Troubleshooting 57
Coleman® Propane Stove 58
Partner® Steel 4-Burner Stove 59
Heaters 59
Mr. Heater® Single-Tank Top Heater 60
Mr. Heater® Portable Buddy Heater 60
Sleds 60
Sled Types 61
Loading and Securing Cargo 61
Pulling Sleds With a Snowmobile 64
Snowmobiles 64
Operational Guidelines 64
Pre-Ride Inspection 65
Starting the Snowmobile 65
Preventative Maintenance 66
Loading, Towing, and Driving 67
Driver Communication 68

Troubleshooting . . . 68
Honda Generators . . . 70
Generator Safety . . . 70
Pre-Operation Check . . . 71
Starting/Stopping the Engine . . . 71
Troubleshooting . . . 72
Mini-Portable Field Power Systems . . . 72

Weather Observations and Ice Assessment

Antarctic Weather . . . 75
Working in the Peninsula Environment . . . 75
Antarctic Weather Forecasting . . . 76
Field Party Weather Observations . . . 77
Setting Up the Handheld Weather Meter (Kestrel®) . . . 77
Reference Altitude and Barometric Pressure . . . 78
Sea Ice Assessment . . . 78
Weather Considerations . . . 79
Ice Thickness . . . 79
Ice Color . . . 79
Ice Temperature . . . 80
Sea Ice Cracks . . . 80
Crack Types . . . 80
How to Profile a Sea-Ice Crack . . . 81
Ice Crack Safety Standards . . . 81
Sea Ice Crack Guidelines for Snowmobiles . . . 81
Sea Ice Crack Profile Example . . . 82

Cargo Operations

Peninsula Cargo Operations . . . 84
Cargo Requirements . . . 84
Weights and Dimensions . . . 84
Waterproofing . . . 84
Labeling . . . 85
Hazardous Cargo on Vessels . . . 85
Shipping Cargo and Samples to the U.S. . . . 85
Sample Shipment . . . 86
Grantee Tasks in Punta Arenas . . . 86

Reference Information

Wind Chill Chart 88
Conversion Table 89
Chilean Standard Time (CLT) to ZULU Time 90
Temperature Conversion 91
Knots 92
Glossary of Nautical Terms 93
Maps 100
Palmer Station Boating Area 100
Palmer Station Small Boat Operating Range 101
Joubin Islands 102

First Aid

Basic Field First Aid Manual 104
Hygiene 104
Sprains and Strains 104
Bleeding and Wounds 105
Carbon Monoxide Poisoning 106
Hypothermia 107
Frostbite 109
Immersion Foot 111
Eye Injuries 112
Skin Injuries 113
Dental Health 113
Controlled Medications 114
Examination Form (SOAP Note) 115

Program Information

National Science Foundation Introduction

The purpose of this *United States Antarctic Program (USAP) Field Manual* is to provide an overview of USAP field logistics, operations, and safety. It contains information relevant to field deployments and living and working in an Antarctic field camp and is intended to enhance your success in the field. It is your responsibility to be familiar with the skills and techniques covered in this manual.

This is intended to be a reference manual and it should be taken into the field with you. Safety, environmental stewardship, and your health are of paramount importance. Continued vigilance and action in these areas are essential to maintain a safe and productive environment for work in Antarctica.

The harsh conditions encountered in the field, coupled with relatively short deployments and important scientific objectives, require effective leadership and constant risk management from all team members. Reducing the risk of injury and illness depends on a combination of systematic risk assessment, hazard elimination or control, appropriate use of personal protective equipment, and safe work practices.

This manual is designed to be used in conjunction with the *USAP Field Practices Manual* located on www.usap.gov. The *Field Practices Manual* provides pre-deployment, planning information that is useful during the Support Information Packet (SIP) process. Using these manuals and adhering to the guidelines set forth will enhance both your safety and productivity while working in Antarctica.

We wish you a very safe and productive field season.

Kelly Falkner	*Director, Office of Polar Programs*
Scott Borg	*Section Head, Antarctic Sciences*
Stephanie Short	*Section Head, Antarctic Infrastructure and Logistics*

First Aid Emergency Response Checklist

- **Survey the scene.**
  Is it safe? What happened? How many are injured? Who can help?
- **Do a primary assessment of the victim(s).**
  Do an ABC check - Airway, Breathing, Circulation.
- **Call or radio for help.**
  Alert other field team members or people in the vicinity. Request medevac if needed.
- **Do a secondary assessment of the victim(s).**
  Interview the victim(s), check vitals, conduct head-to-toe exam.
- **Call Palmer Station physician.**
  If advanced medical care is required, if medications need to be administered, or if medical advice is required.
- **Stabilize the patient(s) until help arrives.**
  Keep patient(s) warm and dry, move to shelter if possible, and provide food and warm liquids if appropriate. Improvise toilet equipment, if necessary.
- **Provide updates to the Palmer Station physician.**
- **Notify the Palmer Station manager or the marine projects coordinator (MPC) on the supporting vessel as soon as possible.**
  See page 28 of this manual for radio frequencies and page 32 for Iridium phone contact numbers.

USAP Operational Risk Management

Probability	Consequences				
	None (0)	Trivial (1)	Minor (2)	Major (4)	Death (8)
Certain (16)	0	16	32	64	128
Probable (8)	0	8	16	32	64
Even Chance (4)	0	4	8	16	32
Possible (2)	0	2	4	8	16
Unlikely (1)	0	1	2	4	8
No Chance 0%	0	0	0	0	0

None	No degree of possible harm
Trivial	Incident may take place but injury or illness is not likely or it will be extremely minor
Minor	Mild cuts and scrapes, mild contusion, minor burns, minor sprain/strain, etc.
Major	Amputation, shock, broken bones, torn ligaments/tendons, severe burns, head trauma, etc.
Death	Injuries result in death or could result in death if not treated in a reasonable time.

USAP 6-Step Risk Assessment

USAP 6-Step Risk Assessment	
1) Goals	Define work activities and outcomes.
2) Hazards	Identify subjective and objective hazards.
3) Safety Measures	Mitigate risk exposure. Can the probability and consequences be decreased enough to proceed?
4) Plan	Develop a plan, establish roles, and use clear communication, be prepared with a backup plan.
5) Execute	Re-assess throughout activity.
6) Debrief	What could be improved for the next time?

Field Camp Put-In Procedures

Planning for camp put-in:

- Review the daily communication schedule and confirm check-in times with Palmer Station or supporting vessel.
- Make sure Iridium satellite phones are programmed with contact phone numbers (e.g., vessel bridge, Palmer Station medical).
- Charge batteries for Iridium satellite phones, VHF radios, and all other electronics.
- Review the cargo plan and the order in which items will go ashore. Life safety and communication equipment should go in first. Identify who will assist on deck, who will facilitate cargo operations at the shore landing zone, and who will lead the camp set up.
- A day or two before put-in, coordinate with the marine projects coordinator (MPC) to hold a safety briefing in the lounge with the shore party, any ship volunteers, and ASC staff.
- Review the environmental and field camp end-of-season report forms and instructions. Be prepared to record the required data daily.

On day of camp put-in:

- Evaluate shore landings. Two landing sites are preferred in case one is inaccessible by ice, swell, or wildlife.
- Determine the best location for the camp site. Observe the terrain for hazards to avoid, and identify the most protected areas for your shelters. The camp should be placed well above the high tide and storm surge lines and be sheltered from the wind.
- Determine if a source of fresh water is available.
- Assist in unloading cargo from the boats.
- Guide volunteers on the safest way to move cargo to the camp site.
- Place the cargo in an area that keeps it out of the way when camp is constructed.

Before the vessel departs:

- Establish a shelter. Set up at least one tent. (A large, communal tent is preferred.)
- Establish a heat source. (Light a camp stove.)
- Establish communications with the camp point-of-contact (POC), confirming that a shelter is erected and a stove is functioning. The vessel cannot depart until there is a reliable communications link.

Day one:

- Set-up all sleeping tents.
- Outfit the kitchen tent and create a food storage area.
- Check that all tent anchors are well set and all guy lines are taut.

In the first 24 hours:

- Place all fuel containers and all equipment with a fuel tank (e.g., generators) in secondary containment.
- Identify disposal locations for human waste and gray water.
- Establish a survival cache away from camp, in a well-sheltered area.

Field Camp Daily Tasking

Communications:

- Complete the daily check-in call before the appointed time. Some locations may require more than one call during the day.

Housekeeping, health and safety:

- Inspect the camp area daily. All tent guy-lines should be taut. Everything should be secure. Wind can increase at any time.
- Maintain an awareness of weather conditions.
- Check for and clean up any pollutant spills.
- Ensure waste is properly sorted, per vessel or Palmer Station requirements.

Record keeping:

- Record any pollutant spills using the Field Spill Reporting Sheet.
- Record the data required in the environmental and field camp end-of-season reports, such as water and fuel usage, the number of people in camp, estimates of human waste and gray water discharge, and weather information (see page 17 of this manual).

Resupply:

- If there is no fresh drinking water available near the camp, conduct a daily inventory of bottled water. Maintain a seven-day emergency supply for everyone at camp, and let the supporting vessel know when a water resupply is required.

Field Camp Pull-Out Procedures

In the days leading up to pull-out:

- Package equipment and cargo that is not being used. This can be time consuming. Label all Rubbermaid bins with the contents.
- Re-package and label hazardous cargo.
- Identify a staging area next to the landing zone and place cargo there when it is packaged and ready to go. Keep it well above the high tide and storm surge lines, and tie it down.
- Communicate with the MPC regarding pull-out details, such as the estimated number of small boat trips it will take to remove all personnel and cargo. Determine how many vessel staff can assist ashore.

Day of pull-out:

- Assess the landing site for ice and swell conditions. Report this information to the MPC, along with local weather conditions and any other pertinent information regarding the pull-out.
- If the weather window allows for camp pull-out, take down all tents.
- Transport all remaining items to the loading zone.
- Visually scan the camp site to ensure all items are removed.

On board the vessel:

- Take the time necessary to clean and return all equipment to its proper storage area or department. See “Camp Gear Return Procedure” for details.
- Hose off or brush off muddy and dirty items on deck. Review the Environmental section of this manual for information on preventing cross contamination when visiting multiple locations. Techniques include using the boot wash station and cleaning all equipment, including camera tripods.
- Hang tents and other wet items in the Baltic Room to dry.

Camp Gear Return Procedures

Grantees using field gear are responsible for unpacking, cleaning, sorting, and assisting in returning all equipment to the Field Room in Punta Arenas (PA). Work with the field supervisor, if present. Otherwise, arrange gear return with the MPC or Palmer Station lab supervisor. Returns can take anywhere from an hour to two days, depending on the type of gear and its condition. Most groups re-deploy three days after the vessel arrives in Chile. Please plan accordingly.

- Remove all duct tape and tags from the gear.
- At the PA warehouse, empty the contents of the sleep kits and put all items to be laundered inside one or two salt/concrete bags.
- Report any damage to the field supervisor, or affix a tag to each damaged item with an explanation of the problem. The field supervisor will inspect the gear and compare it to your RSP allocations. If there are discrepancies, it could delay your redeployment.
- If field cargo or equipment needs to be shipped off the vessel, use the Marine Operations Cargo Application (MOCA) database to create a Transportation Control Number (TCN). Use the Peninsula field project code (879) when creating TCNs, and email a list of them to the field supervisor.
- Field cargo or equipment shipped from Palmer Station is assigned a shipping number from the Maximo materials management database. Palmer Logistics personnel will assign these numbers. As with TCNs, a list of these numbers should be emailed to the field supervisor. (See the Cargo Operations section for more information.)

Items Needing Extra Attention:

- **Tents** – All communal cook tents must be set up in the PA warehouse, swept out, and scrubbed. The field supervisor or MPC can coordinate with DAMCO to determine the best warehouse and location for this. If there are holes in the tent or any other problems, such as cut guy lines, affix a tag explaining the problem to the outside of the tent bag.
- **Dishes, thermos™ bottles, food coolers, stoves, water coolers, and five-gallon buckets** – These items are to be returned clean. Ask the MPC for the best location on the vessel to wash and dry kitchen items.
- **Equipment** – Please inform the field supervisor, in person or by email, if there are any problems with field equipment.
- **Pee bottles and toilet seats** – Clean and bleach these items. It is easiest to do this on the vessel, as there is not much space in the warehouse. Please do not leave them for other people to wash. Do not dump bleach overboard or down drains. See the marine laboratory technician (MLT) for assistance.
- **Jerry cans** – Please label any full or partially full jerry cans with 1) the type of fuel, and 2) the word "FIELD." Request that the MPC ask DAMCO to place these in hazardous storage.

Environmental Guidelines

Environmental stewardship and protection in the Antarctic is essential. The United States is a signatory to the Antarctic Treaty (1959) and the Protocol on Environmental Protection to the Antarctic Treaty (Protocol, 1991). These agreements are implemented under the Antarctic Conservation Act of 1978, Public Law 95541 (16 U.S.C. 2401 *et seq*), as amended by the Antarctic Science, Tourism, and Conservation Act of 1996, Public Law 104-227.

The Antarctic Treaty sets Antarctica aside for peaceful purposes, primarily scientific research, cooperation, and the exchange of information. The Protocol commits to comprehensive protection of the Antarctic environment, including a ban on commercial mineral exploration. Through its six Annexes, it requires an environmental impact assessment of all proposed actions and the conservation of native fauna and flora (including management activities to limit introduction of non-native species). The Protocol also establishes protocols for waste disposal and waste management, prohibits marine pollution, and establishes a process for area protection and management. USAP participant adherence to Protocol obligations relies on educational programs for each of these areas.

U.S. Federal regulations implementing the ACA can be found in the Code of Federal Regulations (CFR) Title 45, sections 640, 641, and 670 through 674. For questions or to obtain additional information, contact ASC Environmental (Environmental@usap.gov).

Antarctic Specially Managed Areas (ASMAs)

ASMAs are areas in which careful planning and coordination are required to avoid activity conflicts, improve coordination among field parties, and reduce the risk of cumulative environmental impacts.

There are three ASMAs located in the Peninsula region: Admiralty Bay, King George Island (ASMA 1); Deception Island (ASMA 4); and Southwest Anvers Island and Palmer Basin (ASMA 7). Before entering and/or conducting research in these ASMAs, be sure to understand the management objectives and requirements for working there (www.ats.aq/e/ep_protected.htm).

Antarctic Specially Protected Areas (ASPAs)

ASPAs are areas designated to protect outstanding environmental, scientific, historic, aesthetic, or wilderness values. This includes protecting ongoing scientific research from inadvertent disruption or

contamination. ASPAs require an ACA permit to enter. There are numerous ASPAs located along the Peninsula. Management plans for each one, including the values to be protected and an environmental code of conduct, can be found at www.ats.aq/. The Peninsula area ASPAs include:

- Harmony Cove, ASPA 33
- Dion Islands, ASPA 107
- Green Island, ASPA 108
- Moe Island, ASPA 109
- Lynch Island, ASPA 110
- Southern Powell Island, ASPA 111
- Coppermine Peninsula, ASPA 112
- Litchfield Island, ASPA 113
- Lagotellerie Island, ASPA 115
- Avian Island, ASPA 117
- Fildes Peninsula, ASPA 125
- Byers Peninsula, ASPA 126
- Rothera Point, ASPA 129
- Potter Peninsula, ASPA 132
- Clerva Point, ASPA 134
- Biscoe Point, ASPA 139
- Chile Bay (Discovery Bay), ASPA 144
- South Bay, ASPA 146
- Ablation Valley and Ganymede Heights, Alexander Island, ASPA 147
- Mount Flora, Hope Bay, ASPA 148
- Cape Shirreff, ASPA 149
- Ardley Island, Maxwell Bay, King George Island (25 de Mayo), ASPA 150
- Lions Rump, ASPA 151
- Western Bransfield Strait, ASPA 152
- Eastern Dallmann Bay, ASPA 153
- Marion Nunataks, Charcot Island, ASPA 170
- Narebski Point, ASPA 171

Historic Sites and Monuments (HSMs) have their own management plan and requirements. Peninsula HSMs are:

- San Martin abandoned station, HSM 26
- Charcot's Cairn 1909, HSM 27
- Charcot's Cairn 1904, HSM 28

- Lighthouse “Primero de Mayo,” HSM 29
- Shelter ‘Gabriel Gonzalez Videla’, HSM 30
- Prat Base Monolith, HSM 32
- Gonzalez Pacheco Shelter, HSM 33
- Arturo Prat’s Bust, HSM 34
- Virgin of Carmen Statue, HSM 35
- Dallman Expedition Plaque, HSM 36
- O’Higgins Historic Site, HSM 37
- Hope Bay Hut, HSM 39
- General San Martin’s Bust, HSM 40
- Paulet Island Hut, HSM 41
- Scotia Bay Huts, HSM 42
- Polish Eagle Plaque, HSM 50
- Great Wall Station Monolith, HSM 52
- Endurance Memorial Site, HSM 53
- East Base, HSM 55
- Waterboat Point Hut, HSM 56
- MacFarlane’s Plaque, HSM 57
- San Telmo Cairn, HSM 59
- Wooden Pole and Cairn (I) and Wooden Plaque and Cairn (II) at Penguins Bay, southern coast of Seymour Island (Marambio Base), James Ross Archipelago, HSM 60
- Port Lockroy, HSM 61
- Base F Wordie House, HSM 62
- Base Y, HSM 63
- Base E, HSM 64
- Un-Named Cove, HSM 74
- Antarctic Treaty Monument, HSM 82
- Base W, Detalille Island, Lallemand Fjord, Loubet Coast, HSM 83
- Hut at Damoy Point, Dorian Bay, Weincke Island, Palmer Archipelago, HSM 84
- No. 1 Building at Great Wall Station, HSM 86
- Lame Dog Hut, St. Kliment Ohridski Base, Livingston Island, HSM 91

Several Peninsula ASPAs and HSMs are located within Peninsula ASMAs. In ASMA 1, the protected areas are:

- Western Shore of Admiralty Bay, ASPA 128
- Puchaslki Grave, HSM 51

In ASMA 4, the protected areas are:

- Whalers Bay, HSM 71
- Aguirre Cerda Station Ruins, HSM 76
- Parts of Deception Island, ASPA No. 140
- Port Foster, ASPA 145
- Four Sites with Visitor Guidelines:
  - Pendulum Cove
  - Baily Head
  - Whalers Bay
  - Teflon Bay

In ASMA 7, the protected areas are:

- Litchfield Island, ASPA 113
- Biscoe Point, ASPA 139

In addition to the ASPAs in ASMA 7, there are 16 Restricted Areas (Bonaparte Point, Christine Island, Cormorant Island, Dream Island, Elephant Rocks, Hermit Island, Humble Island, Joubin Islands, Laggard Island, Limitrophe Island, Norsel point, Rosenthal Islands, Shortcut Island, Shortcut Point, Stepping Stones, and the southwest portion of Torgersen Island. Torgersen Island is also a Site with Visitor Guidelines (described separately). Contact the MPC or station manager for up-to-date information on entering these areas.

Sites with Visitor Guidelines

The purpose of Sites with Visitor Guidelines is to provide specific instructions on conducting activities at frequently visited Antarctic sites. This includes practical guidance on visiting these sites, taking into account their environmental values and sensitivities. Recreational visits to Sites with Visitor Guidelines should be reported in your end-of-season report or to your MPC. For more information and a list of sites, visit: www.ats.aq/e/ats_other_siteguidelines.htm.

For more information on ASMAs, ASPAs, or HSMs, refer to www.ats.aq or contact ASC Environmental at Environmental@usap.gov.

ACA Permits

An ACA permit is required to: 1) enter and work in an ASPA; 2) take native mammals or birds, or remove or damage quantities of native terrestrial or freshwater plants such that their local distribution or abundance would be significantly affected; 3) engage in harmful interference with native mammals, birds, non-marine invertebrates and non-marine plants; 4) introduce non-native species into Antarc-

tica; or 5) export native mammals or birds or parts thereof. The term "take" also applies to dead mammals or birds, bird eggs, or any animal parts, such as teeth, feathers, or bones.

Processing time for ACA permits is three months. Violations of the ACA or of the conditions of a permit will result in fines. Research with marine invertebrates, plants, and fish do not require an ACA permit.

An ACA permit is not needed for entry into an ASMA. However, personnel entering or working in an ASMA are required to know and follow the code of conduct specified in the applicable ASMA management plan. If there are questions regarding ASMAs, ASPAs, or ACA permits, refer to the permit's language, consult with the field supervisor or MPC, or contact the NSF ACA permit officer at acapermits@nsf.gov.

Specimen Collection and Permits

Refer to the project's permit regarding specimen collection. The following applies to all research conducted in the Antarctic:

- Collecting souvenirs is not allowed. Do not remove any specimens from Antarctica, including feathers, rocks, or shells, without a permit from the NSF. This includes historical evidence of humanity's presence, (e.g., whale bones from early whaling expeditions).
- Do not take, handle or remove items that could potentially be historic artifacts. From the Antarctic Treaty Guidelines: "If there is uncertainty as to the age of a newly discovered historic artifact/site it should be treated as a pre-1958 artifact/site until its age has been established." If any USAP participant finds something that MAY have historical significance, the location should be noted with GPS, a photo of the artifact should be taken, and ASC or NSF Environmental should be notified of the artifact's presence (Environmental@usap.gov).
- The Marine Mammal Protection Act of 1972 prohibits U.S. citizens from taking or importing marine mammals or parts of marine mammals into the United States without a permit.

Environmental Training

All personnel deploying to and/or conducting field work along the Antarctic Peninsula are required to attend environmental trainings (provided by the field supervisor or designee) to ensure they understand what is expected of them under the ACA and the Antarctic Treaty.

Spill Prevention, Clean-Up, and Reporting

- All fuels, chemicals, and hazardous liquid wastes should be stored with secondary containment. Where secondary containment is not feasible, best management practices should be employed to protect the environment from a release. These practices include regular inspections of all liquid stores during transport, using absorbent materials, using two people for transfers, ensuring spill response capabilities are available, and any other means as necessary or prudent.
- Primary storage containers should be of durable construction and sealed when not in use.
- Appropriate secondary containment and spill kits must be available for any fueling operation to reduce the occurrence of spills.
- All spills of designated pollutants (e.g., fuel, glycol, transmission fluid) need to be reported immediately upon their discovery, regardless of the volume spilled.
- For camps with a camp manager, spills should be reported directly to the camp manager. For camps without a camp manager, spills should be reported to the Palmer Station manager, the MPC on the vessel, or whoever is designated as the POC for the daily check-in.
- All spills must be cleaned to the greatest extent practicable and disposed of through the hazardous waste system.

Camp Waste Management

Waste management should be discussed with the field supervisor and/or each project implementer before camp personnel deploy to the field. Protocols may vary depending on the type of camp and location (e.g., if the camp is in or near an ASPA). In general, everything taken into the field must be brought out, with the exception of human waste and gray water at most Peninsula field camps.

- Wastes generated at field camps are removed by the camp staff and grantees and transported to supporting stations or ships for disposal.
- Peninsula field camps dispose of food waste and gray water into the intertidal zone, though there are some exceptions where everything must be packed out (i.e. when camps are in or near certain ASPAs).
- Raw chicken products are not allowed at field camps because avian food and food by-products have been

identified as sources of pathogens and microorganisms that may threaten indigenous wildlife communities. *Avian products (eggshells or meat) must be incinerated on the vessel or at Palmer Station, or disposed of in Punta Arenas*.

- It will simplify the camp pullout process if items are consolidated and/or compressed, which makes it easier to pack them.

Waste Packing for Incineration

All camp solid waste must be properly sorted and bagged for return to the vessel. Most non-hazardous waste will be incinerated on the vessel, but the following items cannot go in the incinerator and should be bagged separately for disposal in Punta Arenas:

- Any and all glass, including broken glass
- Metal
- Wire or wire rope
- Electronics
- Batteries
- Aerosol cans
- Hazardous waste items, as listed below

Hazardous Waste

The ACA has strict guidelines on hazardous waste, which requires special handling and labeling. Be sure to remove all hazardous waste from the field at the end of each season.

Questions regarding hazardous waste management should be directed to the MPC, who will work with the marine laboratory technician aboard the research vessel. Hazardous waste includes:

- Fuel and fuel-contaminated material
- Lab waste
- Chemical containers
- Aerosols
- Radioactive material
- Batteries
- Biohazardous waste

Human Waste

- Human waste must not be discharged onto ice-free land, onto sea ice, or in blue-ice areas. Discharge can only occur in the intertidal zone, and only if planned for in advance. If working in an ASPA, please review the specific

ASPA management plan to ensure discharge of human waste in the intertidal zone is acceptable (refer to http://www.ats.aq/devPH/apa/ep_protected.aspx?lang=e#).

- Typically, human waste is collected in five-gallon buckets lined with biodegradable bags. The bags are disposed of in the intertidal zone and the buckets reused. Discuss bathroom set-up with the Peninsula field supervisor.
- Discharging urine on land is not allowed anywhere in Antarctica. Field participants must carry and use a pee-bottle when bathrooms or tidal areas are not available. Urine in pee bottles should be disposed of upon return to the field camp or the vessel, or it may be disposed of in a tidal area (as noted above) where it is easily dispersed in the marine environment.

Usage Rates for Buckets and Containers

Human Waste Type	Container Type	Persons/Days
Fecal Waste	5-gallon bucket (1)	5 people for 5 days (minimum)
Urine	5-gallon bucket (1)	1 person for 5 days
Gray Water	5-gallon bucket (1)	1 person for 5 days

Interactions with Animals

- Personnel should not interfere with wildlife unless they have an ACA permit and are specifically trained for the activity being conducted.
- In general, maintaining a distance of 15 to 20 feet from animals should be sufficient, but if an animal's behavior is altered or disturbed, the distance should be increased.

Non-Native Species

- No non-native species of animal or plant may be introduced onto land, ice shelves, or into water in the Antarctic Treaty area, except in accordance with an ACA permit.
- To avoid introducing non-native species, personnel must clean all science gear and personal equipment before arriving in Antarctica.
- Boot washing stations should be used before departing the vessel for field sites, and they should be used between field sites.
- To avoid cross contamination, personnel must also clean all other gear and personal equipment before transiting between Antarctic field sites.

- If a suspected non-native species is observed in Antarctica, it should be reported immediately to the camp manager or daily check-in POC.

Sample Site Markings

Should a research group need to mark sample sites, reusable and recoverable flags should be used. If flags cannot be used, the only acceptable paint marker is chalk paint, which can be washed or worn away. Prior approval for using paint markings should be obtained from NSF/OPP Environmental personnel.

Environmental End-of-Season (EOS) Report

At the conclusion of field activities, all science groups must submit an Environmental EOS report to Environmental@usap.gov. The EOS form (a Microsoft Excel-based template) is available on the vessel intranet, or science personnel can email the above address to obtain it.

To make the process simpler and more accurate, the report should be populated with information throughout the season.

General Information Required

The following information must be tracked and quantified in the EOS report. Please refer directly to the report form for specifics.

Section A – Field Camp Summary

Part 1: Camp or site information

Part 2: Fuel use

Part 3: Hazardous materials use (non-fuel)

Part 4: Waste disposition

4a: Containerized waste

4b: Discharged sanitary waste

Part 5: Items remaining at camp closeout (fuel, hazardous materials, waste)

Part 6: Fuel, waste handling, spill prevention and spill response suggestions

Section B – Summary of Field Activities

Part 1: Equipment deployed

Part 2: Materials released

Part 3: Spills

EOS Report Form Instructions

- Please complete the EOS report form thoroughly and send it electronically as a Microsoft Excel file to ASC Environmental (Environmental@usap.gov).
- Completing the form is a requirement for each science group and ASC work center. All EOS reports are submitted to the NSF, and data in the reports are compiled in the USAP Master Permit report.
- All principal investigators (PIs) or their designated environmental POC must complete the form. Field camp managers must complete a form separately.
- Please use the drop-down menus in the Microsoft Excel spreadsheet form for consistent reporting.
- For all field parties, please submit GPS coordinates of any science equipment installations, sampling or coring locations, temporary camps, releases (planned and unplanned), any equipment left in the field over the winter, and/or disturbances of any kind (past or present). GPS data should be reported in decimal degrees to five decimal places.
- Specific to field parties operating in an ASMA or ASPA, please submit GPS coordinates for each of the following environmental disturbances:
  - Sample sites
  - Soil pits
  - Non-established helicopter landing sites
  - Tent sites outside facility zones (remote camps) – please take GPS coordinates of the camp perimeter
  - Fuel storage locations outside facility zones
  - Waste handling and storage sites outside facility zones
  - Any releases of fuel (intentional or unintentional), equipment, or any other material.
- Refer to the ASMA or ASPA management plan at www.ats.aq/documents/ATCM38/WW/atcm38_ww005_e.pdf for additional details.
- Contact ASC Environmental (at the above email address) with any questions or comments regarding the EOS form or any other environmental issue.
- Please save and send the form with the file name: Group number_PI_YearEOS.xlsx (e.g., B-001_Smith_2017_EOS.xlsx)

Emergency Management

The RVIB *Nathaniel B. Palmer* (NBP) and R/V *Laurence M. Gould* (LMG) bridges are staffed 24/7 and can connect the caller to the MPC in the event of an emergency. The Iridium phone line at Palmer Station rings in several locations and someone will answer during the day or night. Depending on the situation, the MPC or Palmer staff will gather information to assess needs and risks and determine appropriate actions.

If There is an Emergency

- Notify the vessel bridge or Palmer Station immediately (see page 28 of this manual for radio frequencies).
- If it is a medical emergency – Use Iridium, if possible, to call the Palmer Station doctor. If working from a ship, inform the MPC as well (see page 32 of this manual for Iridium numbers).

Emergency Management at a Field Camp

In the event of an emergency or search-and-rescue (SAR) event at a Peninsula field camp, the ASC camp manager or science field team leader becomes the on-site incident commander. This individual is responsible for establishing communication with the supporting vessel or station and providing a situation report.

If the field team is supported by a vessel, the incident commander will contact the master of the vessel, the MPC, and the chief scientist. If the team is supported by Palmer Station, the incident commander will contact the station's communication technician. Coordination between the incident commander, the NBP and/or the LMG, and Palmer Station will determine which resource could provide the proper response.

If it is a medical emergency, communication and consultation between the incident commander, the vessel emergency medical technician (EMT), and the Palmer Station physician will be initiated immediately to determine treatment protocols.

Broader Crisis Management and Recovery

Under international search and rescue arrangements, Peninsula field camps fall within the Chilean Search and Rescue Region. Therefore, the Search and Rescue (SAR) Service of Chile will conduct broader crisis management and recovery, to include international coordination. The Chilean Rescue Coordination Centre (RCC)

is the lead for International Maritime Organization and International Civil Aviation Organization (IMO/ICAO) purposes.

In all emergencies, the NSF/OPP will be made aware and will be involved in any international coordination efforts.

Camp Supplies for Emergency Planning

Field camps should have enough food, water, and fuel on hand for seven days beyond the planned stay, in case of vessel pick-up delays. Generally, the extra food takes the form of dehydrated meals. Additional water could be from containers, snow melt, or streams, depending on the location. Plan for five liters of water per person per day. This includes water for drinking, cooking, cleaning, and personal hygiene.

Team members must also bring a sufficient amount of personal medication and other supplies to accommodate an extended stay in the field.

Day Trips

Projects intending to remain in the field for one day or part of a day must have at least two people, a sufficient number of survival bags, proper clothing, and two VHF radios or two Iridium phones with spare batteries. All personnel should keep in mind there is a chance that weather or other circumstances may cause them to remain in the field overnight.

Emergency Response Timeline

For a distress call or for failure to check in from:

Palmer: Glacier travel, local and extended boating area, or field camp
Vessel: Small boat operations, sea ice (snowmobile or foot travel), island team, or field camp

Uncertainty Phase for Late Check-in		
Palmer Station foot travel (glacier/ backyard/island drop-off)	5 min	Palmer Station manager notified
Palmer Station small boat - local and extended area	5 min	
Vessel - small boat, snowmobile, sea ice foot travel	5 min	Vessel MPC notified
Vessel - island team	5 min	
Established field camp (Palmer or vessel deployed)	60 min	Station manager or MPC notified

Alert Phase for Late Check-in		
Palmer Station foot travel (glacier/ backyard/island drop-off)	5 min	Palmer Station manager alerts OSAR/GSAR teams
Palmer Station small boat - local and extended area	5 min	
Vessel - small boat, snowmobile, sea ice foot travel	15 min	MPC alerts vessel staff
Vessel - island team	30 min	
Established field camp (Palmer or vessel deployed)	6 hrs	SAR teams/vessel staff alerted

Deployment Phase for Late Check-in		
Palmer Station foot travel (glacier/ backyard/island drop-off)	10 min	Palmer Station OSAR/GSAR teams deploy
Palmer Station small boat - local and extended area	10 min	
Vessel - small boat, snowmobile, sea ice foot travel	30 min	Vessel staff deploys
Vessel - island team	1 hr	
Established field camp (Palmer or vessel deployed)	24 hrs*	SAR team or vessel staff deploys*

Distress Call

Palmer Station Manager or Vessel MPC notified immediately

SAR team or vessel staff alerted immediately

SAR team or vessel staff deploys as soon as possible

*Exact time depends on vessel location

Recovery and de-briefing

Peninsula Survival Bags

Needed - When disembarking from a small boat onto shore or sea ice. Bag will be left with disembarking personnel.

Not Needed - At a location with a survival cache, at a camp with all the components of a survival bag (e.g., Cape Shirreff), or if a boat remains with the field team and the boat's kit has enough supplies for everyone.

Survival Bag Contents

Supports two people for three days

- 2 ea sleeping bags (0 degree Marmot Trestles)
- 2 ea bivy bag
- 2 ea ensolite™ pad, 24"x48"
- 1 ea Fitzroy bivy tent, with instructions
- 1 ea collapsible snow shovel
- 1 ea First Aid kit

Tent stake bag:

- 10 ea assorted stakes
- 2 ea ice screws
- 2 ea snow flukes
- 1 ea plastic mallet/hammer

Cook & Stove Set Bag:

- 1 cook set, 1-2 pots with lids
- 1 ea MSF Whisperlite™ stove w/instructions & repair kit
- 4 bx matches, 35/bx wrapped in foil
- 1 ea MSR® fuel bottle, 20-30 oz., full

Toilet Paper:

- 1 roll toilet paper

Food Bag:

- 6 ea dehydrated meals
- 3 ea large chocolate bars or 6 ea small
- 12 ea tea bags, assorted
- 12 ea hot chocolate
- 2 pk Mainstay™ food bars, 9 bars/pk (2 per person per day)
- 18 ea water packets, 6 oz.

Utensil set contains:

- 1 ea pot handle
- 2 ea mug, hard plastic
- 2 ea spoon
- 1 ea Leatherman™ or Swiss army knife

Ziplock™ Bag:

- May contain a book or game, not essential
- 1 ea survival manual
- 50 ft parachute cord
- 1 ea contents list

Survival Caches

Peninsula Survival Cache Locations

In the Palmer Station Boating Area, eleven survival cache locations across the standard, extended, and beyond extended boating areas provide coverage to places that are most frequented by scientists and operational support staff. These locations are listed below. The number in parentheses refers to the number of complete cache-barrel sets. (Note: Two backup cache-barrel sets are maintained at Palmer Station.)

Within the standard boating area:

Humble Island (2)

Christine Island (2)

Outcast Islands (1)

Cormorant Island (1)

Within the extended boating area:

Dream Island (2)

Access Point (1)

Beyond the extended boating area:

Gossler Island 405 (1)

Wauwermans Island 514 (1)

Joubin Island 8 (2)

Joubin Island 1 (1)

Joubin Island 76 (1)

Survival Cache GPS Waypoints

As Listed in GPS	Description	Coordinates
CHRS-C	Christine Cache	S64 47.537 W64 01.263
CHRS-L	Christine Landing	S64 47.584 W64 01.099
CORM-C	Cormorant Cache	S64 47.588 W63 57.960
CORM-L	Cormorant Landing	S64 47.533 W63 57.977
DREM-C	Dream Cache	S64 43.533 W64 13.426
DREM-L	Dream Landing	S64 43.493 W64 13.376
HERM-C	Hermit Cache	S64 47.900 W64 01.006

HERM-L	Hermit Landing	S64 47.938 W64 00.957
HUMB-C	Humble Cache	S64 45.905 W64 04.989
HUMB-L	Humble Landing	S64 45.896 W64 04.964
JANS-C	Janus Cache	S64 47.008 W64 05.978
JANS-L	Janus Landing	S64 46.963 W64 06.163
OLDP-C	Old Palmer SAR Cache	S64 45.866 W64 04.530
OLDP-L	Old Palmer Primary	S64 45.870 W64 04.664
OUTC-C	Outcast Cache	S64 48.322 W64 08.079
OUTC-L	Outcast Landing	S64 48.307 W64 08.020
SHRT-C	Shortcut Cache	S64 46.960 W64 02.570
SHRT-L	Shortcut Landing	S64 46.961 W64 02.620
STEP-C	Stepping Stone Cache	S64 47.058 W63 59.509
STEP-L	Stepping Stone Landing	S64 47.036 W63 59.484
TORG-C	Torgersen Cache	S64 46.306 W64 04.528
TORG-L	Torgesen Landing	S64 46.296 W64 04.541

Survival Cache Barrel Contents

Barrel 1:

- 1 radio
- 1 razor blade taped to barrel lid
- 1 pocket knife with can opener
- 1 roll toilet paper
- 1 box matches (water/wind proof)
- 1 First Aid kit
- 1 book: *Medicine for Mountaineering*
- 1 headlamp
- 2 sets long underwear (tops and bottoms)
- 2 pair glove liners
- 2 pair socks
- 2 balaclavas
- 2 sets boot liners
- 1 tent
- 1 sleeping bag
- 2 sleeping pads
- 2 USCG emergency rations (8 days each)
- 12 bags water, 4 oz. each

Barrel 2:

- 1 book: Antarctic Survival
- 1 book: *Knot Tying*
- 1 deck of cards
- 1 signal flag
- 1 signal mirror

- 1 coil of parachute cord (50 ft)
- 5 candles
- 1 box matches (water/wind proof)
- 2 emergency space blankets
- 2 all-weather tarps/blankets
- 2 sets cold weather mittens
- 1 piezoelectric lighter (yellow)
- 1 set rain gear (jacket and pants)
- 1 sleeping bag
- 2 sleeping pads
- 2 sets silverware
- 1 mess kit (dish, pot, skillet, cups)
- 1 stove, with pump and directions
- 2 bottles fuel
- 4 energy bars
- 4 meals, dehydrated
- 12 bags water, 4 oz. each

Barrel 3:

- 1 box matches (water/wind proof)
- 5 candles
- 1 coil of parachute cord (50 ft)
- 3 emergency space blankets
- 1 roll duct tape
- 1 tube sunblock
- 2 sets long underwear (tops and bottoms)
- 2 pair glove liners
- 2 pair socks
- 2 balaclavas
- 2 sleeping bags
- 4 meals, dehydrated
- 2 USCG emergency rations (8 days each)
- 12 bags water, 4 oz. each
- 1 whistle

Communications

Communications Equipment

If deploying to a field camp from a vessel, pick up communication equipment from the Peninsula field supervisor or the electronics technician. At Palmer station, the communications technician issues equipment.

- Test the gear by calling the vessel or station to make sure the VHF radios and Iridium phones are working correctly.
- Make sure there are spare charged batteries for each device

VHF Radios

VHF radio is the primary form of wireless communication at Palmer Station and on the vessels. This is a shared resource monitored by multiple users. Proper radio etiquette should be maintained when transmitting on this or any radio network. Always refer to frequencies by the channel name and not the channel number. Radio communications should be brief and on-topic.

Palmer Station deploys three different VHF systems:

1) **Simplex.** In this system, each unit communicates directly with other units. All units use the same frequency to transmit and receive, so communications are one-way and one-at-a-time.
2) **Simplex with Base Station.** Where buildings and hills block radio signals, a base station is used. An antenna is placed at the highest point, such as a hill, a tall building, or a radio tower. The radio at the tower, called a "base station," is connected to a remote dispatcher's console. All units, including the base station, transmit and receive on the same frequency. If two units can't communicate directly, the dispatcher relays messages.
3) **Semi-Duplex.** For areas farther from Palmer Station, semi-duplex repeaters are used. A repeater is a receiver/transmitter combination. The repeater is installed on a hill, a tall building, or a radio tower, and it automatically retransmits the signal it receives on one frequency on another frequency. The control point at the dispatcher's desk transmits and receives just like a mobile radio.

VHF Radio Operations

- Listen before transmitting (to ensure the channel is not in use).
- Hail vessel or Palmer Station and wait for reply before giving check-in information.

- Pause for a moment after pressing to transmit to ensure entire transmission gets through.
- Keep batteries warm (and always carry a spare).
- Do not over-use repeaters (power conservation).

Frequency Assignments: LMG and NBP

Channel	Frequency (MHz) (Transmit/Receive)	Name/Description
5A	156.250	LMG main channel for communications; bridge monitors constantly
06	156.300	NBP main channel for communications; bridge monitors constantly
08	156.400	Alternate channel for frequent communications that would disrupt channels 5A or 06
10	156.500	Helicopter communications channel
13	156.650	Inter-ship navigation safety channel (bridge to bridge); ships >20m length maintain listening watch on this channel in U.S. waters; usually monitored by bridge but turned down in Punta Arenas because of fishing boat chatter
16	156.800	International distress and safety channel; all ships required to carry a radio, the USCG, and most coast stations maintain a listening watch on this channel; the vessel bridge monitors it constantly, and it is often used for initial ship-to-ship contact in Antarctica

Frequency Assignments: Palmer Station

Channel	Transmit (MHz)	Receive (MHz)	Use
25	156.250	161.850	Field activities; reaches glacier repeater
27	157.350	161.950	Palmer Station

Note: Palmer Station has two repeaters, which are linked. Anyone using either channel is heard on both.

Phonetic Alphabet

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

A	**Alpha**	**H**	**Hotel**	**O**	**Oscar**	**V**	**Victor**
B	**Bravo**	**I**	**India**	**P**	**Papa**	**W**	**Whiskey**
C	**Charlie**	**J**	**Juliet**	**Q**	**Quebec**	**X**	**X-Ray**
D	**Delta**	**K**	**Kilo**	**R**	**Romeo**	**Y**	**Yankee**
E	**Echo**	**L**	**Lima**	**S**	**Sierra**	**Z**	**Zulu**
F	**Foxtrot**	**M**	**Mike**	**T**	**Tango**		
G	**Golf**	**N**	**November**	**U**	**Uniform**		

Iridium Satellite Phones

Field parties working away from Palmer Station or a vessel are also issued Iridium satellite phones.

Note: The Iridium phones issued by the USAP are administered by the Department of Defense (DoD). Dialing sequences to and from other commercial Iridium phones may vary.

Note: If a field party has multiple units, the Iridium with the lowest phone number is designated as the Alpha (primary) line. The next ones are Bravo, Charlie, Delta, and so on.

Iridium Dialing

From Iridium to Iridium:

1. Power up the Iridium phone.
2. Wait for the telephone to register with the network and show a signal level in display.
3. Dial 00 to access the satellite network.
4. Dial 8, the country code for Iridium phones.
5. Dial the area code and eight-digit Iridium number.

Example: 00 8 (816) 763-15071 for Palmer Station

To a commercial (non-USAP) Iridium phone: Dial 00 698 (8816 or 8817) XXX-XXXXX.

From Iridium to a regular phone (whether in the U.S. or McMurdo via Denver):

1. Power up the Iridium phone.

2. Wait for the telephone to register and display a signal level.
3. Dial 00 for an international call.
4. Dial 697 to connect to FTS (Federal Telephone System).
5. Dial area code (DO NOT dial "1" before dialing the area code).
6. Dial seven-digit telephone number.
   Example: 00 697 (720) 568-2775 for Palmer Station

From Iridium to a U.S. toll free number:
Dial 00 699 1 (800/888/877) XXX-XXXX.

From Iridium to an international number:
Dial 00 698 + country code + city code + local number.

To a USAP Iridium from any phone:

Any USAP Iridium phone may be dialed via a U.S. domestic phone by using a Hawaii area code. Replace the Xs below with the last four digits of the Iridium number.

If SIM card's last five digits start with a 1: Dial 808-659-XXXX

If SIM card's last five digits start with a 2: Dial 808-434-XXXX

If SIM card's last five digits start with a 3: Dial 808-684-XXXX

If SIM card's last five digits start with a 4: Dial 808-851-XXXX

If SIM card's last five digits start with a 5: Dial 808-852-XXXX

For example, if the Iridium number is 8816 763 2XXXX, dial 808-434-XXXX.

Iridium Text Messages

Friends and family can send short text messages to an Iridium phone. However, unless there is an email data kit installed, an Iridium phone cannot send outgoing texts. People sending a text message should enter the initials of the intended recipient at the start of the message and their own initials at the end. Otherwise, the camp members won't know to whom to pass the message.

Note: Generally, friends and family should only be provided the secondary Iridium number (Bravo phone), keeping the primary Iridium (Alpha phone) for business purposes, and they should be informed that the Iridium phones are a shared resource.

Receiving Text Messages:

Power up the phone, place a call to begin text message download, and call the station or vessel to confirm that the message was received.

Sending Text Messages:

Text messages can be sent from computer to Iridium but cannot be sent directly from an Iridium handset.

Option 1: Send the message via the Iridium website http://inah.pac.disa.mil/sms.shtml. Fill out the form on the home page by entering the Iridium phone number (example: 8816763XXXXX) and composing a message that is no more than 120 characters.

Option 2: Send the message via email, using the format 8816763XXXXX@inah.pac.disa.mil, where the last five digits of the Iridium phone are inserted for the X's.

- Select the Plain Text option (it is easy to do this in Outlook, in the "format" tab).
- Leave the subject line blank.
- Type in the body of the email. There is a 120-character limit.
- Abbreviate where possible.
- The message should start with the recipient's initials, so camp personnel know to whom to pass the message.
- Do not include a signature line or any other extras.

To check for messages in the field, power up the Iridium and place a call. This begins the message download. The Alpha line may be used.

Iridium Troubleshooting

Disconnect and reconnect all accessories (battery, antenna, adapters, etc.) to ensure there are solid contacts. If possible, move to an area clear of obstructions.

Frequently Used Iridium Numbers

LAURENCE M. GOULD	NUMBER
Marine Project Coordinator Iridium (from field Iridium) (rings through to bridge if not picked up in MPC office)	00 8816 763 15074
Marine Project Coordinator (U.S. number)	1 808 659 5074
Electronics Technician Iridium	00 8816 763 15073
Bridge Iridium (see Marine Project Coordinator, above)	
Electronics Lab Inmarsat (from field Iridium*) **Emergency Only; not monitored 24/7** *If dialing Inmarsat from the U.S., substitute 011 for 00698	00 698 870 773 155 323
NATHANIEL B. PALMER	
Marine Project Coordinator Iridium	00 8816 763 15076
NBP Bridge Iridium	00 8816 763 15077
Information Technician Iridium	00 8816 763 29769
Inmarsat (from field Iridium*) **Emergency Only; not monitored 24/7** *If dialing Inmarsat from the U.S., substitute 011 for 00698	00 698 870 773 910 022
PALMER STATION	
Station Iridium	00 8816 763 15071
Station Manager	00 697 720 568 2776
Communications Technician	00 697 720 568 2779
After hours calls	00 697 720 568 2775
DENVER OFFICE	
Denver ASC main line (from Iridium) If calling after hours, leave message	00 697 303 790 8606
FOR MEDICAL EMERGENCIES	
Palmer Station Medical	00 697 720 568 2778
ASC Medical Director (Dr. McKeith) cell	00 697 707 974 9969
UTMB Medical	00 697 855 300 9704

Communication Requirements for Day Trips

Before departing the vessel or station:

- Check out by VHF radio to ensure it's working
- Also check out by Iridium phone (if issued one). Make sure there are spare charged batteries for each radio, and frequently used numbers are programmed into the phone.

Check-out procedure:

- **Use the VHF radio**
- Use this format (assuming the supporting vessel is the LMG): "LMG Bridge, LMG Bridge. This is the sea-ice field party."
- Provide the following information when prompted:
  - Party name
  - Destination
  - Number of people
  - Estimated time of return (ETR) to vessel (or station), or estimated time of arrival (ETA) at destination

Call to extend return time! There is NO grace period!

Check-in procedure:

- **Use the VHF radio**
- Notify the vessel bridge or MPC, or the Palmer Station communications technician, when the field part has arrived at the destination and/or returned to the vessel or station

If the check-in time is missed:

- After twenty minutes, the vessel bridge notifies the MPC. The Captain and MPC initiate an action plan to reach the field party.

Communication Requirements for Overnight or Multi-Day Camping Trips

Field Camp Daily Check-In

Field camp personnel must check in twice daily with the supporting vessel or Palmer Station. One call should be made by 0800 and the other at 2000, local time. If the field team is unable to reach the ship or station by VHF, the team will call the main phone line using Iridium. If the team is unable to reach someone at the designated time, team members will call hourly, at the top of each hour, until contact is made. If the field team is supported by a vessel but is unable to contact the vessel, team members should try to contact Palmer Station, another vessel, or ASC Denver.

If no contact is made within six hours of a designated check-in time, Denver headquarters will be notified by the monitoring station or supporting vessel that the field party has missed its check-in.

Status Conditions to be Relayed During Check-in

In the event the Iridium or HF communication signal is weak, a color code system (green, yellow, red) should be used to convey information. Initial contact should include the current camp status.

Green: All's well. No further contact required until next scheduled time.

Yellow: There is an issue that requires further consultation.

Any and all pertinent information regarding the situation should be at hand during this initial contact.

Additional contact times and methods should be established.

Red: EMERGENCY!!! Vessel and/or outside assistance required immediately.

If the camp is supported out of Palmer Station, station personnel notify the NSF immediately and request that the nearest vessel proceed to the camp.

Vessel personnel will initiate a request for additional SAR assistance, as required.

Small Boat Missions from a Vessel

Small-boat based field teams must make contact with ship's communication command via VHF or Iridium every 30 minutes while underway. If they are 30 minutes late, a second boat will be prepared for an emergency response or SAR, while the captain and MPC assess the situation and make a plan.

Field Camp Operations

Field Camp Safety

Field camp installations involve a certain amount of risk. Dynamic conditions exist across four possible platforms: ship, small boat, surf zone, and on shore. The weather, wind, sea state, and sea ice are all factors and each can change rapidly over the course of an installation or removal.

The safety of all members of the party is paramount. Discuss safety with the entire field team before arriving at camp, and revisit the field safety plan after camp is established.

- Develop a general emergency plan.
- Discuss how it should be implemented in different types of situations the team could encounter.
- Discuss any job or camp hazards before initiating any work.
- Discuss methods of incident and injury prevention.
- Make risk mitigation a daily strategy and discussion topic.
- Emphasize the importance of staying safe, given the remoteness of the research location.
- Be certain everyone is familiar with the use of all communication equipment, and set up a schedule to check the equipment throughout the time at camp.
- Encourage field team members to be their own advocate and bring attention to any safety issues they observe, regarding both work and camp operations.
- Encourage team members to watch out for each other's safety and well-being.

All field team members have the right to stop any operation if they observe something unsafe.

Extreme Cold Weather Clothing

It is imperative to stay warm and dry in Antarctica. This is especially critical in a Peninsula field camp, where the weather is characterized by cold, wet conditions and there isn't a quick or easy way to dry clothing or get warm. The marine environment on the Peninsula experiences, on average, 28 inches of rain annually and temperatures from -40°F to +40°F.

The standard USAP clothing issue includes two types of waterproof garments. One is a water resistant/waterproof breathable shell for working on land. The second is a non-breathable, PVC rain jacket

and bib pant. The PVC gear is generally preferred by researchers spending a fair amount of time working from small boats, where one is likely to get soaked from sea spray, or by those working on land in wet and muddy conditions.

Layering underneath the water resistant/waterproof layers is important. The insulating layers should be synthetic (polypropylene, for example) or wool. Unlike cotton, these garments will not lose their insulating properties if they get wet. Layering is especially helpful when the weather or the level of physical work is apt to change. One may add or shed a layer as needed to manage body heat. Avoid sweating, since wet clothing promotes heat loss thorough evaporative cooling. If a long walk and/or extended labor is required, and conditions warrant, stop to remove some layers. In short, it is vital to wear:

- A wind and water proof outer layer (shell);
- Warm insulating layers (fleece); and
- A wicking layer (base layer/long underwear).

Goggles are provided, and personal, glacier-rated sunglasses are strongly recommended. These protect eyes from sun and wind, and they help prevent snow blindness (see the First Aid section).

Footwear

Keeping feet dry is essential to keeping them warm. It may be necessary to change socks during the day. Feet and socks get damp or wet through sweat or from stepping in deep water when exiting a small boat or walking in a stream, and post-holing through snow can allow snow to enter boots. It may be prudent to carry a second pair of boots in case one becomes wet. Wearing gaiters can prevent snow and mud from entering boots.

Personnel on the Peninsula are issued steel-toed, rubber work boots. Steel-toed boots are required when working on the deck of the research vessel. It is recommended that researchers wear the issued rubber boots when boating and during shore landings and change to hiking boots for shore work.

Dry feet and socks thoroughly each night. Avoid starting the day with wet socks or boots.

Gloves and Mittens

Bring a variety of gloves and mittens. Waterproof rubber or neoprene gloves are essential for small boat activities (which could be wet) and warm, dry ones are needed on shore. It is helpful to have

several spares of a variety of gloves and mittens, since they may get wet during the day.

Small Boat Ride Clothing

No amount of careful preparation for a shore expedition will be helpful if you get soaked during the ride ashore. It's best to think about dressing for two different situations: the clothing needed to stay dry and warm in the boat (sometimes for a considerable length of time) and the clothing needed to stay warm onshore.

All outer layers need to be waterproof when in a small boat: boots, pants, jacket, and gloves. Almost as important to what is worn is how it is worn. Waterproof gloves will be useless if they fill with water because they aren't tucked into a jacket sleeve, and the waterproof jacket will be no comfort if the hood is not worn and a wave splashes through the neck opening.

Since waterproof layers are not very breathable, it's often best to shed them once arriving ashore to prevent getting wet from sweat.

Camp Put-In

Before deploying to the field, project personnel should carefully review camp put-in, daily tasking, and camp pull-out checklists.

Before field deployment, the entire project team must test all VHF field radios and Iridium phones and review the communications plan with the MPC and vessel captain or Palmer Station manager. All team members must know how to use the equipment and know where emergency phone numbers are stored.

Planning and flexibility are crucial to a successful installation. Before the operation, the vessel MPC and field camp manager will hold a meeting with all involved parties, outline the operation, and assign roles. ASC personnel and grantees will fill many of these roles.

On the day of the operation, the captain, MPC, lead marine technician, chief scientist, and field camp manager will meet to discuss the viability of the operation in view of the forecast, current weather, sea conditions, and ice conditions. If the decision is made to attempt an installation, the full team is mobilized.

During the installation, all parties will continue to monitor environmental conditions and the safety of the operation. If weather deteriorates, the attempt will be abandoned and all personnel recalled until conditions abate and another attempt can be made.

Loading Cargo from Small Boat to Shore

Camp put-ins will require multiple trips in small boats operated by ASC marine technicians. Prioritize cargo so items are offloaded in the appropriate order. Field team members must ensure all essential, life-sustaining supplies and equipment are on the first boat, in case deteriorating weather or ocean conditions prevent a complete camp put-in. This includes radios and satellite phones, sleep kits, stoves, matches, extra clothing, tents, and enough food, fuel, and water for an extended period. Field teams must be flexible and develop risk mitigation plans.

Calm Conditions/Bow-In Landings

If there are calm conditions and an appropriate beach, the bow of the boat can be brought up to the sand, rocks, or snow/ice berm. That way, gear can be passed from the boat directly onto dry land. Personnel should be positioned so that gear can be passed hand-to-hand over any wet, rocky, or icy ground, or any treacherous footing. Arrange people where they can exercise proper lifting technique, avoiding twisting and jerking movements.

Surf or Stern-To Landings

In surf or stern-to landings, people in immersion suits will need to be in the water to help control the boat and offload cargo. Offloading over the stern is more difficult, as the engine is in the way. Often, the best option is to have two people steady the boat while others pass cargo over one side of the boat near the stern and through a chain of people to safe ground.

Moving Cargo from Shore to Camp

Gear can be piled on shore before being sorted, carried, or sledged to the final campsite. The first priority is getting the boat unloaded; the faster this happens, the quicker the boat can return to the ship for another load. This is especially important where there is a great distance between the ship and the shore. Also, there is a finite weather window on most operations on the Peninsula, so the more expediently everything gets ashore, the greater the likelihood of a complete and successful installation.

Tasks Before Vessel Can Depart

During camp put-in and before the vessel departs, the field team must make radio or Iridium phone contact with the vessel or Palmer Station. The team must also erect a tent for shelter and test a cook

stove. The most efficient way to do this is to split the team into two groups, each with a defined task.

Campsite Location

When selecting a campsite, field team members should follow ACA protocols, as well as the regulations for ASMAs and ASPAs, if relevant. These details should have been discussed during the planning process for each project.

Specific campsite selection should address any concerns that came up during the planning process. Field team members should also be aware of the flora and fauna in the proposed camp area, the area topography, and camp logistics. The Peninsula field supervisor can assist with site selection.

Wildlife, Vegetation, Sensitive Areas

Participants should not interfere with wildlife unless they have an ACA permit and a specific reason to do so. Consider camp location in relation to seabird nests and colonies, paths for penguins walking to and from the ocean, and haul out/resting areas for seals. Consider any existing vegetative ground cover (mosses, grasses, lichens) and avoid trampling and disturbing it as much as possible. Avoid camping in areas that drain into sensitive sites (streams, ponds, lakes, nesting areas). At the end of the field season, disassemble any rock cairns and leave the area in its original state.

Topography and Weather

Consider the lay of the land and how storms will impact the camp. Choosing areas with physical features that block the wind can be ideal, but be aware that leeward sites will accumulate snow. Consider how meltwater or rainwater may enter camp or accumulate in low spots. Be aware of tide lines, glacier walls that could calve at any time, and rock fall hazards.

In addition, select an area where topography does not interfere with VHF radio and Iridium phone communications. This will be particularly important if you have an emergency.

Travel Time Between Research Site and Boat Landing

The research location and the small boat landing site can also play a role in camp selection. Erecting camp closer to the research location will reduce walking commute time.

Conversely, it may be best to establish camp as close to the put-in area as possible (keeping in mind the above considerations) in order to maximize the efficiency (and perhaps the safety) of the put-in/pull-out process. Identify alternative boat landing sites in case weather or ocean conditions during camp pull-out are different from those during camp put-in (i.e., different wind and wave action may prohibit boat landings at previously used sites). These factors may play a role in determining the best location for the camp.

Camp Layout

The layout of camp can be discussed ahead of time and adjusted once actual conditions are observed, taking into consideration the above mentioned factors (wildlife, vegetation, sensitive areas, topography, weather, safety, logistics). Consider where to erect tents (berthing, kitchen/meeting), establish a bathroom area (with or without tent), store outside gear, and establish an emergency cache. Discuss camp layout with regard to possible white-out conditions, taking into account obstacles between tents and the feasibility of erecting rope lines between berthing, kitchen, and bathroom tents.

Survival Cache and Emergency Shelter

A survival cache should be set up a short distance from camp (200-300m upwind) in case the main tent with food and supplies is destroyed by fire or a storm. The cache should contain a basic assortment of survival gear, with the minimum amount of each item determined by the number of people in camp and how remote the location is. It is imperative that this cache be anchored securely and the items kept dry.

The survival cache could consist of just the red survival bags issued by the Peninsula field supervisor. These would be supplemented with a radio and batteries, water bottles, and other crucial items specific to the field team. The bags can be stashed in a cave, anchored to the ground, or buried in snow and flagged.

If the need arises for an emergency shelter, the first and most important order of business is to arrange for protection from the wind. Soon after arriving, spend some time looking around the camp and research locations for physical features that provide a break from the prevailing wind and could be used in case of an emergency. Identifying those locations ahead of time might be crucial. Erecting rock walls or snow walls, digging snow trenches, building other types of snow shelters, or erecting makeshift shelters out of piles of

gear and tarps are all options for staying out of the wind, snow, and rain in an emergency.

Shelters

Tents should have a solid anchor for every guy line, and these should be checked daily to ensure they are tensioned. Loose guy lines make the tent more prone to wind damage, and they make catastrophic failures in a storm more likely. “Hard” knots should be avoided. Instead, use taut-line hitches or trucker’s hitches, as they are easy to undo. Field team members should practice and become familiar with these knots before deploying.

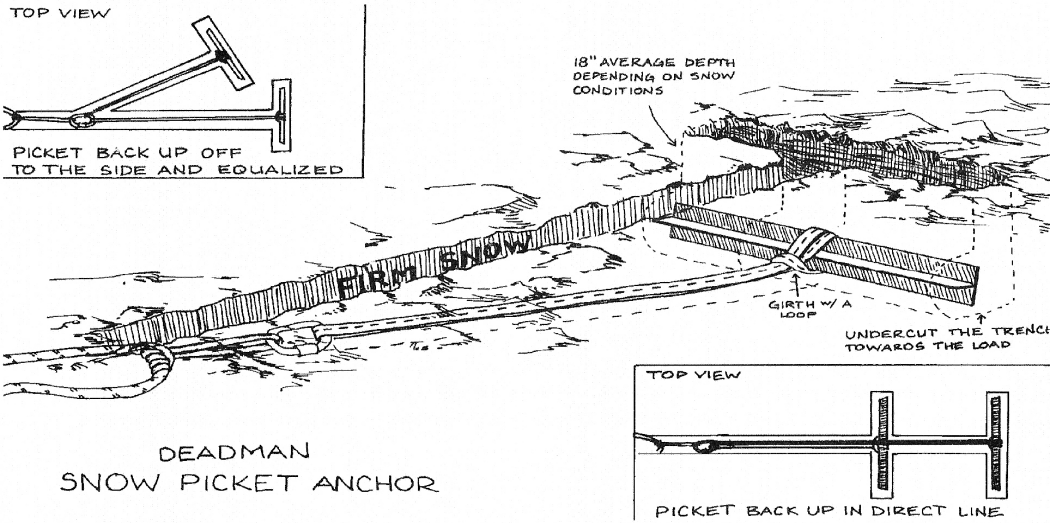
Establishing Wind Direction

The most important factor in setting up a tent is securely anchoring it to withstand high winds. Field teams should first determine the prevailing wind direction by observing patterns in the snow or sand. Long rows of snow drifts (sastrugi) in, for example, a north-south orientation will indicate that the prevailing wind is either from the north or south. Next, look for etching at the ends. If the prevailing wind is from the south, the snow at the southern end of the sastrugi will be etched.

Orient the tent with the main door opening downwind but at a 45-degree angle to the prevailing wind. This will help prevent drifting that blocks the door, and it will best shed the windload.

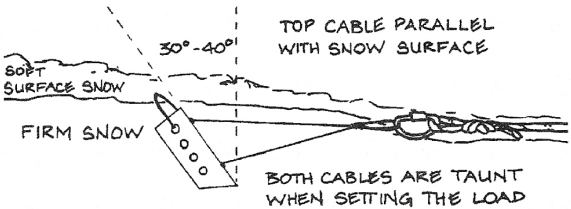
Anchoring the Tent

Anchoring techniques differ based on snow, ice, soil, and sand conditions. If the surface is hard-packed, hammer in long stakes or sections of bamboo, angled slightly away from the tent, and attach guy lines to these. If the surface is soft, bury a long stake or piece of bamboo (“deadman”) in a slot perpendicular to the angle of pull (refer to illustration below), with a guy line attached at the mid-point. The guy line should run in a straight line from the deadman to the tent, via a slot cut in the snow. The deadman should not be buried too close to the tent or it will be pulled upward when the line is tensioned. In very soft snow, the deadman anchor should be buried two feet deep or more. If enough metal or bamboo stakes are not available, cloth rock bags or other biodegradable items can be filled with sand or snow and buried.



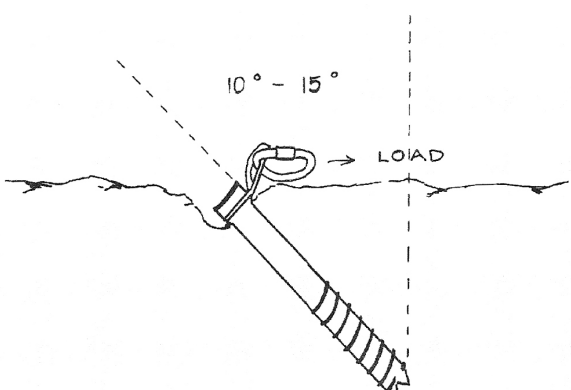
DEADMAN
SNOW PICKET ANCHOR

SNOW FLUKE ANCHOR



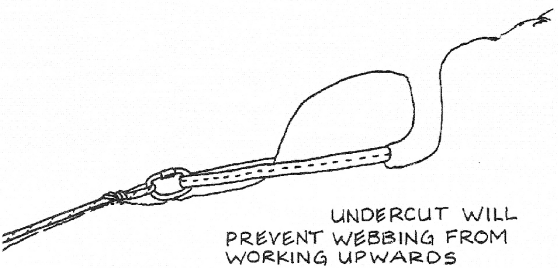
SLICE A SLOT FOR CABLE WITH PICK OF YOUR ICE AXE

ICE SCREW ANCHOR

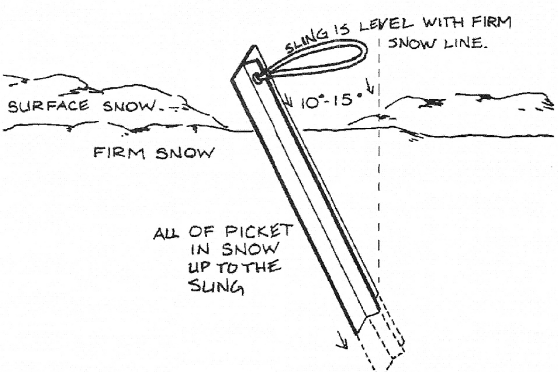


CHOP A SMALL LEDGE FOR THE EYE TO REST AT THE PROPER ANGLE, FLUSH AGAINST THE ICE.

SNOW BOLLARD ANCHOR



SNOW PICKET ANCHOR



CLEAR AWAY SOFT SURFACE SNOW TO INSURE THE PICKET IS IN FIRM SNOW.

Erecting Tents at Snow Camps

If it is a windy day or if the camp is at a windy location, field teams may need to construct snow walls before setting up a tent. Snow walls, which are constructed with blocks cut from the snow, shelter tents from wind. Ideally, blocks are cut with a saw in hard-packed snow, but a shovel or ice ax may work. Since snow conditions can change over a small area, probe the snow to see if there is an area harder than others. If there is only soft snow, it can be packed down with boots to see if it hardens (sinters) after an hour or more.

Erecting Tents on Sea Ice

If the snow on the ice is deep enough, anchor the tent as described above. Otherwise, clear off any snow and anchor the tent to the ice with ice screws. Team members may also drill V-threads (two holes that intersect to form a V-shaped channel), then use an ice screw or ice drill to feed a guy line through the channel. It helps to feed it to the bottom of the V on one side, then insert an ice screw on the other side. Twist the ice screw, and the teeth should grab the line and pull it out as the ice screw is withdrawn from the hole. The line can then be attached to the tent.

Erecting Tents on Soil

If the soil is not frozen, anchor the tent by digging deep trenches for deadman anchors. There should be one anchor for every tie-off point on the tent. Care should be taken when camping in sandy locations, as many deadmen will be required to anchor the tent properly for windy conditions. If temperatures are below freezing, fresh water can be poured on the anchors to freeze them and the soil in place. Large boulders can provide a wind break, and large rocks or stacks of rocks can be used as anchors. If the field team is using metal stakes for anchors, it may take several minutes to sledge hammer each one into frozen soil. If the team intends to move camp, members should take extra anchors, as it may be difficult to remove some of the stakes from the frozen soil.

Camp Medical Protocols

Before arriving at the camp, team members should discuss relevant medical concerns with the appointed field safety/medical lead. The ASC camp manager (if there is one) will most likely be in control of the medical kit. Any medical interventions at camp involving more than basic First Aid must be coordinated by the medical lead with the

Palmer Station physician. Make sure everyone is familiar with the contents of the medical kit, knows the location of medical supplies, and knows what to do in case of a medical emergency.

Camp Hygiene

Preventing illness within the camp is crucial for ensuring the team's success and eliminating the risk of a serious illness requiring a medevac. Practice proper hygiene to minimize pathogen transmission, and keep drinking water clean.

- Designate a hand-washing area in camp.
- Wash hands after using the bathroom, before cooking and eating, before cleaning up after meals, and at other times during the day. Have hand sanitizer easily accessible in the toilet tent and at other locations around camp.
- Protect drinking water from motor exhaust and microbial contamination.
- Use filters, chlorine, iodine, or boiling to disinfect water, as needed.
- Designate certain equipment for water collection (containers, shovels, ice axes) and don't use it for anything else. Or, sterilize the equipment before using it to collect snow or ice for water.
- Clean and disinfect drinking water storage containers regularly.
- Use bleach to sterilize dishwater and dishes.

Drinking water

Depending on the location of the camp, there may be access to fresh drinking water. Any fresh water from a lake, stream, glacier, or snow will need to be filtered, sterilized with chlorine (household bleach), or boiled. The Peninsula field supervisor will determine if your campsite has a reliable fresh water source and provide filtration and sterilization materials.

The fresh water source may need to be supplemented, or it may be that a fresh water source is not available. In these cases, bottled water will be supplied in five- or six-liter bottles purchased in Punta Arenas. The Peninsula field supervisor will calculate the appropriate amount of bottled water needed for the group, including an emergency stash in case camp resupply or pull-out is delayed. Practicing water conservation at camp is important, and maintaining a rolling inventory of bottled water throughout the field season is helpful.

Fire Prevention

Fire prevention is crucial in remote camps. Losing supplies or shelter to fire can immediately create an emergency situation. In Punta Arenas, make sure all field team members know how to operate stoves, lamps, heaters, and generators properly.

- Be aware of and minimize hazards in areas where combustible equipment is set up.
- Ensure all equipment remains in proper working order throughout the field season.
- Small propane heaters should only be placed on aluminum tables.
- Check propane cylinders for damage or leaks before using them.
- Propane cylinders should be stored outside the tent as much as possible, with long propane hoses running from the tank to the inside of the tent where the stove or heater is located.
- Release pressure in any liquid fuel canisters outside the tent before packing or storing them.
- Operate and store generators at least 50 feet away from any tent.
- Do not dry clothing on a heater or stove. Use a clothespin to hang wet clothing on a string inside the tent.
- Line the inside of the tent behind the cooking stove with foil so the tent is not splattered with cooking grease and becomes a fire hazard. Change the foil frequently. Foil also helps protect the tent fabric from burning or melting.
- Fire extinguishers, CO detectors, and smoke detectors are standard issue for field camps. Place them in appropriate and accessible areas and make sure all field team members know their location and proper use.

Rest/Duty Cycles

Antarctic field research opportunities are precious. It is tempting to burn the candle at both ends in order to accomplish project objectives. However, when individuals become extremely tired, their awareness level can decrease and their stress level can increase. Exhaustion can cause the following problems:

- Compromised work quality
- Deterioration of personal relations
- Lapses in judgment

- Decreased awareness of safety (situational and self-awareness)
- Behavioral changes that put the individual or team at risk

Create a work schedule that encompasses research duties, camp responsibilities, and rest time. Divide camp responsibilities as equally or sensibly as possible. Prioritize work objectives and complete them accordingly. Encourage individuals to be responsible for their own well-being and take advantage of rest periods as necessary. Camp set-up and maintenance should take priority.

Lifting and Carrying

Manual material handling tasks performed repeatedly or over long periods of time can lead to fatigue and injury. The main risk factors associated with these injuries are:

- Awkward postures (bending, twisting)
- Repetitive motions (frequent reaching, lifting, carrying)
- Forceful exertions (carrying or lifting heavy loads)
- Pressure points (grasping loads or contact with parts or surfaces that are hard or have sharp edges)
- Static postures (maintaining a fixed position for a long time)

Guidelines for Safe Lifting

- Before lifting, always test the load for stability and weight.
- Plan the lift:
  - Wear appropriate footwear to avoid slips, trips, or falls.
  - If you wear gloves, choose a size that fits properly. Depending on the glove material and the number of pairs worn at once, more force may be needed to grasp and hold objects. Wearing a single pair of gloves can reduce grip strength up to 40 percent. Wearing two or more pairs can reduce grip strength up to 60 percent.
  - Lift only as much as you can safely handle by yourself.
  - Keep the lifts in your power zone (i.e., above the knees, below the shoulders, and close to the body), if possible.
  - Use extra caution when lifting unstable loads.
- When lifting:
  - Get a secure grip.
  - Use both hands whenever possible.
  - Use smooth, even motions.
  - Keep the load as close to the body as possible.

- To the extent feasible, use your legs rather than the upper body or back to push up and lift the load.
- Do not twist your body. Step to one side or the other to turn.

Alternate heavy lifting or forceful exertion tasks with less physically demanding tasks.

Camp Pull-Out

The camp pull-out schedule must be coordinated with the MPC, who will confer with the vessel captain and other stakeholders. The field supervisor or field team member assigned to communications is responsible for providing all requested information to the incoming vessel. This person should know the condition of the landing site and the current wind, sea, and ice conditions. Any animal activity that will impact operations should be noted as well.

In addition, the field team must provide detailed information regarding the weight, dimensions, and type of returning (retrograde) cargo, and the specifics of any scientific samples, such as Keep Frozen and/or Do Not Freeze.

All of this information will greatly aid in preparations for pulling out the camp.

The pull-out procedure is similar to the put-in, but in reverse. The field camp must be entirely broken down. All gear except for life-essential materials must be packaged, staged, and ready for quick loading when the vessel arrives. Pack all non-essential gear, equipment, and waste in waterproof packaging. Life-sustaining supplies should be loaded last.

Field Team Tasks on Vessel

There are many tasks to perform on the vessel after returning from the field. These include drying sleeping bags and tents by hanging them in the Baltic Room, storing food properly, cleaning gear by scrubbing and washing it on the deck with hoses and brushes, cleaning generators and emptying fuel, and labeling broken or damaged equipment. Work with the field supervisor or MPC for a full list of tasks, and refer to the pull-out procedures checklist at the beginning of this manual.

Field Gear

Pre-Deployment Requirements

Before the field season, all stoves, tents, generators, communications gear, and other equipment should be thoroughly tested and checked to ensure proper working order and confirm all parts and spares are included.

Field team members are also required to become proficient in setting up their tents before deploying to the field. This should be done in Punta Arenas or at Palmer Station.

The Peninsula field supervisor and marine technicians provide equipment operations and maintenance training to science team members before they deploy to the field. This guide provides information on safety, basic operation, and troubleshooting for stoves, heaters, sleds, generators, snowmobiles, and renewable energy power systems. Contact the field supervisor for assistance or further guidance.

Stoves

The field supervisor issues propane and white-gas cooking stoves to field parties.

Stove Safety

Liquid-fuel stoves are potentially hazardous due to the flammability of the fuels and the toxicity of the carbon monoxide they produce. Therefore, it is important for field personnel using a stove to follow these safety measures:

- Test all stoves before field deployment.
- Do not use stoves without adequate ventilation. Always have a tent door or window open several inches to allow for air flow.
- Do not release fuel-tank pressure near an open flame.
- Use extreme caution when refueling. Skin contact with super-cooled fuel can cause instant frostbite.
- Check for leaks before every use.
- Release pressure in the fuel tank before packing and storing it.
- Pack stoves and fuel away from food.
- Do not cook in mountain tents, except in the vestibule during emergencies.
- Use caution when priming the stove, as it can flare up when fuel is lit.

- Do not place the stove directly on the tent floor. Use a rock-box lid (preferably covered in aluminum foil), a metal platform, or another non-fabric surface.

Residues of evaporated gasoline are combustible. Designate a pair of gloves for fueling operations and don't use them near stoves. Should a person's clothing become ignited, stop, drop, and roll to extinguish flames.

Carbon Monoxide (CO) Risks

CO is a colorless, odorless, tasteless, and toxic gas produced by the incomplete combustion of carbon compounds, including the fuels used in heaters and stoves. Dangerous amounts can accumulate when fuel does not burn properly and/or when an area is poorly ventilated. Both of these situations can occur when someone is cooking in or heating a tent.

CO displaces oxygen in the bloodstream, starving the heart, brain, and other vital organs. People are even more susceptible to CO poisoning at altitude.

Carbon Monoxide is Dangerous

There have been several cases of CO poisoning in Antarctic field camps from improper stove use. This is completely avoidable. The best way to prevent CO poisoning is by ensuring any structure in which cooking is taking place is well ventilated. Because CO has no color, taste, or smell, it is better to be safe than sorry. In short:

- ALWAYS ventilate the tent.
- NEVER cook in or heat a tent without leaving a door or window cracked.
- Be especially vigilant if sleeping in a heated structure.
- VENTILATE, VENTILATE, VENTILATE!

Also, field teams must use a CO detector (issued by the field supervisor) when cooking, but the detector should not be attached directly to the stove. The detectors are not fool-proof, so all team members should remain vigilant of CO risks and symptoms. For information on the signs, symptoms, and treatment of CO poisoning, consult the First Aid section of this manual, or contact the medical department.

MSR® WhisperLite™ Stove

Assembling the Stove

- Fill the MSR® fuel bottle to within two inches of cap.
- Screw the pump snugly into the fuel bottle. Make sure it is not cross-threaded.
- Pump the plunger 15 to 20 times for a full bottle. Additional strokes will be necessary if the bottle is not full.
- Insert the fuel line through the hole in the heat reflector.
- Rotate the stove legs into the slots in the flame reflector.
- Insert the end of the fuel line into the fuel-tube bushing on the pump. Lubricate the end of the fuel line with lip balm, and be extremely gentle when inserting.
- Snap the catch arm securely into the slot on the pump body.

Operating the Stove

Priming

- To preheat the stove, the priming flame must contact the generator tube.
- Open the control valve until fuel flows through the jet and fills the priming cup ½ full.
- Close the control valve.
- Double check for leaks and fuel overflow before lighting.
- Light the priming cup or wick.
- Place a windscreen around the stove.

Lighting

- As the priming flame diminishes, slowly open the control valve.
- If the stove goes out, attempt to re-light it at the burner. If that doesn't work, wait for the stove to cool and re-prime it.
- If the stove burns with a yellow, erratic flame but the priming cup is still burning, turn the control valve off and prime longer.

Cooking

- The stove should burn with a steady blue flame.
- Note that there is a delay between control valve turns and changes in flame intensity.

Shutting Off the Stove

- Turn the control valve off.
- Wait for the stove to cool before disassembling.

- To depressurize the fuel bottle, use a fuel absorbent pad or dedicated fueling gloves when you unscrew the pump.

Safety Tips

- Do not use these stoves in mountain tents.
- Ensure the stove assembly has no fuel leaks.
- Securely lock the catch and ensure the stove is properly assembled.
- Clear the area of flammables and spilled fuel.
- Do not open the control valve more than three full turns.

MSR® WhisperLite™ Stove Troubleshooting

Problem	Possible Cause	Remedy
Fuel leaks at control valve	Control valve O-ring torn or damaged	Replace O-ring*.
	Control valve threads are damaged or stripped from over-tightening	Replace with new pump.
Fuel leaks at pump/fuel bottle connection	Incorrect fuel bottle in use	Use only MSR® fuel bottle.
	Bottle threads are damaged or bottle is dented	Replace bottle.
	Fuel bottle O-ring is torn or damaged	Replace O-ring*.
Fuel leaks at fuel line/pump connection	Fuel tube O-ring is torn or damaged	Replace O-ring*.
	Fuel tube bushing is damaged or missing	Replace bushing*.
Fuel leaks at fuel line	Fuel line is damaged	Replace fuel line or entire stove.
Fuel leaks at shaker jet	Shaker jet is loose	Tighten with jet and cable tool*.
	Shaker jet is damaged	Replace shaker jet*.
Fuel leaks through the shaker jet when control valve is off	The pump is damaged from over tightening the control valve	Replace pump.
Pump not pressurizing	Dry leather pump cup	Lubricate or replace pump cup.
	Dirt in check-valve assembly	Clean check-valve assembly.
Burner cap turns bright red and a dull roar is audible	The flame is burning under the burner cap instead of through the flame rings	Clean the jet, ensure the correct jet is installed, and ensure flame rings are clean and installed correctly.

Problem	Possible Cause	Remedy
Reduced performance; diminishing flame, slow boil	Insufficient pressure in fuel bottle	Pump plunger as required to increase pressure.
	Obstructions in jet and/or fuel line	Remove obstructions.
	Incorrect jet installed for fuel type	Install correct jet.
Erratic yellow flame	Insufficient priming	Shut off the stove, let it cool down, and re-prime it.
	Fuel bottle is over-pressurized	Reduce bottle pressure.
	Improper fuel used	Replace fuel.
	Old or poor quality fuel	Replace fuel.
	Improper jet installed	Replace jet.
	Incorrect flame ring installation under burner cap	Re-install flame rings. Correct order is wavy, flat, wavy, flat, wavy, flat, wavy.
	Weather conditions are cooling the generator tube	Use windscreen and heat reflector.
	Lack of oxygen at high altitudes	Reduce fuel bottle pressure and open windscreen.
* Stove and pump replacement parts available in the repair kit.		

Coleman® Gas Stove

Operating the Stove

Filling the Tank

- Close the valve and unscrew the tank cap. Do this carefully if the tank has pressure inside.
- Use a fuel funnel (with filter). Use white gas only.
- Wipe off any spilled fuel and replace the cap.

Caution: Never open the tank around an open flame! Never remove the cap while the stove is running!

Pressurizing the Tank

- Close the cap and ensure the generator valve is closed.
- Turn the pump plunger handle to the left to open.
- Place a thumb over the small hole in the handle and pump 35 to 50 times.
- Turn the plunger handle to the right to tighten.
- Put the stove handle into the opening on the side, insert the generator into the mixing chamber, and place the tank in hanger brackets.

Lighting the Stove

- Close the auxiliary burner valve.
- Turn the fuel-valve lever to the up position.
- Hold a match above the main burner and open the fuel-flow valve wide.
- Let the stove burn for one minute with fuel-valve lever up.
- When the flame is blue, turn the valve lever down.

Note: Add more pressure if needed, but hold the tank firmly. If the flame does not burn fully, open and close the valve to clean the tip. After the main burner is lit, the auxiliary burner can be lit by opening the valve on the left side of the stove. If there are problems, refer to the "Troubleshooting Guide" included with the stove.

Shutting Off the Stove

- Put the fuel-valve lever in the up position and let the stove burn for one minute to reduce carbon deposits.
- Turn off the valve. The flame will burn for a few minutes until the gas in the generator is gone. When the flame is out, let the stove cool before packing it away.

Coleman® Gas Stove Tips

Most problems with Coleman® stoves occur in extremely cold temperatures. This stove was not designed for use in sub-zero temperatures, and measures must be taken to enhance its performance:

- Use white gas only. Always use clean, filtered gas.
- Do not overfill the tank, as this impedes performance.
- The pump mechanism becomes impaired as temperatures drop. Keep the pump plunger oiled. Also, the rubber or leather pump cup sometimes dries out. It is essential to keep it oiled and pliable.
- In temperatures below -6°C, the stove generator must be preheated to ensure the fuel vaporizes. Apply priming paste along the generator and above the burner. Light it with a match. Allow at least three minutes of burning to ensure the stove is sufficiently preheated. When the flame burns down, make sure the lever is up and open the valve. The burner should light from the paste.
- Keep the stove and tank clean. Grease deposits can flame up. Line the inside of the stove with foil for easy cleaning.

Note: Place the stove where it can be thrown out of the tent in an emergency. Keep a small fire extinguisher nearby.

If the fuel does not vaporize, liquid gas collects in the manifold as-

sembly and a strong, blue flame cannot be achieved. The stove will sputter and spark, and the flame will be orange and sooty. If this occurs, shut the stove down and allow it to cool off completely. Remove the tank assembly and clean fuel from the manifold and burners with absorbent pads provided in the spill kit (the small, black nylon bag). Replace the tank assembly and repeat the lighting process.

To access the control valve assembly (behind the knobs and under the burners) for troubleshooting:

- Unscrew the burners
- Turn the stove over and unscrew the nuts on the bottom. It should be possible to push the burner assembly up and release the retaining ring that holds the burner to the metal tray. Alternatively, spread the retaining rings to release the burner assembly.
- Remove the metal tray for access to the burner and control valve assemblies.

Coleman® Gas Stove Troubleshooting

Problem	Possible Cause	Remedy
No pressure	Cracks, dryness, creases, or tears in pump	Remove and inspect pump; replace if necessary and oil.
	Leaking tank lid gasket	Check gasket; replace if necessary.
	A flooded pump cylinder indicates a faulty pump valve	Replace pump valve.
	Broken seal at valve assembly and tank junction	Tighten by one rotation, if possible; replace seal if necessary.
	Loose generator	Tighten.
Loses pressure too fast	The tank will lose pressure the longer it sits without periodic pumping	If pressure is lost soon after pumping, check all joints and gaskets.
	Leaky cap and gasket	Replace if necessary.
Orange flame (on older stove with flame rings)	Corrosion on flame rings	Remove flame rings as on a white gas stove. Lightly use steel wool or a nylon brush to remove corrosion from each ring and improve flame quality.
Yellow flame	Bad or dirty generator	Clean or replace.
	Manifold assembly is flooded	Turn stove off, cool, remove tank assembly, and wipe out excess fuel.
	Bad fuel	Drain and replace with new fuel.

Problem	Possible Cause	Remedy
Flame at generator/manifold assembly	Tip of generator is loose	Tighten.
Poor gas flow to burner	Clogged generator	Clean or replace generator.
	Cleaning needle is non-functional or bent	Check the needle and replace if necessary.
Weak flame	Generator too cold	Preheat generator.
	Bad or dirty generator	Clean or replace generator.
	Pressure too low	Increase pressure.
	Manifold assembly is flooded	Turn stove off, cool, remove tank assembly, and wipe out excess fuel.
	Contaminated fuel	Replace fuel.
	Control valve nut too loose	Remove the metal tray (see above). There is a small nut where the copper tube meets the control valve assembly. Try tightening (or first loosening then re-tightening) this nut. This often works on new stoves that burn poorly.
Flaring	Loose gas tip	Tighten gas tip (at end of generator).
	Flooded burner	Shut down stove and dry it out
	Excessive pressure in tank	Reduce pressure.
	Insufficient priming	Shut down stove and re-prime.
	Premature switch to "on" position of fuel flow switch	Refrain from opening fuel flow switch too early.
	Contaminated fuel	Replace fuel.
	Grease in stove	Clean grease out of stove. Line the bottom of the stove with foil and change when dirty.

Coleman® Propane Stove

Note: Propane cylinders should only be stored outside of a tent. Use a long propane hose though an opening in the tent door or window to connect the cylinder to the stove.

Setting up the Stove

- Press on latch to open the lid.
- Position the wind baffles.
- Insert wire clips into slots.

- Close both burner valves firmly.
- Remove the regulator from storage under the grate.
- Attach the regulator, hand tight, to hose or propane bottle.
- Inspect the gasket on the stove connection before attaching the regulator.
- Screw the regulator hand-tight onto the stove.

Operating the Stove

Lighting Electronic Ignition Stoves

- Open the burner valve and rotate the igniter knob several times until the burner lights.
- Use a match to light the burner if the igniter fails.

Lighting Standard Ignition Stoves

- Hold a lighted match near the burner and open the valve.
- Adjust the flame with burner valves.

Shutting the Stove Off

- Close the burner valves firmly.

Storing the Stove

- Remove the propane cylinder or hose.
- Unscrew the regulator from the stove and store it under the cooking grate.

Partner® Steel 4-Burner Stove

This stove is 18 inches wide, which allows it to accommodate food preparation for larger groups. In terms of operation and troubleshooting, the stove is very similar to its Coleman counterpart, with one critical difference: the hose that connects the stove to the propane cylinder is specialized. A Coleman stove hose will not work. Test the stove before deploying to make sure the correct hose is included and that there is a spare.

Heaters

There are two types of heaters in the Peninsula field inventory that can be used to warm tents. These should only be used in Arctic Oven, Polar Pyramid, or Scott Tents. They are not designed for mountain tents. They should only be used on a non-flammable surface, such as an aluminum table, and kept far away from combustible materials. They also must not be left unattended, and a lot of care should be taken for proper ventilation to reduce the risk of CO

poisoning. These heaters are not to be used for drying clothing.

There should never be a propane or gas odor when heaters or cook stoves are in use. If someone detects an odor, turn off all valves and re-check hose and cylinder connections. The odor may be more detectable closer to the floor, since propane gas is heavier than air.

Do not store heaters and propane cylinders near the open flame of cook stoves. It is best to store propane cylinders outside the tent when they are not in use.

Mr. Heater® Single-Tank Top Heater

This 15,000 BTU, single-tank, top heater runs on a one-pound Coleman propane cylinder. The heater screws directly onto the cylinder and does not require a special adapter hose. The propane cylinder must be placed in the plastic stand base.

Lighting the Heater

1. Turn the heater's regulator knob to "Med."
2. Place a lit match on the reflector, then push in the button on the safety shutoff valve.
3. Hold the valve button for 30 seconds, then slowly release.

It takes a minute or so for the heater to warm, and it may appear that it is not working. Be patient and give it a minute before trying again. After turning the heater off, it will remain very hot for 15 minutes.

Mr. Heater® Portable Buddy Heater

These propane heaters provide 4,000-9,000 BTUs of heat per hour. They can be used with a one-pound Coleman propane cylinder, or they can connect to a 20-pound propane cylinder with an optional hose and filter. The latter is the preferred method, since 20-pound cylinders are easier to purchase and re-fill. The heaters are easy to use, have an accidental-tip-over shut-off valve, and are lit by an integrated sparking mechanism. Simply turn the knob to "Pilot" and push. These heaters burn a lot of propane, so be diligent with ventilation and use a carbon monoxide detector in the tent.

Sleds

The Peninsula field supervisor issues several types of sleds that can be towed behind a snowmobile or pulled with a rope by someone skiing or walking. Each field team should consult with the field supervisor to determine which sled type matches the team's requirements.

Sled Types

Nansen Sleds

These sleds can haul two drums side by side. Nansen sleds are used infrequently on the Peninsula.

Siglin® Ultra High Molecular Weight (UHMW) Sleds

Siglin sleds can also accommodate two drums side by side. There is an eight-foot version and a twelve-foot version, and each can be towed behind a snowmobile. These sleds have side ropes for lashing down gear.

Banana Sleds

Banana sleds have fabric cargo covers attached along the sides. The cover folds over the cargo and is tied down. These sleds are heavy and are best towed by a snowmobile.

Paris Pulk Sleds

These are the most common sled used on the Peninsula. The sleds are 59” x 20” x 6” and are lightweight (four pounds), making them suitable for hauling by a person.

Loading and Securing Cargo

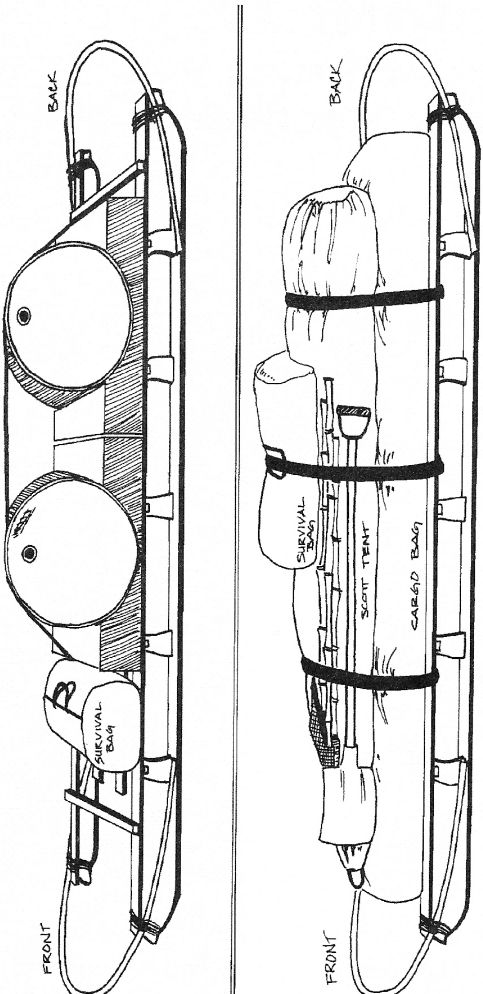
Following are illustrations showing how to distribute the cargo on a Nansen sled. The same principles apply to the other sleds. Load the sled with heaviest items on the bottom. Place small items in sled bags. The survival bag should be placed at the top of the load, along with anything the team members might need during the day.

Rock boxes (18” x 12” x 12” wooden boxes) make convenient containers for fieldwork and can be loaded with either samples or gear. Rock-box platforms are available if the team anticipates hauling a large number of boxes.

It is best to transport fuel drums on drum cradles for stability. Secure the finished load tightly with cord, cargo straps, or bungee cords. Avoid using hard knots when rigging loads for travel. Use taut-line hitches or trucker’s hitches instead, as they are easy to undo if it becomes necessary to re-tension a cord. Be sure to check all lashings periodically and every time the team stops for any reason, and re-tighten them if they have become loose. (It is prudent to bring extra lashing supplies into the field.) If towing the sled with a snowmobile, inspect the snowmobile, tow plate, ropes, and sled at the same time for any developing structural issues.

NANSEN SLED
BUMPER
BRIDGE
RUNNER
22.mm HAWSER LAID ROPE
TOP FRAME
FRONT
1
3
4
6
5
2
BACK
WEIGHT DISTRIBUTION WHERE 6 IS THE MOST AND 1 IS THE LEAST.

Nansen sled load examples



Pulling Sleds with a Snowmobile

With ideal surface conditions, a tail wind, and light loads, a snowmobile may achieve seven miles per gallon (mpg). Soft snow conditions, heavy loads, and strong head winds significantly reduce fuel efficiency. Mileage can drop to as low as two to three mpg. In good conditions, a snowmobile may be able to pull up to 2,000 pounds. Soft snow and a headwind will reduce that substantially. It is important for field teams to keep these things in mind when planning loads and fuel consumption.

Snowmobile operators pulling a sled should adhere to these rules:

- Attach sleds equipped with rigid tongues directly to snowmobiles. Other sleds attach with a tow rope. In those cases, ensure the rope does not get sucked into the track.
- Before driving, rock sleds back and forth to break the runners and the bottom free of the ice.
- Drive slowly. Driving fast over uneven terrain may cause a sled to tip over, which can not only damage the sled, cargo, and snowmobile but can cause severe injury as well.
- Drive even more slowly if pulling passengers. Everyone must wear a snowmobile helmet, including those riding on the sled.
- Maintain situational awareness and regularly look back to ensure everything is riding securely, especially passengers.
- If the sled is attached with a rope, stop gradually so the sled doesn't run into the back of the snowmobile.

Snowmobiles

Operational Guidelines

- All riders and passengers must wear a helmet! This includes people pulled on a sled behind a snowmobile.
- Each operator is responsible for checking the snowmobile before each use.
- Ensure the correct fuel is used. Snowmobiles have two-stroke engines that require gasoline (mogas) pre-mixed with lubricating oil. The mixture ratio is 50:1 (12 ounces of oil per five gallons of mogas).
- To avoid over-working the electric starter, the pull starter should be used when the engine is cold.
- A snowmobile's center of gravity is just in front and toward

the bottom of the fuel tank. Operators must shift body weight for turning and as needed for the load, the terrain, and the snow and ice conditions.

- Be mindful of track tension. In general, if the track is slapping against the frame tunnel while the snowmobile is in motion, it is too loose. Contact the Mechanical Equipment Center (MEC) at McMurdo Station for advice. Call 720-568-1080 and ask to be transferred to the MEC.
- Watch for loose trailing straps and ropes, as these can get tangled in the tracks and around axles.
- Never shift the transmission unless the snowmobile is stopped. Shift gently. If gears will not engage, turn off the engine, shift gears, and restart. Abusive shifting can cause problems that are not repairable in the field.
- Park snowmobiles facing into the prevailing wind, and always cover them. This reduces the likelihood of snow accumulating under the cowling.

Pre-Ride Inspection

- Check all hardware on the suspension; tighten any loose nuts or bolts with the tool kit under the seat.
- Look for broken components, such as H arms, springs, shock mount, shock, and tracks. Inspect everything.
- Remove any snow from under the engine hood, drive belt, pulleys, exhaust pipe, and lower steering arms.
- While the hood is up, use the pull starter and make sure the cooling fan spins. Check this again after the engine starts. If the cooling fan belt fails, the snowmobile will operate for about five miles before failing catastrophically.
- Ensure the machine is in neutral. Always start in neutral! All riders should make it a habit to shift into neutral when stopping.
- Ensure the throttle moves through its full range of motion and snaps back to idle when released.
- Ensure the brake moves through its full range of motion. It is normal to feel resistance, and the brake lever should NEVER pull all the way to the handle bar. The brake should also never go all the way to the floor.

Starting the Snowmobile

1. For the first cold start of the day, or if the machine is off for more than an hour:
   a. Ensure the transmission is in neutral
   b. Prime engine twice (if below 0° F, prime three times)

c. Pull the engine over three times with pull starter
d. Prime the engine twice again (three times if below 0° F)
e. Start the engine with the pull starter or electric starter
f. Feather the throttle and allow the engine to warm up; feathering the throttle also will allow the belt to warm up as it spins the pulleys

2. Now that the machine is warm and ready to go, allow it to return to idle.
3. Engage the gear and then ease into the throttle.
4. If the engine is off for less than an hour, ensure the transmission is in neutral and engage the electric starter. Give it a little throttle to get it to start. Allow the engine to warm thoroughly before driving it.

Starting Tips

- Don't use the choke; it causes more problems than it solves.
- If the machine will not start because it is flooded, hold the throttle all the way to the handlebar (with the transmission in neutral) and engage the electric starter. The engine should start. Once it does, release the throttle and feather it until the flood is cleared.
- If the engine still doesn't start, check all kill switches. If that isn't the problem, check the spark plugs. They may have failed and need to be replaced. (See Troubleshooting at the end of this section.)

Preventative Maintenance

Daily

- Check operation of the snowmobile.
- Check the suspension, particularly when operating on ice. Look for broken suspension components.
- IMPORTANT: Check all parts at the end of the day! Finding a broken machine at the beginning of the following day can result in a lost day of science. Finding it at the end of the day provides time for repairs.

Weekly

- Check for loose mounting bolts on bogie wheels, skis (particularly the two bolts through the springs), rear suspension, and steering. A small suspension problem can rapidly become serious (e.g., slashed tracks, broken bogie mounts).

Loading, Towing, and Driving

Loading

- Maintain a low center of gravity.
- Place survival packs on the hood to help maintain ski contact on hills.
- Keep straps tied down; ensure there are no loose ends.
- Place frequently used items where they are easy to get to.

Towing a Sled

- Sleds may be towed with rigid tongues or ropes, depending on the circumstances. Rigid tongues are preferable.
- Check the hitch mechanisms on both snowmobile and sled for proper operation.
- Cover the load to protect it from track spray, if necessary.
- Check load tie-downs for tightness and security shortly into each trip.
- Check both the sled and the load frequently for problems.

Driving

- Whenever possible, drive on a proven trail or hard surface.
- If driving in powdery snow and the snowmobile begins to bog down, maintain the throttle and head in the straightest line possible for firmer or packed snow; sharp turns will compound the problem.
- If the machine slows and reaching firmer snow appears impossible: STOP! DO NOT CONTINUE SPINNING THE TRACK!
  - Tip the snowmobile on its side (in both directions, if necessary), clear snow from the track, and pack the snow under the track.
  - Dig a ramp out of the hole and attempt to ease the machine out of the hole, with other people pushing. Or use a tow rope and have another snowmobile pull the stuck one out.

Caution: If a stuck machine does not come out quickly, stop towing and dig more. Continual towing wears drive belts prematurely and can cause them to break. It can also damage the engine.

Driver Communication

Hand signs for group travel on snowmobiles

Hand Sign	Meaning
No sign	“Not ready to depart”
Hand on head	“OK, ready to depart”
Arm waving above head	“Problem - Assistance required”
Left arm in air, elbow at right angle with fist	“Stop” or “Stopping”
Arm outstretched, palm down, patting down	“Slow down” or “Slowing down”
Arm outstretched, palm up, pushing up	“Speed up” or “Speeding up”

Troubleshooting

Fuel Flow Problems

Symptom: The engine cranks but it won’t run; no fuel is present in the line from the pump to the carburetor; the engine may run briefly after priming.

Diagnosis and Repair:

1. Check the fuel level in the tank.
2. Pry the fuel line off the carburetor, pressurize the fuel tank (i.e., seal and blow into the vent line) to see if fuel flows out the end of fuel line. Crank the engine to see if fuel pulses out the end of fuel line.
3. If fuel flows adequately and pumps adequately, the problem may have been small ice crystals in the fuel pump valves. Pressurizing the tank dislodged them, solving the problem. Replace the line and continue operation.
4. If fuel flows when the tank is pressurized but does not pump, the problem is in the fuel pump. First, disconnect the vacuum pulsation line from the center of the fuel pump to the engine crankcase. Blow through the line. If it is blocked, clean ice out of the line with wire. Check the nipples on the pump and crankcase for obstructions. If the vacuum line is operational but fuel still does not pump, replace the pump or remove it and thaw it.
5. If fuel will neither flow nor pump, then either the line or the fuel filter is clogged. Clean the line or replace the filter.
6. If the tank is under vacuum pressure when the cap is open, check the vent line for obstructions or pinches. Occasionally the vent hose will rub on the exhaust and melt. Make sure the tank is venting properly.

7. If all of the above is tried and still no fuel flows, check the line for cracks or holes. Look for any obvious fuel deposits (i.e., discolored snow) in the engine compartment. Repair or replace the line.

Starter/Cranking Problems

Symptom: Engine cranks slowly or not at all when key is turned.

Diagnosis and Repair:

1. Usually this problem indicates a dead battery. If that is the case, the engine must be pull-started. Once the engine is running, the battery should begin to recharge, unless it is shorted or the rectifier is faulty. The battery can also be charged with an AC charger, if one is available.
2. If the battery is fine, check the in-line fuse (30 amp) in the red wire near the starter or see if the red-green wire has slipped off the terminal on the starter solenoid. Finally, the starter itself may be faulty.

Spark Problems

Symptom: The engine cranks but it won't start. Fuel is present in the line between the fuel tank and carburetor.

Diagnosis and Repair:

1. Remove both spark plugs. Push the spare plugs into the wire caps, ground the metal plug bodies to the metal engine housing, and crank the engine. If a spark can be seen at the electrodes of the spare plugs, the problem may be that the installed plugs were fouled with excessive fuel, ice, or a piece of carbon. Install the new plugs or clean and re-install the old ones.

   Note: Use a tool or some other method to ground the plugs. Holding them with your hands will result in unpleasant shocks. Also, it may be hard to see the spark in direct sunlight.
2. If a spark is not present, the problem is in the electrical system. Check the kill switches and all electrical connectors. If they are in the correct position and operational, the solution to the problem depends on the engine type.
   g. 503/550: These models have an electronic ignition, so the problem is probably the igniter box. Replace the igniter box.
   h. Other engines: The problem may be a bad coil or a shorted wire.

Power Problems

Symptom: The snowmobile runs but it lacks power.

Diagnosis and Repair:

1. If engine seems to be running fine, but the snowmobile has trouble with uphill starts, the problem may be with the clutch-driven pulley. Remove the cowling and see where the belt is riding on the pulley. It should be along the outer edge of the driven pulley when the snowmobile is at rest. If the belt is instead slotted down between the driven-pulley halves, check for ice in the drive and driven pulley. Shift the transmission into neutral and rev the engine slowly until the belt works its way to the outer edge.
2. If the engine has very low power or dies when revved, remove the carburetor and check for ice. If ice is present, thaw out the carburetor and reinstall it. If the engine is weak and runs rough, but the carburetor is ice free, the problem may be a bad spark in one cylinder. Follow the procedures outlined in Spark Problems.
3. The problem may be altitude. If hill-climbing performance is weak and the problem isn't the belt or an iced-up carburetor, check the spark plug color. Chocolate brown is correct; gray or white too lean; and black signifies a mixture that is too rich. For altitudes up to 4,000 feet, decrease jet size by one increment from the standard setting (i.e., from 290 to 280). From 4,000 feet to 8,000 feet, decrease it by two increments. From 8,000 feet to 11,000 feet, decrease it by four. Remember to enrich the mix when returning to lower altitudes.

Honda Generators

Generator Safety

- Place the generator on a firm, level surface. If the generator is tilted or turned over, fuel may spill or the generator may become contaminated with soil or water.
- To prevent a fire hazard and provide adequate ventilation, keep the generator at least three feet away from tents or other equipment during operation. Do not place flammable objects close to the generator.
- Know how to stop the generator quickly. Know how to operate all the controls.
- Do not let the generator get wet, and do not operate it with wet hands. The generator is a potential source of electrical shock if misused.

- Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks where gasoline is stored or where the generator is refueled. Refuel it in a well-ventilated area, with the engine stopped.
- The engine muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler or engine until the generator has cooled down. Let the engine cool before storing the generator indoors.

Pre-Operation Check

1. Check and add fuel (mogas), if necessary.
2. Check and add engine oil (0W30), if necessary. Check the oil level every time fuel is added.
3. Check the air cleaner element to ensure it is clean and free of ice and snow. It should feel oily.

Starting the Engine

1. Make sure the AC circuit breaker is in the “off” position. It may be hard to start the generator if a load is connected.
2. Turn the fuel valve to the “on” position.
3. Pull the choke rod, or lever, to the closed position. **Note:** Do not use the choke if the engine is warm.
4. If the generator is so equipped, make sure the auto-throttle switch is off.
5. Move the engine switch to the “on” position.
6. Pull the starter grip slowly until resistance is felt, then pull briskly. **Note:** Do not allow the starter grip to snap back. Return it slowly by hand.
7. Once the generator has started, push the choke rod or twist the choke lever to the open position as the engine warms up.
8. Allow the engine to warm up for three to five minutes; do not apply a load during this time.
9. Once the generator is warm, turn on a breaker or plug in a load.

Stopping the Engine

1. Turn off the breaker or unplug the load.
2. Allow the generator to run unloaded for two minutes to cool down.

3. Turn off the engine switch.
4. Turn off the fuel supply.

Troubleshooting

Symptom: The engine will not start.

Diagnosis and Repair:

1. Check that the engine switch is on.
2. Check to see if the oil-alert lamp flashes when the starter is pulled. If it does, add oil.
3. Ensure all loads are unplugged from the AC receptacles.
4. Check to see if there is a spark at the spark plug. Ground the side of the electrode to the engine and pull the recoil starter to see if a spark jumps the gap. If there is no spark, replace the spark plug.
5. Check to see if gasoline is reaching the carburetor. Place a suitable container under the carburetor and loosen the drain screw. Fuel should flow freely. If it does not, check the fuel valve on the tank.

Symptom: The engine starts but stops immediately.

Diagnosis and Repair:

1. Check the oil level. If it is low, fill the oil reservoir to the top of the dipstick.
2. Restart the engine.

Symptom: There is no electricity at the receptacles.

Diagnosis and Repair:

1. Check to see if the AC circuit breaker is on.
2. Check the appliance or equipment plugged into the generator for defects.

Mini-Portable Field Power Systems

The Mini-Portable Field Power System (MFPS) is a portable, self-contained solar power supply that can be disconnected and disassembled quickly for transportation. The unit is composed of three components: a weatherproof box, a solar panel stand, and an output cable. The input and output cables connect to the battery box via sturdy, screw-on, weatherproof connectors. The system is fully grounded, and all wiring and electrical components are rated to -40° C. Maximum output is 300 watts AC or 80 watts DC.

1. Open the box and inspect the unit for damage or loose wires. Correct as necessary.

2. Decide on the configuration of the solar panels. They can be mounted on top of the box with four 1/4 X 20 bolts, they can stand independently and be tied down, or they can be spread out to face the sun for maximum input. However they are configured, ensure the panels are secure in case of wind gusts.
3. Connect the three-pin solar plug to the three-pin receptacle.
4. Connect the five-pin extension cord to the five-pin receptacle.
5. Turn the 40-amp breaker to “on” and turn the switch on the far side of the inverter to “on.” AC power will now be available.

When battery power is low, the AC and DC outputs will disconnect. The power will not return until battery voltage reaches 12.2 volts DC. Disconnect loads and let the system recharge. Recharge time from 80% discharge is approximately three days in the sun. Keep in mind there is rarely full sun in Antarctica for three days in a row.

Weather Observations and Ice Assessment

Antarctic Weather

Weather in Antarctica is characterized by extremes: extreme temperatures, extreme winds, and extremely variable local conditions. Weather conditions vary widely, depending on elevation, topography, and distance from the ocean. Temperatures can vary from below -40°F (-40°C) to well above freezing during the course of an austral summer. The polar plateau is very cold because of its higher altitude and distance from the moderating effect of the sea, while areas near the coast can be subject to heavy precipitation and warm days with intense sunlight.

Winds can range from light to sustained hurricane strength, and it's an unusual day when there is not at least a breeze blowing. The wind takes its toll on people, making camp chores, such as setting up tents, difficult. Improperly anchored tents can blow away or be ripped apart. Tent guy-lines must be continually re-tensioned. More importantly, wind chill increases the risk of hypothermia and frostbite. (The wind chill chart in the reference section shows the effect of wind on perceived temperature.) All of this makes Antarctica a challenging place to work and live.

During the austral summer, conditions along the Antarctic Peninsula are characterized by wet, cold, windy weather. Palmer Station receives 28 inches of rain annually. During the summer, precipitation occurs approximately 22 to 24 days each month, and it can rain or snow at any time. Winds exceeding 20 knots are normal, and speeds in excess of 40 knots are not uncommon. Peninsula field camps can expect to experience similar weather conditions.

Past reports and weather data can help remote field parties plan for weather conditions at a given site. Still, it is best to expect the unexpected when it comes to weather.

Working in the Peninsula Environment

No matter what the weather is doing, boating or working aboard a research vessel are wet activities. No matter where researchers may find themselves along the Peninsula, combining wet conditions with just-above-freezing temperatures can create a work environment that varies from unpleasant to potentially dangerous if proper clothing is not worn.

The ability to install, service, or remove a field camp is heavily dependent on sea conditions. Rough seas or heavy surf can render a

normally ideal location unsafe for operations. In addition, storms can radically change the shoreline by blowing in and grounding large icebergs or rafts of sea ice or brash ice.

In addition to weather and sea state considerations, many shore landings are tidally dependent; camp put-ins and pull-outs have to be timed around either high or low tides. A high or low tide can change the distance gear needs to be carried by several hundred feet. It can also turn a calm landing into one with breaking surf, or bring underwater hazards to the surface. Some camp installations will take many hours, and the landing site may change over the course of the operation.

These factors will also affect operations once the camp is installed. Conditions at a shoreline used for waste disposal or for transit to and from study sites may alter rapidly, as waves, storms, and ice remake the coastline. Since the easiest routes to transit at some locations will be along the shoreline, be aware of the initial tidal range at each location and remember that storms and lunar phases can increase that range.

Antarctic Weather Forecasting

Weather forecasting for U.S. Antarctic stations is done under the auspices of the National Science Foundation and is coordinated through the SPAWAR (Space and Naval Warfare) Systems Center in Charleston, South Carolina. SPAWAR also has a presence at McMurdo Station. Compared to most places in the world, Antarctic weather forecasters have fewer data collection sites upon which to base their forecasting models. Forecasters rely heavily on weather observations called in from remote field sites. They also use satellite imagery, data from automated weather stations, and a weather modeling system, the Antarctic Mesoscale Prediction System (AMPS), which produces twice daily forecasts for the Antarctic continent.

Both USAP research vessels receive weather forecasts for their current location and their expected location in 24 hours. If either vessel is working in the same area as a field camp, vessel personnel can relay weather forecasts to the field team.

If a field camp is located near Palmer Station, VHF marine radios can receive a continuous broadcast of weather conditions on Channel WX 1 (162.550 MHz). If a camp's daily check-in is with Palmer Station, station personnel can pass along a Palmer area forecast at that time.

For field camps not in the Palmer area, especially those farther north on the Peninsula, team members should check with the Peninsula field supervisor before camp put-in to determine if there are any international research stations nearby. These stations might have weather forecasting capabilities.

Field Party Weather Observations

Observing weather conditions at a camp is important for making safe decisions about daily activities. Field team members should maintain awareness of changing weather conditions and take particular note of drops in barometric pressure. Watch for changes in cloud coverage or appearance, changes in wind direction or intensity, rapid changes in temperature, decreasing visibility, increasing precipitation, and changing ocean conditions.

Take note of sea and ice conditions daily to ensure safe operations. As the pull-out date approaches, pay specific attention to the landing site. Assess beach, ice, and surf conditions. If they vary significantly from conditions at put-in, relay this information to the MPC. Any large icebergs, rafting ice, changes to snow and/or ice berms, or other changes to beach conditions should be reported. Scout out alternate landing sites if access to the primary site is obstructed.

Prepare early for shelter from storms. Have a pre-determined set of weather guidelines for field parties. Be aware of the increased risk of hypothermia due to wind chill. Blizzards and white-out conditions can make any travel hazardous. Double-check the camp area to make sure all equipment and supplies are secure. Check all tent anchors and guy lines before gale force winds arrive. Storms with strong winds may be accompanied by storm surges and ice deposition on the shoreline. Make sure all gear is secured well above the high tide line and any potential surge.

Setting Up the Handheld Weather Meter (Kestrel®)

Weather observers in remote locations often use a handheld weather meter to measure wind speed, temperature, dew point, and pressure. The handheld weather meter discussed in this manual is the Kestrel® 4000. Observers using a different meter should refer to the user instructions for that meter.

The Kestrel® 4000 is available from the Peninsula field supervisor. The field team member picking up the equipment should ensure the Kestrel is set to measure temperature in Celsius, wind speed in knots, and altitude in feet. Extra batteries should also be obtained, in case the installed batteries lose power in the field.

The Kestrel should be stored in an inside coat pocket or a warm area when not in use. The liquid crystal screen will function only at temperatures above -10°C (-14°F). At colder temperatures, the screen will be sluggish and eventually fade, although the device will still record data. The Kestrel should be returned to a warm, inside coat pocket as soon as possible after use.

Setting a Reference Altitude and Barometric Pressure on the Kestrel®

Most field camps put in by small boat from the vessels will be operating at or very near sea level. If a camp is supported by helicopter, obtain the site's altitude in feet from the pilot. (Be sure to notify the pilot in advance so he or she knows to provide this information before departing.)

1. Be sure the Kestrel is set with feet as its default altitude measurement.
2. Navigate to the barometric pressure (BARO) screen and press the center COMMAND button to enter.
3. On the screen, go to the reference altitude (Ref Alt) line.
4. Use the left and right buttons to increase or decrease its value to equal the altitude in feet (0 at sea level). Notice that the barometric pressure reading changes in response to changes in the altitude number.
5. Press the COMMAND button to save and exit the adjustment mode.
6. Next, go to the altitude screen and navigate to the reference pressure line.
7. Enter the barometric pressure number now shown in the BARO screen.

Since the Kestrel is used to monitor barometric pressure for weather reporting, it should be kept in the same location (i.e., at the same altitude), because the pressure will change with changes in altitude.

Sea Ice Assessment

There is no regular forecasting or analysis available for travel on Peninsula sea ice. Be extremely conservative. Pay attention to

weather conditions, ice thickness, ice color, ice temperature, and cracks. The remoteness of a field camp means that other members of the field party will often be the only viable rescue option.

Field parties can obtain current and historical satellite imagery for research areas from the Polar Geospatial Center, the ASC remote sensing analyst, or the Palmer Station research associate. The remote sensing analyst can also provide near-real-time sea ice conditions for vessel movements.

Weather Considerations

Poor weather conditions will obscure surface definition, making it difficult or impossible to detect cracks in the ice. Use extra caution if surface definition or visibility is poor, especially in low light conditions. Strong winds can be particularly dangerous, especially at the ice edge, where large chunks of the sea ice can break off and blow away with little warning.

Ice Thickness

Strong currents can erode the ice from below. This is hazardous because there may be no obvious indication of thinning at the surface. Strong currents typically occur later in the season and usually over underwater shoals. Land formations that indicate a potential shoal are long, low-angle ridges or peninsulas that descend into the sea. However, shoals can also occur offshore of steep slopes. In addition, as the air and sea temperature rise later in the season, the sea ice becomes progressively weaker and thinner everywhere.

Ice Color

The color of the sea ice is a good indication of its thickness and safety. In general, white or milky blue ice is the safest. These colors indicate solid ice 24 or more inches thick. Ice that is sky blue and has a slick, scalloped surface is multi-year ice that is several feet thick.

Ice of different ages and thickness will be marked by a thin line on the surface and, usually, slight differences in elevation. If the color of the ice changes abruptly, travelers should stop immediately and investigate. Darker ice indicates a hazard. Ice that is young or has thinned to six inches or less will appear grayish, even beneath a thin crust of snow. This ice may support an adult on skis but should never be traversed in a vehicle. Gray ice can also form as a result of surface flooding and subsequent freezing of the surface water, which often occurs at tidal cracks. It is always important to investi

gate areas of gray ice. Ice that appears black is very thin and should be avoided at all times.

When traveling on sea ice, field team members should drill the ice every 100 meters if the ice surface is consistent, and much more frequently if there are variations in color or texture.

Ice Temperature

The colder the ambient air temperature, the more the ice grows and the colder the sea ice becomes. The colder the ice, the stronger the overall structure. Just looking at the surface will not disclose the true strength of the ice. Sea ice strength is measured according to four ice temperature periods (see table below). Period 1 ice is the strongest. As the ice gets warmer, it requires more thickness to carry the same weight.

Period 1	Period 2	Period 3	Period 4
<14° F	14°- 23° F	23°- 27° F	27°- 28.5° F

Sea Ice Cracks

Cracks are fissures or fractures in the sea ice that form in response to environmental, geographical, and mechanical pressures, such as currents, wind, waves, tidal action, and the pressure applied by ice shelves and glaciers. Tidal cracks form along coastlines and around islands, grounded icebergs, and glacier tongues. Other cracks radiate out from the land, especially from headlands and glacier tongues, like the spokes of a wheel.

Cracks should be avoided whenever possible. If crossing one is unavoidable, cross it in a line perpendicular to the crack. Never cross a system of multiple, closely set cracks in a manner that places a snowmobile on more than one crack at a time or on a small piece of ice between two cracks. Avoid sets of cracks that form triangular wedges. These could break off and turn over under the weight of a snowmobile.

Snow cover on the sea ice can completely hide cracks or open water within cracks. Look for continuous linear features and sagging areas of snow, sometimes of different color tones. Watch for areas where snow has drifted differently, especially if the drifted area is in a long, straight line. Good visibility and lighting are essential to seeing these features. Also, pay attention to seals or signs of seals, such as feces, urine, seal shadows, and breathing holes. Their presence anywhere on the sea ice indicates the presence of a crack. Seal breathing holes may become covered and obscured by thin ice

or snow. A small mound of ice or snow on the otherwise flat surface of the sea ice may indicate the presence of a breathing hole.

Crack Types

There are four general types of sea-ice crack:

- Tidal
- Straight edge
- Working (active)
- Pressure ridge

The Peninsula field supervisor will discuss these during sea-ice training, if applicable to a research team. Field party members working on the sea ice should learn to identify and evaluate each type.

How to Profile a Sea-Ice Crack

Stop the vehicle before reaching a crack and check for other cracks nearby.

1. Determine the nearest edge of the crack by removing snow down to bare ice.
2. Using an ice ax, probe for open water or weak spots to determine if it is safe to cross by foot.
3. If it is safe, shovel the snow out of the crack from edge to edge, clearing at least one shovel blade width.
4. Drill holes every 12 inches in a straight line, beginning outside one crack edge and ending outside the other, making certain to drill healed shelves and any visible fractures.
5. Drill each hole either to water level or to a full Kovaks drill flight length (>30 inches).
6. Measure the ice thickness in each hole.
7. Pay attention to the characteristics of the ice shavings (dry, moist, or slushy).

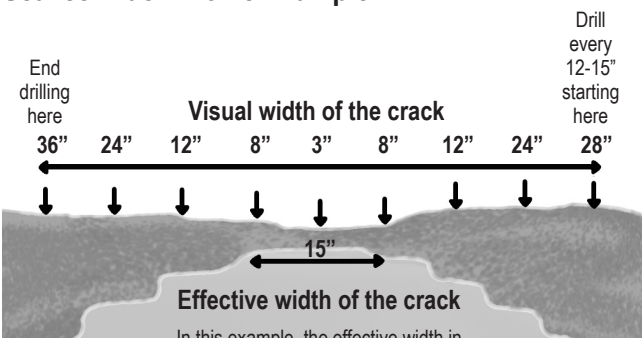
Sea Ice Crack Safety Standards

Effective crack width is the distance over which the sea ice in a crack is less than the minimum required for a vehicle, based on ice period. The effective width cannot exceed 1/3 of a snowmobile track length. Use the following guidelines to determine the required ice thickness and effective width for a snowmobile.

Sea Ice Crack Guidelines for Snowmobiles

Maximum Effective Crack Width (inches) for snowmobile	Minimum Ice Thickness (inches)			
	Period 1	Period 2	Period 3	Period 4
20	5	5	6	7
** If towing a sled or trailer, different ice thickness requirements may apply. Please contact the Peninsula field supervisor for more information.*				

Sea Ice Crack Profile Example



In this example, the effective width in period 1 or 2 for a snowmobile is 15".

Rule 1: Ice thickness must be ≥ the Vehicle Sea Ice Guidelines for specific temperature periods.

Rule 2: Effective width of the crack must be ≤ 1/3 of the vehicle track length.

Cargo Operations

Peninsula Cargo Operations

Overview

Field teams preparing to set up camps on the Peninsula will be transported by the research vessels (NBP and/or LMG). Once at the site, team members and cargo are transferred via small inflatable boat or landing craft.

Team members should contact the ASC science project implementer or marine laboratory technician (MLT) if they foresee any changes in the cargo and sample shipments planned for the end of the field season.

Cargo Requirements

Weight and Dimensions

Cargo is transferred from the vessel to the small watercraft via crane and cargo net. In general, all cargo should fit within a four-foot by six-foot space in the net, and it should not be stacked higher than four feet. Loads should be balanced, and poles, picks, and long and/or sharp objects should be handed down separately. Larger equipment should be discussed in advance with the implementer and ASC Marine operations staff. The marine technicians or Peninsula field supervisor will ensure cargo loads are of the appropriate weight and size.

Cargo needs to be weighed before field deployment, with the weight written on duct tape and adhered to the package or equipment. Individual items should not be more than 30 pounds. It is very difficult to transport cargo through waist-deep water, especially in a surf zone and/or on a beach that could be rocky and icy. Packing cargo so it is smaller, lighter, and more easily handled may create more packages, but will make the loading and unloading at the shore much safer and smoother.

Waterproofing

Depending on the field site and sea conditions, the trip from vessel to field site can be very wet. All sensitive cargo should be wrapped in heavy plastic trash bags or packed in watertight packages, such as dry bags, five-gallon buckets with sealed lids, or sealed and taped Rubbermaid tubs. Note that plastic bags are very slippery when wet and could easily be dropped into the sea. Extra care should be taken when handling bagged items.

Labeling

All cargo requiring special handling should be clearly marked, such as “Liquid”, “Fragile”, or “Do Not Freeze.” For safety reasons, hazardous cargo must be clearly marked as such, with special handling requirements included. All items also need to have the weight clearly noted on the packaging.

In addition, cargo labels should include a general description and/or camp location (e.g., “kitchen,” “personal,” “science equipment,” “power supplies”). This will assist with sorting cargo efficiently at camp, especially when handled by volunteers from the ship who may not know how the cargo was packed.

Hazardous Cargo on Vessels

All hazardous cargo should be loaded separately and stored in designated areas aboard the ship while en route to the field camp. Hazardous chemicals will be stored in a hazmat locker. The MLT will oversee storage of these items.

Liquid fuel containers (drums or jerry cans) must have the type of fuel written on them in indelible marker. A hazardous-cargo shipping label must also be affixed to the container. Fuel containers are usually stowed in a special rack on the 01 deck of the vessel. Depending on the number of containers and on vessel space limitations, the captain may authorize other areas.

Propane tanks and other pressure vessels should be in good condition and free of rust or damage. The ship’s captain has the authority to deny loading for any pressure vessel deemed unsafe for transport.

When field parties return hazardous cargo from the field, it must be properly packaged and labeled. Preserving the packaging, labels, and paperwork generated for the cargo’s field deployment makes it easier to prepare it for return shipping or entry into the USAP logistics stream.

Shipping Cargo and Samples to the U.S.

Cargo slated for return to the U.S. is called retrograde cargo. This includes samples and grantee-owned equipment. The individuals generating retrograde cargo must be the ones to pack it, and a unique shipping number must be assigned to each package or item. For each item or container shipped from a vessel, a TCN

is generated in the MOCA database (see pages 6-7: Camp Gear Return Procedures). The marine laboratory technician (MLT) will instruct grantees how to use MOCA and provide guidance regarding proper cargo packing and documenting. As equipment is packed, grantees should prepare a list of TCNs, along with an inventory list for each one.

For items shipped from Palmer Station, a shipment notification must be sent to Palmer Logistics personnel, and they will assign a shipping number (not a TCN) from the Maximo materials management database. A proforma is required for each retrograde item, regardless of its origin.

Sample Shipment

Science samples from Peninsula-based vessels and Peninsula field camps enter the cargo stream via the MOCA program, much like retrograde cargo. Vessel-based or field camp grantees can receive the same assistance from the project implementer and/or the MLT. At Palmer Station, Maximo is used in place of MOCA. Palmer Logistics personnel can help Palmer Station grantees determine how best to package samples, and they will assign a unique shipping number to each sample shipment.

Science samples require extensive and complete documentation, some of which must be obtained before deployment. Take great care in organizing the documentation; shipping samples from Antarctica, particularly from the Peninsula, can be a complicated process.

Researchers should have informed ASC Logistics during pre-deployment planning of any temperature-sensitive sample requirements. Make sure to discuss these requirements again once arriving in Antarctica. Palmer Station researchers should speak with Palmer Logistics personnel. Field camp or vessel-based researchers should contact the MLT or project implementer.

All science samples must be submitted to Logistics personnel at least 72 hours (or whatever is feasible, in the case of Peninsula field camps) before departing Palmer Station or the USAP vessel.

Grantee Tasks in Punta Arenas

Researchers must pack “Keep Frozen” and “Keep Chilled” samples the first day the ship is in port. In addition, they must assist in unpacking and cleaning all field camp gear. This may take one or two full days. Researchers must plan accordingly.

Reference Information

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

Wind Chill (°F) = 35.74 + 0.6215T - 35.75($V^{0.16}$) + 0.4275T($V^{0.16}$)

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Conversion Table

	To Convert	To	Multiply By
Weight	Pounds	Kilograms	0.4536
	Kilograms	Pounds	2.2046
Distance	Inches	Millimeters	25.4
	Millimeters	Inches	0.0394
	Inches	Centimeters	2.54
	Centimeters	Inches	0.3937
	Meters	Feet	3.2808
	Feet	Meters	0.3048
	Meters	Yards	1.0936
	Yards	Meters	0.9144
	Kilometers	Miles	0.6214
	Miles	Kilometers	1.609
	Kilometers	Nautical Miles	0.5396
	Nautical Miles	Kilometers	1.853
	Statute Miles	Kilometers	1.6093
	Kilometers	Statute Miles	0.6213
Density	Cubic Feet	Cubic Meters	0.0283
	Cubic Meters	Cubic Feet	35.3145
	Cubic Yards	Cubic Meters	0.7646
	Cubic Meters	Cubic Yard	1.3079
Volume	Liters	Gallons	0.2642
	Gallons	Liters	3.7854
	Liters	Pint	2.1134
	Pint	Liters	0.4732

Chilean Standard Time (CLT) to Zulu Time Conversion Table

CLT	Zulu	CLT	Zulu
0000	0300	1200	1500
0030	0330	1230	1530
0100	0400	1300	1600
0130	0430	1330	1630
0200	0500	1400	1700
0230	0530	1430	1730
0300	0600	1500	1800
0330	0630	1530	1830
0400	0700	1600	1900
0430	0730	1630	1930
0500	0800	1700	2000
0530	0830	1730	2030
0600	0900	1800	2100
0630	0930	1830	2130
0700	1000	1900	2200
0730	1030	1930	2230
0800	1100	2000	2300
0830	1130	2030	2330
0900	1200	2100	0000
0930	1230	2130	0030
1000	1300	2200	0100
1030	1330	2230	0130
1100	1400	2300	0200
1130	1430	2330	0230

Weather observations are reported in Zulu Time. For example, the 8:00 am weather observation from a Peninsula field camp operating on Chilean time would call in the 1900 Zulu observation.

Temperature Conversions

Fahrenheit	Celsius
40	4.44
35	1.67
32	0
30	-1.11
25	-3.88
20	-6.66
15	-9.44
10	-12.22
5	-15
0	-17.77
-5	-20.55
-10	-23.33
-15	-26.11
-20	-28.88
-25	-31.66
-30	-34.44
-35	-37.22
-40	-40.00
Fahrenheit to Celsius: (F degree-32) x (5/9)	
Celsius to Fahrenheit: (1.8 X C degree)+32	

Knots

FIGURE 8
FIGURE 8 ON A BIGHT
GIRTH W/ 1 STRAND
GIRTH W/ A LOOP
PRUSSIK

ITALIAN MÜNTER
WATER KNOT
CLOVE HITCH

TRUCKER'S HITCH

Glossary of Nautical Terms	
Abaft	In or behind the stern of a ship (adverb); nearer the stern than; behind (preposition)
Abeam	A direction at right angles to the ship's length; on the beam
Aboard	On or in the vessel; close aboard means close to another ship or obstruction
Abreast	Alongside of; on the beam
Aft	Toward the stern; in or on the stern
Aloft	Above the decks (e.g., on the mast or in rigging)
Amidships	Midway between bow and stern, in the line of the keel
Astern	Toward the rear of the vessel; behind the vessel
Athwartship	At right angles to the fore and aft line
Beam	The greatest width of the vessel
Belay	1) To make a line secure by winding it around a belaying pin, cleat, or piton; to hold fast; 2) to hold, stop, or cancel (as in "belay that order")
Below	Downward, under the deck
Bend	To fasten one line to another or to a spar
Berth	1) Bed or bunk; 2) the position where a ship ties up or anchors; 3) a position of employment aboard a ship; 4) a margin of safety in the distance from which another vessel or object is passed, as in "giving wide berth"
Bight	A doubled or looped part of a line; a cove or indentation along a coastline
Bitter end	The end of the line or cable opposite from the end that is performing work

Block	A mechanical contrivance of one or more grooved pulleys (sheaves) through which turns of line (falls) are threaded for the purpose of gaining mechanical advantage or changing the direction of motion
Boat	Generally speaking, a vessel of less than 65 feet in length
Boathook	A long, sturdy pole fitted with a blunt hook at one end
Boatswain	Top-ranking seaman who oversees deck crew and maintenance/upkeep of the ship, except for the engine room and the galley areas; pronounced “bos’n”
Bow	The forward end of a vessel
Bridge	An enclosed, elevated platform from which the ship is navigated and steered
Bulkhead	Wall (ashore)
Bulwark	Fence-like guard along edge of a deck
Bunk	Bed; berth
Buoy	A float, usually moored, used as navigation aids, markers for moorings or underwater objects, or to support test or scientific gear; comes in a variety of designs and shapes
Cable	1) A bundle of insulated wires that provides both strength and signal/power transmission; 2) A unit of maritime measure equal to one tenth of a nautical mile
Cast off	To let go a line; to leave a dock or anchorage
Chafing gear	Canvas, rope, or other material used as wrappings to prevent wear from abrasion, usually on mooring lines
Chart	Map (ashore)
Cleat	1) A double-horned piece of wood or metal around which lines are made fast; 2) belay

Course	The compass direction in which a vessel is being steered
Deck	Floor (ashore)
Dog	Heavy latch by which doors, hatches, and portholes are secured; verb: to latch. A hatch can be “dogged open” or “dogged closed” (i.e., secured)
Draft	The distance from a vessel’s waterline to the deepest part of the hull; the depth of water necessary to float a vessel
Ease off	To slack off or release tension slowly and smoothly
EM cable	Electromechanical cable; a hybrid cable composed of outer armor wires for strength and inner copper or fiber conductors to carry power and/or signal
Eye	A loop or hole spliced or tied to end of a line
Fairlead	A chock, hole, block, or sheave through which a line may be run, without danger of chafing or jamming, so as to provide a smooth run or change of direction
Fantail	After part of main deck from which most scientific work involving heavy gear is done
Fasten	To make secure
Fathom	Six feet; 1.85 meters
Fore	Toward the bow
Foredeck	The exposed deck forward of the ship’s superstructure
Foul	The opposite of clear, as in tangled line or chain, or bad weather
Galley	Kitchen; also used for eating area (mess)
Gear	Equipment, instruments, riggings; any apparatus used aboard ship; clothing and other personal items taken aboard ship

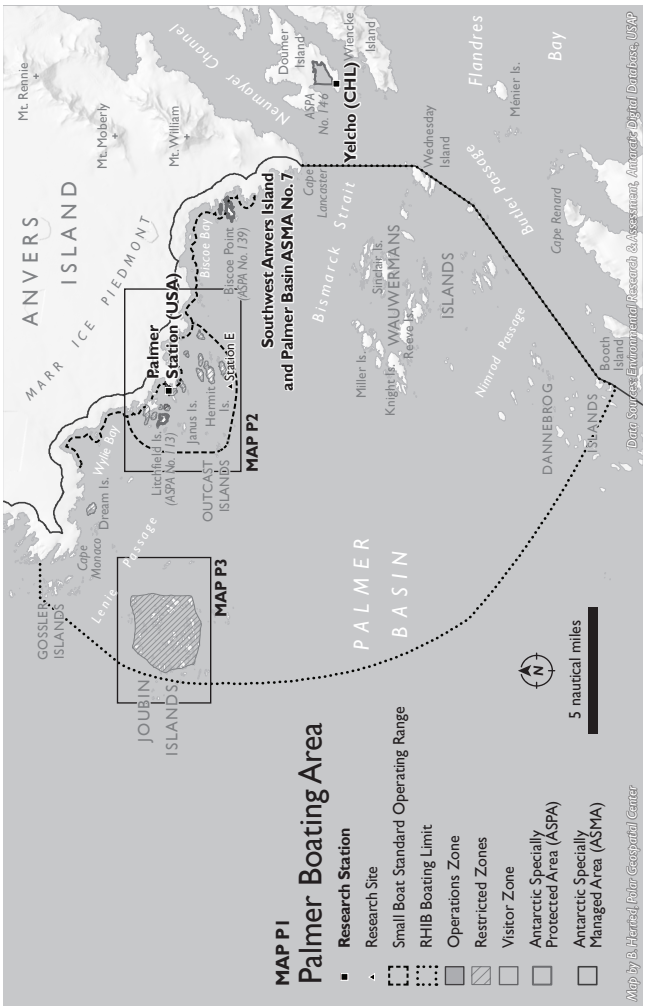
Guy	A supporting or steadying line or wire
Hatch	Opening between spaces or in ship's deck for access to space below (hold)
Heave to	Come to a stop
Haul	To pull
Head	The compartment containing a toilet; the toilet itself
Heading	The compass direction in which the ship is pointed
Hold	Storage area below decks
Hydro wire	A torque balanced mechanical wire rope used to support over-the-side sampling equipment, such as Niskin bottles, which are clamped to the wire rope and tripped with a mechanical messenger
Inshore	Near or toward the shore
Keel	The backbone of a vessel, running fore and aft along the center line of the bottom of the hull
Knots	Speed expressed as nautical miles per hour; it is incorrect to say "knots per hour"
Ladder	Stairway between decks
Lash down	Tie down; secure
Lee	The side of a ship, or shore location, sheltered from the wind or weather; opposite of windward
Leeward	Toward the lee; away from the wind
Line	A piece of rope is called a line once it leaves the rope reel and is put into use
Locker	A closet or chest-like storage space
Make fast	Tie with a line; make secure
Master	The captain of a vessel
Messdeck	Where meals are eaten

Midrats	Midnight rations; same as “night lunch”
Nautical mile	Equals 1.15 statute or land miles, 1852 meters, 6,080 feet, and one minute of latitude
On the beam	The direction at right angles to a ship’s heading or the line of her keel
On the bow	A direction of 45 degrees or less from the bow
On the quarter	Direction of 45 degrees or less from the stern
Overboard	Over the side of the vessel
Overhead	Ceiling (ashore)
Painter	The line at the bow of a boat for towing or making fast
Part	Break; e.g., the line parted under strain
Pay out	To let out chain, line, or wire
Pitch	The vertical motion of the bow and stern
Port	The left side of the vessel when facing forward
Porthole	Circular opening in a ship’s hull for ventilation and light
Quarter	The part of a vessel forward of the stern and abaft of the beam
Rail	Top edge of bulwarks
Reeve	To pass a line through a block
Roll	The side-to-side, up and down motion of the ship’s beam
Running lights	The usual navigation lights carried when a vessel is under way
Secure	To fasten; tie down; make safe and shipshape
Seize	To bind with cord or wire to prevent accidental opening or unraveling
Shackle	A U-shaped fitting with a pin across the open ends; the pin is sometimes threaded on one end and sometimes held in place with a cotter pin

Ship	A vessel over 65 feet in length
Ship's port agent	A firm that provides services to organizations that operate vessels; services include loading; shipping; dealing with local maritime, customs, and immigration authorities; and referral to reputable repair facilities; mail is addressed in care of the agent for the next port of call
Shot	Maritime unit of measure equal to 15 fathoms or 90 feet; anchor chain is measured in shots for a given water depth and bottom composition
Skiff	A shallow, flat-bottomed, open boat
Sound	To measure water depth or the depth of liquid in a tank
Sounding	Depth measured; the number indicating depth on a chart; the process of measuring fuel or water in ship's tanks
Splice	To join two lines by interweaving and tucking together individual strands in a prescribed pattern
Starboard	The right side of a vessel when facing forward
Stateroom	Cabin; sleeping compartment
Station	A position along a ship's course where the vessel is hove to for the purpose of scientific or other work
Steerage	The minimum amount of speed required to maintain control of the ship with the rudder
Stern	The aft part of a vessel
Stow	To put things away in preparation for getting under way; to put gear in its proper place
Superstructure	The part of a ship above the main deck
Thimble	A pear-shaped, grooved, metal fitting around which an eye splice is made
Topside	On or above the main deck

Trawl wire	A torque balanced mechanical wire rope used to tow nets or other gear
Two-block	To reach the end; to bring one object hard up against another, as when an instrument on the end of the wire is hauled hard up against the block through which the wire runs; may occur slowly and intentionally or suddenly and unintentionally
Underway	When the anchor has been weighed or the lines cast off; strictly speaking, a vessel can still be underway even though stopped, as long as it is not connected to land
Unreeve	To haul a line out of a block, fairlead, etc.
Vessel	A general term for a floating craft used in navigation
Watch	To work a period generally four hours long; also refers to those standing watch as an individual, pair, or group
Way	A vessel's movement through water
Weather	Toward the point from which the wind blows, as in "weather side of the ship"; the side from which the wind is blowing; opposite of lee
Winch	Motor-driven drum onto which line or wire is wound; verb: to winch onto the drum
Windward	The direction from which the wind is blowing; weather side of the ship; opposite of leeward
Wire rope	A rope made of intertwisted strands of wire and designed for mechanical strength; usually torque balanced

Palmer Station Boating Area



Palmer Station Small Boat Operating Range

REFERENCE

Joubin Islands

First Aid

Basic Field First Aid Manual

This First Aid Manual describes some of the medical issues that may be encountered in an Antarctic field environment. This is not an exhaustive manual, but it will serve as a guide to those with limited medical background to help treat their companions. It should be read in advance to help field team members recognize dangerous situations and help prevent injuries from occurring or becoming more serious if they do occur.

Antarctica is an inherently risky environment. Participants are often dehydrated, mildly hypothermic, and sleep deprived. This can lead to an increase in accidents. It is essential that all team members slow down, assess each task, and ensure the safety of the team.

The medical kit provided to a team depends on the team's activities, locations, and needs. Team members should familiarize themselves with the contents of the kit – before there is a need to use it.

Hygiene

Occasionally, people deploying to the deep field use the remote environment as an excuse to abstain from normal hygiene and sanitation. Extreme cold temperatures, lack of running water, and communal living make bathing, brushing teeth, and basic hygiene a chore.

People must continue with a normal hygiene routine to avoid painful and distracting issues that can occur in the absence of cleanliness, such as dental abscesses, gum pain, yeast infections, skin rashes, cracked skin, and trench foot.

Wet-wipe and sponge baths are the norm. If wet wipes are preferred, personnel should bring enough for the anticipated time in the field. Blanket partitions can be set up in large tents to create a semi-private space.

Sprains and Strains

Sprains and strains are the most common injuries in Antarctica. People must work carefully, thoughtfully, and deliberately to avoid them. A sprain is an injury that involves tearing the ligaments that help keep joints intact. A strain involves overstretching a muscle.

Sprain and Strain Signs and Symptoms

Sprains and strains will manifest as pain at the site of the injury that may radiate outward. There will also be swelling and discoloration.

Sprain and Strain Treatment

R Rest: Stop activity, make the patient comfortable, and set up shelter if necessary.

I Ice: Cool down the affected area with water, snow, or ice for approximately 15 minutes. Don't apply directly to the skin.

C Compression: Wrap the affected area with an elastic bandage.

E Elevation: Keep the affected limb raised to reduce swelling.

Immobilize the Joint

Fingers: Place gauze between the injured finger and the uninjured finger next to it. Buddy tape the fingers in two places (but not over a joint, so the fingers can be flexed and extended).

Wrist: If swollen, splint it using a SAM™ splint or materials on hand. If it is not swollen, or when the swelling subsides, bandage it from the hand to below the elbow with an elastic (ACE™) bandage. The patient should exercise the fingers, elbow, and shoulder regularly.

Knee: If it is very swollen, suspect a more serious injury. With the knee in a neutral position (slightly bent, between full extension and flexion) wrap a thick layer of cotton wool around the leg from mid-calf to mid-thigh. Apply a SAM splint on the back of the leg to keep it in position, and hold the splint in place with an elastic bandage.

Ankle: Remove the boot. Place the foot in a position of comfort. Using an elastic or tape bandage, wrap from the toes to just below the knee, keeping the foot up and covering all the skin. If the ankle is very swollen, especially on both sides, then a more severe injury should be suspected.

Caution: Do not wrap bandages too tightly. Toes must remain warm and pink and have feeling.

Bleeding and Wounds

External Bleeding and Wound Treatment

Stop the bleeding with a gloved hand or finger(s), using well-aimed, direct pressure. Once bleeding has been controlled, clean the wound with mild soap and potable water, or use Hibiclens® or povidone-iodine. Remove any obvious debris with tweezers or forceps and irrigate the wound copiously with high pressure irrigation. If high pressure irrigation is not available, continue to flush the wound until no debris is seen. Never use alcohol to clean a wound. Once the wound is clean, apply an antibiotic ointment, cover the wound with a clean dressing (sterile, if possible), and tape it in place. All wounds

should be cleaned twice a day and a new, clean dressing applied. If a wound is contaminated and there is concern about infection, medical personnel should be advised.

Impaled Objects

If an impaled object will interfere with transport and is not in an eye, chest, or abdomen, it can be carefully removed. No objects impaled in an eye should be removed. Instead both eyes should be patched and padding should be placed around the injured eye to support it and decrease movement until it can be safely removed in a controlled environment.

Carbon Monoxide Poisoning

Carbon monoxide (CO) can be produced by burning anything containing carbon, including fuel in open flames, gas cookers, or engines. CO poisons by attaching itself to the hemoglobin in the blood. It does so about 200 times more readily than oxygen, easily displacing inhaled oxygen. When enough hemoglobin is compromised, the remainder cannot carry sufficient oxygen to the rest of the body. Oxygen starvation of the brain will cause permanent damage, even if the patient is revived. Furthermore, the toxicity of CO increases with altitude.

Carbon Monoxide Signs and Symptoms

Often there are none. However, the following may occur:

- Slight headache
- Shortness of breath
- Panting
- Confusion
- Nausea
- Chest pains
- Dimming of vision
- Feelings of exhilaration or lassitude
- Dizziness
- Excessive yawning
- Ringing in the ears

In latter stages, the patient's skin color becomes pink to cherry red, though the red and yellow polar tents will make it difficult to notice any skin color change. Unconsciousness and death is often rapid.

Carbon Monoxide Treatment

If carbon monoxide poisoning is suspected:

- Immediately move the patient to fresh air or to an uncontaminated tent.
- Provide the patient with 100% oxygen, if available.
- Contact Medical and describe the incident and symptoms.
- Keep the patient quiet and resting for at least eight hours. Early exertion may cause cardiac arrest.
- If breathing stops, commence cardio-pulmonary resuscitation (CPR).

Carbon Monoxide Poisoning Prevention

Field parties must utilize the issued carbon monoxide detector. Team members must ensure there is adequate ventilation at all times in all buildings, shelters, and vehicles. Tents or other shelters must be thoroughly ventilated during cooking and before personnel bed down each night.

Hypothermia

Hypothermia occurs when a person's core temperature is reduced to a level where normal brain and body functions are impaired. Hypothermia progressively affects a person's judgment, perception, and coordination.

Wind greatly increases the chilling effect of cold. The faster the air moves, the more heat it can drag away. This is wind chill. The cooling effects of air can be seen by referring to the wind chill chart in the reference section.

Wet clothes, from sweating, marine dampness, or precipitation also cause chilling. Finally, fatigue reduces a person's ability to protect himself or herself, and it diminishes the physiological capacity to thermoregulate and maintain a proper core temperature.

Hypothermia Prevention

Hypothermia is prevented by wearing the proper clothing and by supporting and regulating the body's heat production. Proper nutrition and hydration help prevent hypothermia, and adequate rest is critical. Exhaustion promotes the onset of hypothermia and precedes its development in almost all cases. The tendency to "press on" has led to many avoidable deaths.

A layered clothing system should be employed, where layers can be

added or removed as needed. Field team members should not allow themselves to get either cold or hot and sweaty.

Hypothermia Signs and Symptoms

Hypothermia manifests in three stages:

- Mild: This stage includes shivering and personality changes. A person may become withdrawn, apathetic, or irritable. There is a loss of fine motor control. Field party members should always be on the alert for a team member displaying the “umbles”: stumbles, mumbles, fumbles, and grumbles.
- Moderate: At this stage, hypothermia progresses to violent shivering, altered mental states, and disorientation. Moderate hypothermia also manifests as a loss of gross motor skills, such as balance and coordination (ataxia).
- Severe: In this stage, shivering stops and the level of responsiveness drops. A person becomes unresponsive and may appear dead, with very slow and weak pulse and respiration rates. An individual will appear cold and blue, and he or she may have associated frostbite. Cardiac arrest is possible.

Hypothermia Treatment

The essential and immediate treatment for hypothermia is to prevent further heat loss by insulating the body. If any member of a field party shows signs of developing hypothermia, the individual must be moved into shelter immediately.

Mild hypothermia may be turned around quickly. A person with this condition should be:

- Helped into additional clothing layers and fed quick-energy carbohydrates and warm, sweet drinks, such as hot chocolate or warm electrolyte beverages.
- Encouraged to run in place or perform another exercise.
- Provided dry clothes, if necessary, and external heat sources, such as hot pads or water bottles filled with warm fluid.

If moderate to severe hypothermia is suspected, contact Medical immediately. The patient should be placed in a hypothermia wrap, which is a bundle made of sleeping bags and reflective sheeting, with warm heat sources on the patient’s neck, armpits and groin. (Body-to-body rewarming in a sleeping bag is of limited usefulness and may result in two cold people.)

Frostbite

Frostbite is freezing of body tissue. Areas most at risk are the extremities and exposed skin (ears, nose, face). Factors that lead to frostbite are:

- Previous frostbite injury
- Cold temperatures and wind
- High altitude
- Overexertion (fatigue and dehydration)
- Touching metal or super-cooled liquid fuel
- Poor circulation
- Constrictive clothing or footwear
- Underlying medical problems
- Hypothermia

Frostbite Prevention

Frostbite is almost always avoidable. A buddy system should be established to observe any whitening on the face or ears of a companion. If any whitening or tingling of the face, ears, feet, or hands occurs, these areas should be warmed immediately. Socks and boots should fit snugly, with no points of tightness. Glove liners should be worn so that skin is never exposed when performing work that can't be done in heavy gloves.

Strenuous exercise should be avoided in extreme cold, particularly at high altitudes. Very cold air brought too rapidly into the lungs will chill the body's core. Perspiration under conditions of extreme cold should be avoided. Perspiration evaporates, chilling the body.

Plenty of food should be consumed to produce maximum output of body heat. Food items in cold weather should tend toward quick energy first, such as fats and carbohydrates, and then proteins. In addition, personnel should drink two to three liters of water per day to stay hydrated.

Avoid the following, which can promote frostbite:

- Smoking
- Alcohol
- Excessive coffee and tea drinking
- Excessive fatigue
- Improper or inadequate eating habits
- Unnecessary medication
- Exposure to fuel, especially on bare skin

Mild Frostbite Signs and Symptoms (pre-thaw)

There is an uncomfortable sensation of coldness, followed by numbness and skin anesthesia. In superficial frostbite (frost nip), the skin turns red, then pale or waxy-white. In partial thickness frostbite, the skin becomes cold and frozen on the surface, but remains soft and pliable when gently pressed.

Full-Thickness Frostbite Signs and Symptoms (pre-thaw)

The skin is waxy-white. Toes and fingers become solid (like a piece of chicken taken from the freezer). They feel wooden, and the skin cannot be rolled over the bone.

Full-Thickness Frostbite Signs and Symptoms (post-thaw)

The entire hand or foot swells, which limits the mobility of the injured toes or fingers. Blue, violet, or grey (the worst) discoloration appears. After two days, the patient suffers severe throbbing and shooting pains. Huge blisters form, usually between the third and seventh day. These usually dry up, blacken, and slough off, leaving an exceptionally sensitive thin, red layer of new skin.

Frostbite Treatment

Frostbite should not be rubbed, as this will cause additional tissue damage from the ice crystals within. Treatment in the field for anything beyond superficial frostbite is full of challenges and additional risk for the patient. Prevention is paramount!

Superficial Frostbite Treatment (Frost Nip)

Superficial frostbite can be treated effectively in the field. If noticed promptly, it can usually be treated by the firm, steady (no rubbing) pressure of a warm hand or by blowing onto it with warm breath. Superficially frostbitten feet are best treated by removing the patient's footwear the moment there is any suspicion of danger and rewarming the feet immediately. After warming is complete, the affected feet should be covered with dry socks. If footwear is replaced, it should be done loosely to ensure adequate circulation and warmth is maintained.

Partial-Thickness Frostbite Treatment

Partial-thickness frostbite of a small body area should be reheated in water that is between 42°C and 43°C (107°F and 109°F). Water at higher temperatures can burn the skin. The injury should then be treated to prevent infection, bandaged for protection, and kept warm. Refreezing must be prevented, as this will cause major additional damage. Medical personnel should be consulted if necessary.

Full-Thickness Frostbite Treatment

Because of limited resources in the field, full-thickness frostbite is a major medical emergency. Medical personnel should be contacted immediately for consultation and to discuss evacuation plans. Re-warming should not be attempted in the field if there is any possibility that the affected part may become refrozen. In such cases, the affected part must be kept frozen until it can be re-warmed rapidly under controlled conditions.

If rewarming is recommended, remove jewelry (especially rings) if possible. Immerse the injured part in 42°C to 43°C (107°F to 109°F) water, continually adding water and stirring it to maintain a constant temperature, until the digital tips (ends of fingers or toes) turn pink or burgundy red. This takes approximately 20 minutes to one hour and is extremely painful. When adding water, ensure that it is not more than 44°C and is not poured directly over the injured body part.

Significant pain, swelling, and blistering will develop after re-warming. Do not puncture the blisters, and do not allow the injury to refreeze.

Protect the thawed injury with sterile, soft, fluffy dressings. Separate toes and fingers with cotton wool. Wrap the whole part lightly with gauze bandages. Do not change dressings unless they get dirty, and never rub the skin. Keep the patient and the injured body part warm. Pain medication will be needed, and medical personnel will advise on specific type and dose. In addition:

- Elevate the injured limb(s)
- Commence antibiotic treatment, per medical personnel instruction
- Keep the patient absolutely still, lying down
- Evacuate to a medical facility as quickly as possible

Immersion Foot

Immersion foot, or trench foot, is a medical condition caused by prolonged exposure to cold, damp, and unsanitary conditions.

Immersion Foot Prevention

Feet should be kept warm and dry by wearing protective footwear, and they should be checked frequently during wet and cold conditions. Footwear should not be constrictive, and it should be cleaned and dried at every opportunity. In the field, extra pairs of dry socks should be carried next to the abdomen under the shirt. Wet socks

can be dried by placing them next to the abdomen, either inside or outside the shirt.

If feet get wet, they should be dried as soon as possible. They can be warmed by the hands. Foot powder should be applied and dry socks put on. If it is necessary to wear wet socks and footwear for any length of time, then the feet should be exercised at regular intervals by wriggling the toes and bending the ankles.

Immersion Foot Signs and Symptoms

The area becomes cold, swollen, waxy-white and mottled with burgundy-to-blue splotches. The skin becomes numb, deep sensation is lost, and movement of the affected area becomes difficult.

If allowed to continue untreated, the area becomes red, hot, and swollen, and blisters appear. The victim experiences constant throbbing and a burning sensation. Skin numbness is aggravated by heat and relieved by cold.

Immersion Foot Treatment

Remove wet footwear. Gently and rapidly rewarm the affected foot by immersing it in warm water (about 40˚C). Once the foot is warmed, dry it completely and elevate it in a warm room. Swaddle it with clean bandages or cloth to keep it warm and clean.

The injury must not be rubbed or massaged. Blisters should be kept clean and dry. Do not apply ointments. Two 200 mg ibuprofen tablets every four hours may be administered for pain, if required. Evacuate the victim to a medical facility.

Eye Injuries

Tent Eye

Antarctica's extreme low humidity may cause the film of tears protecting the eye to dry up, making the cornea susceptible to damage from stove fumes in the tent. The condition can be treated by applying Chlorsig® ointment to the eye when it occurs and/or before going to sleep.

Snow Blindness

Snow blindness is caused by ultraviolet (UV) light burning the eyes. The danger of snow blindness is greatest not on clear, bright days but on dull, cloudy (whiteout) days, when crystalline snow mist is present. There is no warning that damage has been done until the symptoms begin to appear two to twelve hours after exposure.

Snow Blindness Signs and Symptoms

Snow blindness manifests as intensely painful, red, watering eyes that are sensitive to light. The victim will also feel as though there is grit in the eyes.

Snow Blindness Treatment

A single episode of snow blindness may last up to five days, even while being treated. The eyes should be rested for at least 24 hours. That means closing them and covering them with a non-fluffy pad. If the temperature is above freezing, a cold compress may be placed over the affected eyes to relieve pain. Medical should be contacted for treatment recommendations and possible medications. Medical personnel may recommend providing the victim two tablets of ibuprofen (400 mg) every four hours, as required, or putting Chlorsig® ointment on the eyes every three hours.

Snow Blindness Prevention

This condition must be avoided, as it is a crippling injury that may seriously delay a field party. Team members should wear dark, UV-protective glasses or goggles with the appropriate lenses (not yellow) at all times when in the field, especially on overcast days.

Skin Injuries

Sunburn and Windburn

Direct exposure to the sun, especially when it is very windy or the body is wet with sweat, can result in a sunburn and chaffed skin. Because the Antarctic air is cleaner and thinner, there is greater ultra-violet penetration, so sunburn can occur even on overcast days. If sunburn occurs, apply aloe vera gel to the burn and provide the victim 400 mg of ibuprofen every four hours, as necessary, to relieve pain.

Sunburn and Windburn Prevention

Prevent sunburn by applying sunscreen ChapStick® to the lips and regular sunscreen to other areas of exposed skin. Covering the face with a balaclava will prevent both sunburn and windburn to this frequently exposed area.

Dental Health

Oral Hygiene

Oral hygiene can be inconvenient in the field, but it is just as impor-

tant as bodily hygiene. Failure to maintain good oral hygiene may result in increased tooth decay (especially around the edges of fillings) and gingivitis. Ideally, teeth must be brushed after every meal, with snow if no water is available. Use toothpicks or waxed dental floss to clean gaps between the teeth that are hard to clean with the brush.

Controlled Medications

Issue of Restricted Drugs

The Peninsula field supervisor issues a field medication kit containing over-the-counter, prescription, and controlled medications (restricted drugs) to each designated field party medical lead. The kit is the responsibility of this person. The medical lead (or any USAP participant) must contact a station doctor for consultation and authorization before administering any medication. Always check for any known allergies before administering drugs.

Chain of Custody

The Peninsula field supervisor will fill out a controlled-drug Chain of Custody form and provide it to the field medical lead. The lead must account for all controlled substances when the kit is checked out, weekly, and when the kit is returned. If the lead departs before the end of the season, he or she must complete a new Chain of Custody form and count the medications before transferring the kit to another person. At the end of the season, the medical kit, controlled medications, and a completed chain-of-custody must be returned to the Peninsula field supervisor.

SOAP NOTE

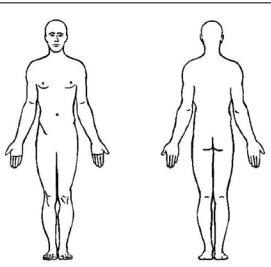
SCENE

S	Symptoms

A	Allergies
M	Medications
P	Past History
L	Last Meal
E	Events

OBJECTIVE

EXAM:



VITAL SIGNS						
Time	Pulse	Resp.	B/P	Skin	Temp.	AVPU
			/			
			/			
			/			
			/			
			/			
			/			
			/			

ASSESSMENT AND TREATMENT PLAN

A = Assessment (Problem List)	P = Treatment Plan