UNITED STATES ANTARCTIC PROGRAM

Field Manual

Peninsula Version 2026

This manual was prepared for the U.S. National Science Foundation (NSF) Office of Polar Programs by Antarctic Support Contract field area and other personnel. It brings together decades of first-hand field experience in Antarctica with the United States Antarctic Program.

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Please send suggestions and corrections to DEN-FieldSafety@usap.gov.

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Gentoo penguin,
Palmer Station

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PROGRAM INFORMATION

U.S. National Science Foundation Introduction

The "United States Antarctic Program Field Manual" provides an overview of field logistics, operations and safety within the U.S. Antarctic Program (USAP). It contains information relevant to living and working in an Antarctic field camp and is intended to enhance your success in the field. This reference manual provides valuable knowledge. Read it before deploying, and take it into the field with you. It is your responsibility to be familiar with the skills and techniques covered in this manual.

The harsh conditions encountered in the field setting, coupled with the need to conduct important scientific objectives in short periods, require effective leadership and constant risk management from all team members. Safety, environmental stewardship and your health are of paramount importance. Continued vigilance and action in these areas are essential.

This manual is designed to be used with the "U.S. Antarctic Program Participant Guide" available at https://www.usap.gov. The participant guide provides general programmatic information that complements the field manual. Using these materials and adhering to their guidelines will enhance your safety and productivity while working in Antarctica.

We wish you a safe and successful field season.

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Emergency Management

An essential part of field planning is anticipating emergencies. USAP supports scientific research at and around U.S. National Science Foundation (NSF) Palmer Station and in field camps along the Antarctic Peninsula. Management of emergency situations usually involves boat response. Before deploying to

the field, all station and vessel teams conduct field planning sessions to identify how to respond to emergency situations.

Under international search and rescue (SAR) arrangements, Antarctic Peninsula region field stations and camps fall within the Chilean Search and Rescue Region. Therefore, the Search and Rescue Service of Chile will conduct broader crisis management and recovery, including any necessary international coordination. The Chilean Rescue Coordination Centre is the lead for International Maritime Organization and International Civil Aviation Organization purposes. When planning field activities for the season, it is important for research teams to note appropriate contact information, including that of other nearby stations. However, unless directly supported by another station or agency, contact with another country should be initiated through NSF.

Who to Contact

If an emergency occurs at a field camp and the USAP support vessel is in the area, notify the Bridge immediately. Vessels are staffed 24/7.

In all other cases, contact NSF Palmer Station directly. The Iridium phone line at Palmer Station rings in several locations, and the phone line is monitored 24 hours per day. If you receive no response, the next point of contact is U.S. National Science Foundation McMurdo Station Central Communications (Central Comms).

Emergency Iridium Numbers

Contact	Number
Palmer Station Doctor	00-697-720-568-2778
Palmer Station	00-8816-763-15071
McMurdo Central Comms	00-8816-763-12464
McMurdo Medical	00-8816-763-15142

For non-emergency numbers, see the Communications section. For a medical emergency, call the Palmer Station doctor. If they are unreachable, call McMurdo Medical.

When an emergency call is made, the person answering the phone will collect the caller's name, phone number and location; classify the situation (e.g., injury or illness, spill, aircraft mishap, vehicle accident, loss of shelter); and gather the information necessary to assess needs and risks and determine appropriate actions. No emergency looks the same, so this manual cannot pinpoint specific courses of action. But the following information provides field party members with resources to help manage incidents in the field.

Emergency Response Guidelines

When responding to an emergency, first survey the scene. Is it safe? What happened? How many people are involved? Assess the situation, and determine if the emergency is mechanical/logistical or medical.

Mechanical or Logistical

Problem-solve to the best of your ability.

Medical

1. Conduct a primary assessment using the ABCDEs.

   Airway

   Breathing

   Circulation

   Disability

   Exposure

2. Provide necessary first aid to stabilize the patient.
3. Radio for help if needed. Alert other field team members of the situation.
4. Contact your emergency point of contact (POC) to give an initial report of the following:

   A. Patient's condition (if applicable)

   B. Plan of action

   C. Resources or support needed

5. Establish a callback time with the emergency POC.
6. Perform a secondary assessment.
    A. Interview the patient.
    B. Take vitals.
    C. Conduct a head-to-toe physical assessment.
    D. Continue monitoring.
7. Provide care and comfort.
    A. Keep the patient warm, dry and sheltered if possible.
    B. Reassure them and offer food or warm liquids, if appropriate.
    C. Improvise toilet equipment if needed.
8. Prepare documentation.
    A. Take detailed notes throughout the incident.
    B. Complete a subjective, objective, assessment, and plan (SOAP) note. (A SOAP note is an organized way to take notes about a patient. See the References section for a template.)
9. Conduct an inventory of available resources.
    A. Other people
        i. Define roles and responsibilities. Check in with team members to determine who will do what while the situation develops.
    B. Standard operating procedures
    C. Wilderness Medical Guidebook.
    D. Palmer Station doctor or NSF McMurdo Station medical team
    E. Equipment (e.g., first aid, medical, mechanical)

10. Reporting
    A. Notify the appropriate manager and other involved parties about the incident.
    B. Complete and submit the required incident report as soon as possible. (See the References section for a sample of the Emergency Incident Worksheet).

PRO TIPS

- Be prepared before making a call. Iridium phone calls can drop or cut out momentarily. Have a concise message ready when first establishing a call.
- Prepare focused questions.
- Be ready to take notes, or have someone available to do so.
- Have your documentation ready. Use the Emergency Incident Worksheet if helpful.
- If possible, have a plan ready to share.
- Understand the urgency of the situation.
- Know your location.
- Understand and communicate weather and terrain factors.
- Understand the timetable for evacuation.
- State requests for any additional needed resources (e.g., gear, food, support).
- Be prepared with a backup plan.
- Determine timelines for continued communication with your emergency contact.

Response Timeline

Emergency response times will vary by location. See the next flowchart for details by location.

▼ Missed Check-in or Distress Call

▼ Uncertainty Phase

05 min	**Palmer Station Foot Travel** Glacier, Backyard, island dropoff **Palmer Station Small Boat** Local and extended area	Palmer Station manager notified
05 min	**Vessel** Small boat, snowmobile, sea-ice foot travel **Vessel** Island team	Vessel CPC notified
60 min	**Established Field Camp** Palmer or vessel deployed	Palmer Station manager or CPC notified

▼ Alert Phase

05 min	**Palmer Station Foot Travel** Glacier, Backyard, island dropoff **Palmer Station Small Boat** Local and extended area	Palmer Station manager alerts OSAR/GSAR teams
05 min	**Vessel** Small boat, snowmobile, sea-ice foot travel **Vessel** Island team	CPC alerts vessel staff
60 min	**Established Field Camp** Palmer or vessel deployed	SAR team or vessel staff alerted

▼ Deployment Phase

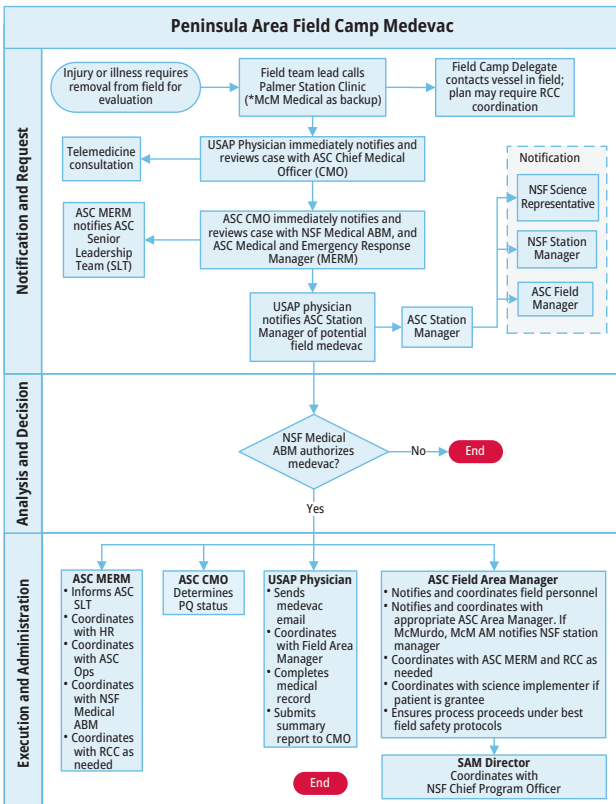
10 min	**Palmer Station Foot Travel** Glacier, Backyard, island dropoff **Palmer Station Small Boat** Local and extended area	Palmer Station OSAR/ GSAR teams deploy
30 min	**Vessel** Small boat, snowmobile, sea-ice foot travel **60 Vessel** Island team	Vessel staff deploy
24* hr	**Established Field Camp** Palmer or vessel deployed	SAR team or vessel staff deploy

■ Recovery and Debrief

Note: CPC = commercial project coordinator. GSAR = glacier search and rescue. OSAR = ocean search and rescue. SAR = search and rescue.
* Actual time varies by vessel location.

Medevacs

A decision about the need for a medical evacuation (medevac) will be reached with guidance from the USAP support vessel or Palmer Station. Medevacs require considerable resources and involve many stakeholders to successfully execute.



Field Deployment Emergency Planning

The more you know about available resources prior to deployment, the wiser your decisions will be in an emergency.

USAP Six-Step Risk Assessment

No.	Step	Task
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	Reassess throughout activity.
6	Debrief	What could be improved for the next time?

Questions to Consider

- What are the roles and responsibilities of each person? Consider medical, technical and communication skills.
- When will you be furthest away from additional resources (e.g., other camps, groups)?
- Where do you anticipate your highest level of hazards?
- Is there anything unusual you can anticipate?
- How will extreme weather affect your plans, and what are your thresholds for weather?
- Where does emergency gear live (e.g., first aid, communication resources, paperwork that could be helpful in talking you through steps to responding to an incident, mechanical backups)?
- Establish relationships with people you would rely on in an emergency. Before going into the field, introduce yourself and your team to emergency contacts (e.g., vessel captain/first mate, Palmer Station manager, Palmer Station medical staff).

Scenarios to Discuss

- High likelihood / low consequence
- High likelihood / high consequence (entirely avoid or actively mitigate these, which hopefully are few)
- Low likelihood / high consequence
- Low likelihood / low consequence

USAP Operational Risk Management

The following matrix is used across USAP to help determine the probability of an incident and the consequence level. During planning, this matrix can be utilized to reduce the overall risk of a project while balancing goals, priorities and logistics. In the field, this tool can be used daily to discuss hazards as they are encountered.

Risk Matrix

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

Note: None = No degree of possible harm. Trivial = Incident may take place, but injury or illness is unlikely or will be extremely minor. Minor = Mild cuts/scrapes, mild contusion, minor burns, minor sprain/strain, etc. Major = Amputation, shock, broken bones, torn ligaments/tendons, severe burns, head trauma, etc. Death = Injuries that can/do result in death if untreated in a reasonable time.

Survival Bags

All field parties participating in boating, including those going ashore or transiting more than 300 meters (~985 feet) on sea ice, are required to bring survival bags. The Peninsula survival bag is designed for use by field parties for emergencies in which they may be stranded away from a supporting vessel. Enough survival bags must be brought ashore for the entire field party, for any shore landing where the small boat and driver is not standing by.

While the bag is designed for survival purposes, it can also be used in medical emergencies. The bag contains emergency shelter, a sleeping bag, a stove and minimal food and water. The bag does not negate the need for each participant to pack their own day pack with extra clothes and warm layers, water, food, personal medications, lip balm and sunscreen.

A tag on the inside of each bag lists its contents, which are also covered in the "Peninsula Field Training" and "Sea Ice and Remote Shore Safety" training for grantees. If a survival bag is used, it should be returned to "Peninsula Field" under cargo code 879 and tagged with the missing and used items. Also email this information to the Peninsula field supervisor.

Palmer Boating Area Caches

Survival caches provide emergency supplies in places most frequented by scientists and operational support staff in the local, regional and extended rigid hull inflatable boat (RHIB) boating areas (i.e., the Palmer Station boating area). Survival caches are barrels of emergency supplies on islands. Like survival bags, each cache contains emergency shelter, a sleeping bag, a stove and minimal food and water. Unlike survival bags, each cache contains a radio that is tested and supplied each season by Palmer Station Communications.

A complete list of cache contents is covered in the mandatory "Boating 1: Passenger" training. Contents are also detailed in "Palmer Station Island Cache and Survival Bag Procedure" (PAL-SOP-0025) on the USAP Master List and on the Boathouse SharePoint site.

A list of cache locations is on the Pre-boating Checklist that each group must complete before riding in or piloting a Zodiac. The locations are also detailed in the mandatory, three-part “Passenger,” “Operator” and “Competent Crew” boat courses. Cache locations are also preprogrammed into all Palmer global positioning system (GPS) units at the start of each season.

Two additional cache-barrel sets are maintained at Palmer Station as backup, if extra barrels are needed or to swap out used or damaged caches (see local information on caches).

ENVIRONMENTAL POLICIES

Policy and Designations

Environmental stewardship and protection in Antarctica are essential. The U.S. is a signatory to the Antarctic Treaty (1959) and the Protocol on Environmental Protection to the Antarctic Treaty (Antarctic-Environmental Protocol; 1991). These agreements are implemented under the "Antarctic Conservation Act of 1978" (ACA; 16 U.S.C. 2401 et seq.).

The Antarctic Treaty sets Antarctica aside for peaceful purposes, primarily scientific research, cooperation and the exchange of information. The Antarctic-Environmental 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 Antarctic-Environmental Protocol also establishes procedures for waste disposal and waste management, prohibits marine pollution and establishes a process for area protection and management. USAP participants' adherence to it relies on educational programs in each of these areas.

U.S. federal regulations implementing the ACA can be found in 45 C.F.R. §§ 640, 641, 670–674. For more information, contact ASC Environmental at Environmental@usap.gov.

Antarctic Specially Managed Areas

Antarctic Specially Managed Areas (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.

Three ASMAs are 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 or conducting research in any of these ASMAs, ensure you understand the management objectives and requirements for working there by reviewing the ASMA

management plans on the Antarctic Treaty website at https://www.ats.aq/devph/en/apa-database.

Antarctic Specially Protected Areas

Antarctic Specially Protected Areas (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. Numerous ASPAs are 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 https://www.ats.aq/devph/en/apa-database. Several ASPAs are also located within ASMA 7 or can be accessed from Palmer Station, including ASPA 113 – Litchfield Island, ASPA 117 – Avian Island, ASPA 139 – Biscoe Point, ASPA 176 – Rosenthal Islands and ASPA 182 – Western Bransfield Strait and Eastern Dallman Bay.

The region surrounding Palmer Station (ASMA 7) contains 14 restricted zones on islands and points, with the aim of protecting breeding birds, seal haul-outs and vegetation. All restricted zones, except for Bonaparte Point, include a 50-meter (~165 feet) marine buffer. Restricted-zone entrance does not require a permit but does require prior authorization from the NSF environmental program manager. Details of the restricted zones and site-specific guidance can be found in the management plan.

In addition to ASPAs and ASMAs are Historic Sites and Monuments (HSMs) designated by the Antarctic Treaty. **You are responsible for knowing the latest restrictions and guidelines for all locations you plan to visit.** Discuss your field plans with the Boathouse, the Palmer Station manager or Antarctic Support Contract (ASC) project implementer to ensure all protected area requirements are met.

Visitor Site Guidelines

Visitor site guidelines provide specific instructions for conducting activities at frequently visited Antarctic sites. This includes practical guidance on visiting the sites, considering their environmental values and sensitivities. Permission to conduct recreational visits to sites with visitor site guidelines must be requested from NSF, and if approved, reported in your environmental end-of-season (EOS) report. For more information and a list of sites, visit https://www.ats.aq/devAS/Ats/VisitorSiteGuidelines. For more information on ASMAs, ASPAs or HSMs, visit the Antarctic Treaty website at https://www.ats.aq or contact the ASC Environmental team at Environmental@usap.gov.

ACA Permits

Without an ACA permit, it is illegal to (1) take native mammals, birds or terrestrial plants, (2) engage in harmful interference of native mammals, birds or terrestrial plants, (3) enter ASPAs, (4) introduce non-native species to Antarctica, (5) introduce substances to Antarctica designated as waste, (6) discharge designated waste or (7) import certain Antarctic items into the U.S. or export them to another country. It is important to know that the term "take" also applies to dead mammals or birds, including parts (e.g., teeth, feathers, bones) or eggs.

The processing time for an ACA permit averages three months. Violations of the ACA or conditions of a permit can result in fines. Research with marine invertebrates, marine plants or fish does not require an ACA permit if it does not occur within an ASPA.

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 language, consult with the field supervisor or commercial project coordinator or contact the NSF ACA permit officer at ACApermits@nsf.gov.

Specimen Collection and Permits

Teams should refer to the project's permit regarding specific 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 an ACA permit from 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. The Antarctic Treaty guidelines state "[i]f 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 a USAP participant finds something that may have historical significance, they must note the location with GPS coordinates, take a photo of the artifact and notify the ASC Environmental team of the artifact's presence at 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 U.S. without a permit. The take or harmful interference of marine mammals requires permits from both the National Oceanic and Atmospheric Administration and NSF.

Environmental Training

All personnel deploying to, 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 under the ACA and the Antarctic Treaty.

Wildlife

Personnel must not interfere with wildlife unless they have an ACA permit to do so and are specifically trained for the activity

being conducted. In general, always maintain a distance of at least three meters (15 feet) from animals. If an animal's behavior is altered or disturbed, increase that distance. Incidental disturbance of wildlife is not allowed unless specifically permitted. This means that if your project is not wildlife focused, you may not disturb wildlife while conducting your project, including on any routes to access your field sites.

Highly Pathogenic Avian Influenza

Highly pathogenic avian influenza (HPAI) H5N1 outbreaks were first detected in the Antarctic Peninsula region in December 2023. Outbreaks in the Peninsula spread in the 2024–2025 season, including a confirmed outbreak around Palmer Station. There continues to be a high risk that HPAI will spread in Antarctica. In response, USAP requires enhanced biosecurity protocols in Antarctica, including prelanding surveillance, decontamination of boots and gear between wildlife colony visits, use of appropriate personal protective equipment when in contact with potentially infected animals, reporting of suspected HPAI outbreaks to the NSF Office of Polar Programs (OPP) Environmental team at OPP-ENV@nsf.gov and enhanced management of areas impacted by HPAI. The status of HPAI outbreaks in the Peninsula may change rapidly, and certain USAP field activities may be impacted by HPAI outbreak status.

Non-native Species

No non-native plant or animal species may be introduced onto land, on 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.

Use boot washing stations before departing a USAP support vessel for field sites and when moving between field sites. To avoid cross-contamination, personnel must also clean all gear and personal equipment before transiting between Antarctic field sites. If a suspected non-native species is observed in

Antarctica, immediately report it to the camp manager or daily check-in POC.

Sample Site Markings and Equipment Installation

If a research group need to mark sample sites, it must use reusable, recoverable flags. 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 must be obtained from the OPP Environmental team. If a group needs to install equipment with the use of mechanical fasteners (e.g., bolts drilled into rock), prior approval from the OPP Environmental team is required and use of such fasteners must be minimized.

Spill Prevention, Cleanup and Reporting

All fuels, chemicals and hazardous liquid wastes must be stored with secondary containment. Where secondary containment is not feasible, employ best management practices 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 using any other means as necessary or prudent.

Primary storage containers must 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) must be immediately reported upon discovery, regardless of the volume spilled. At camps with a camp manager, report spills directly to the camp manager. At camps without a camp manager, report spills to the Palmer Station manager or the POC for daily check-ins. All spills must be cleaned to the greatest extent practicable and disposed of through the hazardous waste system.

Waste Management

Discuss waste management with the field supervisor or project implementer before camp personnel deploy to the field. Protocols may vary by camp type and location (e.g., if the camp is in or near an ASPA). In general, everything taken into the field must be brought out.

Waste generated at field camps is removed by camp staff and grantees and transported to supporting stations or ships for disposal. Peninsula field camps dispose of gray water into the intertidal zone, though in some cases everything must be packed out (e.g., when camps are in or near ASPAs). To expedite the camp takeout process, consolidate or compress items to make packing easier.

Raw chicken products are not allowed at field camps due to the potential for avian byproducts to contain pathogens and microorganisms that may threaten indigenous wildlife communities. Avian products (e.g., eggshells, meat) must be incinerated on vessel or at Palmer Station or disposed of in Punta Arenas, Chile.

Packing for Incineration

All camp solid waste must be properly sorted and bagged for return to the USAP support vessel. Most non-hazardous waste will be incinerated on vessel. The following items cannot go in the incinerator and must instead be separately bagged for disposal in Punta Arenas or to be sent to Palmer Station. For more information, contact Palmer Hazardous Waste at Palmer.HazWaste@usap.gov.

- Any and all glass, including broken glass
- Metal
- Wire or wire rope
- Electronics
- Batteries

- Aerosol cans
- Hazardous waste items (see next section)

Hazardous Waste

The ACA has strict guidelines on hazardous waste, which requires special handling and labeling. Remove all hazardous waste from the field at the end of each season. Questions about hazardous waste management can be directed to the Palmer Station lab manager at Palmer.LabManagers@usap.gov or to Palmer Hazardous Waste at Palmer.HazWaste@usap.gov. The following are examples of hazardous waste:

- 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 occur only in the intertidal zone and only if planned in advance. If working in an ASPA, review the specific ASPA management plan to determine if discharging human waste in the intertidal zone is acceptable.

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 unavailable. Urine in pee bottles must be disposed of when returning to the field camp or vessel, or it may be disposed of in a tidal area, where it is easily dispersed in the marine environment.

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 setup with the Peninsula field supervisor.

Bucket Use Rates

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

Environmental EOS Report

At the conclusion of field activities, all USAP-supported science groups must submit an environmental EOS report to Environmental@usap.gov. (Email Environmental@usap.gov to obtain a copy of the Microsoft Excel template for the report.) To ease the process and increase accuracy, populate the report with information throughout the season.

The following information must be tracked and quantified in the EOS report: camp site location and information, fuel use, hazardous materials used, waste disposition, scientific equipment installed, materials remaining and any spills. See the template for specifics.

Report Instructions

Thoroughly fill out the EOS report and email it as an Excel file to the ASC Environmental team at Environmental@usap.gov. Each science group and environmental ASC work center is required to complete the form. All EOS reports are ultimately submitted to 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 their own form.
- Use the dropdown menus in the Excel template for consistent reporting.
- All field parties must submit GPS coordinates of any science equipment installations, sampling or coring

locations, temporary camps, planned and unplanned releases, equipment left in the field over the winter and past or present disturbances of any kind.

- Report GPS data in decimal degrees to five decimal places.

Field parties operating in an ASMA or ASPA must submit GPS coordinates for each of the following environmental disturbances:

- Sample sites
- Soil pits
- Non-established helicopter landing sites
- Tent sites outside facility zones (i.e., remote camps; report GPS coordinates of camp perimeter)
- Fuel storage locations outside facility zones
- Waste handling and storage sites outside facility zones
- Any intentional or unintentional releases of fuel, equipment or any other material

For details, see the most current ASMA or ASPA management plan provided by the ASC Environmental team. Contact Environmental@usap.gov with any questions or comments about the EOS template or any other environmental issue.

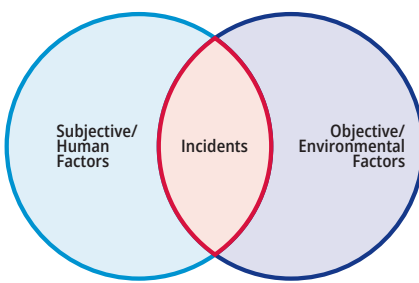
RISK MANAGEMENT

Risk management (RM) is essential to all we do in the field, from the daily hazards inherent to field work, to the bigger risks analyzed weeks or months before a project. Understanding what the hazards are and how to manage them as a team can ensure a successful field season.

Hazards and Risks

Hazard and risk assessments are the foundation of RM, informing the decisions and plans we make in the field. "Hazard" and "risk" are often used interchangeably but are distinct terms in the field. Hazards are sources of danger, while risks constitute the possibility of loss or injury due to exposure to a hazard. Typically, we identify hazards and manage their related risks. We cannot change the hazard but can manage our interactions with it.

RM often concerns "accident potential," the interaction of subjective/human factors and objective/environmental factors. Objective hazards are aspects of the natural environments and forces that present risks (e.g., weather, terrain, ice, snow, rockfall, moving water, wildlife). Subjective factors are the characteristics and behaviors of people (e.g., communication style, fatigue, complacency, personality, risk perception and tolerance, overconfidence, experience level). Incidents occur where the subjective and objective factors intersect.

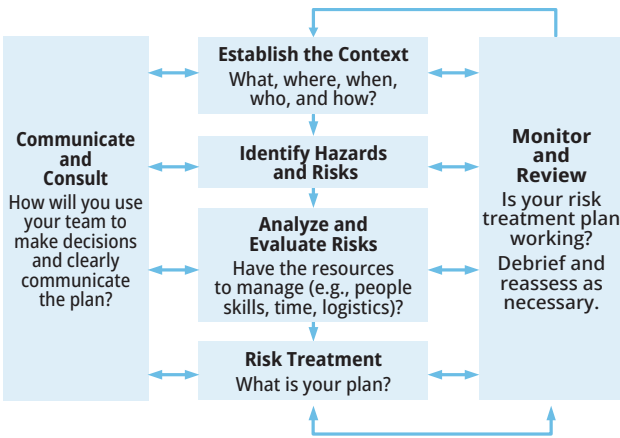


For example, crevasses may be present while traveling on a glacier (objective factor, i.e., out of our control), yet how we

communicate and plan to manage them is key to not falling into a crevasse and getting injured (subjective factor, i.e., within our control).

RM Process

The RM process involves systematically applying management policies, procedures and practices to communicating, consulting and establishing context, as well as to identifying, analyzing, evaluating, treating, monitoring and reviewing risk. From the proposal stage to implementation, RM is accounted for at all levels, from big picture oversight to daily decisions.



Daily RM leads to successful projects. Teams need tools to recognize hazards, mitigate risks and communicate effectively. Questions like the following have proven successful and can serve as the starting point of the risk assessment process:

- What can happen?
- How likely is it to happen?
- If it does happen, what are the consequences?

Asking these questions helps identify one or more scenarios in which someone or something is at risk to a hazard and how. These hypothetical sequences of events go through the initiating conditions to a final state (e.g., reduction of hazard, loss to the entity at risk), leading to this next set of questions that will inform the mitigation measure you choose:

- What is tolerable?
- How safe is safe enough (i.e., what is acceptable)?
- What needs to be done?

The RM process involves continuous iteration as shown in the next figure. Communication, consultation, monitoring and reviewing occur at each step as you cycle through the process.

Practical RM in the Field

Each day, we are making decisions, assessing hazards and communicating with our team. RM does not stop once the field plan is complete and you have arrived in the field. There are many ways to approach practical, everyday RM.

Conduct Daily Briefings and Debriefings

Morning Brief

- Conduct a rundown of activities for the day and associated hazards.
- Cover the mitigation plan for hazards.
- Do a physical and mental check-in for all team members.
- Plan for self-care throughout the day (e.g., food, water, personal needs).
- Go over the equipment and resource checklist.

Afternoon Debrief

- Did we make good decisions, or did we get away with it?
- What happened? So what? What next?
- What do people need to be at their best?

Assess Likelihood Versus Consequence

We often assess this unconsciously. Do a quick check-in: What is the likelihood of injury or incident, and what would that consequence be for myself and my team?

Use Common Language

Come up with common language and terms to identify risks (e.g., red means stop, yellow means caution, green means go). This can be applied to a variety of terrain and hazards.

Practice Situational Awareness

- Observe, orient, decide and act.
- Be observant of changing conditions — with individuals, the team and the environment.
- Effectively make decisions based on your observations.
- Reflect (in real time) on your decisions to refine courses of action.

Positive Work Environment

Successful field work is a result of a high-functioning team. Expeditions with extended time in the field tend to have their own culture characterized by team member's shared values and practices. USAP supports creating an inclusive, respectful and welcoming work environment, on the belief it leads to teams who successfully manage and plan for risks. To help make this happen, make time to discuss and practice the following together:

- Actively invest in a work culture that promotes proactive RM and support for all team members.
- Plan a positive work environment that is pertinent to team makeup, location, work, schedules, etc.
- Have AM/PM meetings that include dialog about subjective and objective hazards.
- Interrupt behaviors that erode the work environment, and actively solicit feedback about impact on others.

- Determine how the group plans to hold one another accountable to this?
- Facilitate foundational conversations around respectful team dynamics.
- Be inclusive by being curious and appreciating other's differences and identities. Exclusion is not tolerated.
- Build in time that is not centered on work. Ensure there is space for fostering relationships, morale and respite.
- Be mindful of humor, jokes and references that could alienate team members.

Sexual misconduct is a serious offense. Online and in-person meetings, both before and during deployment, are good ways to understand and address team dynamics, review the sexual misconduct policies of associated institutions and employers and consider the logistical impact that Antarctic field camp life has on implementing such policies.

Early discussions are chances to build trust and rapport in the group, work through scenarios and formulate agreements on how the team will process conflict and promote accountability in the field. Teams are encouraged to memorialize these discussions in a field safety agreement and ensure all members are aware of and have access to the material.

Self-awareness

Effective RM starts with **you**! Having a good understanding of your skills, attitudes, comfort level and risk tolerance and perceptions allows you to be a solid team member. Working in the cold, harsh environment of Antarctica has its challenges. Learning to thrive and not just survive is the goal.

Strengthen your situational awareness with accurate self-awareness by being aware of both your mood and your thoughts about that mood. Self-awareness can be cognitive (e.g., thoughts, beliefs, biases, assumptions), emotional (e.g., feelings, moods) or behavioral (e.g., language, actions), all of which helps us understand how we will respond in various situations. Self-awareness also benefits from feedback from

others. Strong teams make a habit of giving and receiving objective performance feedback in a way that minimizes defensive responses.

Stress Management

PRO TIPS

- Before deploying to the field, consider talking with your team about what you need to be successful (e.g., I like to have my hot drink in the morning before talking to anyone; it is important to me to laugh and have fun; I like to find time to connect with loved ones at home).
- As part of field planning, discuss some scenarios and ask team members to be realistic about how they would react.
- As a team, determine how you will make space for each other to get needs met.
- What does leadership, communication and feedback look like?
- Think about intent versus impact when communicating.
- Prioritize curiosity over assumptions. We all come with a belief system that influences our behaviors. Ask questions before assuming ill intent.

Stress and fatigue are normal components of field work. Working in the outdoors demands a strong work ethic. Team members work hard, both physically and emotionally, regularly putting in long days throughout the field season.

Teams can be under enormous stress from the physical exertion of living outdoors in the cold, time pressures, aspects out of our control, living with strangers, or adapting to a new diet and routine. The effects of stress and fatigue on performance are well documented. Our strength, stamina, mental and emotional health and immune responsiveness decline if we are chronically tired, undernourished or stressed. We are also more susceptible to injury when tired and hungry.

PRO TIPS

- Make it normal to ask for help. Role-model this regularly.
- It is not a character flaw to be tired or need time to recharge. Before deployment, ask team members what they need to be successful in the field. Know how you will support one another beforehand.
- Have a plan for your team to get good, consistent sleep.
- Ensure mealtimes are consistent and meals are nutritious.
- Have regular team check-ins as a team or one-on-ones as needed.
- Carve out personal time so people can recharge the way that is best for them.
- Mix up camp responsibilities throughout the season.
- Use the following stress continuum so team members have common language to describe how they are feeling.

Using the Responder Alliance's stress continuum (https://www.responderalliance.com/stress-continuum), we can become attuned to our stress levels and communicate when they are green, yellow, orange or red. This helps teams approach situations that require heightened focus and risk mitigation.

Individual Stress Continuum

Green/Ready	Yellow/Reacting	Orange/Injured	Red/Critical
Healthy sleep	Sleep loss	Sleep issues/ nightmares	Insomnia
Healthy relationships	Distance from others	Disengaged relationships	Broken relationships
Spiritual/ emotional health	Change in attitude	Feeling trapped	Intrusive thoughts
Physical health	Fatigue	Exhausted	Anxiety and panic
Emotionally available	Avoidance	Physical symptoms	Depression
Gratitude	Short fuse	Emotional numbness	Feeling lost or out of control
Vitality	Criticism	Suffering	Thoughts of suicide
Room for complexity	Lack of motivation	Isolation	Blame
Sense of mission	Cutting corners	Burnout	Hopelessness
	Loss of creativity/interest		

Fatigue Management

Antarctic field research opportunities are precious. It is tempting to burn the candle at both ends to accomplish project objectives. However, when people become extremely tired, their awareness level can drop and their stress level can rise. Exhaustion causes the following problems:

- Compromised work quality
- Worsening personal relations
- Judgment lapses
- Decreased situation or self-awareness of safety
- Behavioral changes that put self or others 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 people to be responsible for their own well-being and take advantage of rest periods as necessary.

Rest and Duty Cycles

Setting up a field camp can be one of the busiest days of the field season. Getting basic needs met is the priority: shelter, warmth and water. It is important to determine roles and responsibilities before arriving at camp. It is also important to plan what to accomplish in the first 24, 48 and 72 hours on site. Making your task list is important. So is knowing when you will rest, which keeps motivation up. Consider keeping a rest and duty cycle throughout the field season.

Lifting and Carrying

Manual material-handling tasks performed repeatedly, or over long periods, can lead to fatigue and injury. Below are some of the main risk factors when lifting and carrying.

Risk Factors for Injury

Risk	Example
Awkward posture	Bending, twisting
Repetitive motion	Frequent reaching, lifting, carrying
Forceful exertion	Carrying/lifting heavy loads
Pressure point	Grasping loads, contact with parts/surfaces that are hard or have sharp edges
Static postures	Maintaining one position for an extended time

Before Lifting

- Always test the load for stability and weight.
- Assess whether more than one person may be needed to accomplish the lifting activity.
- Wear appropriate footwear to avoid slips, trips and falls.
- If you wear gloves, choose a size that fits properly. Depending on the glove material and number of pairs worn, more force may be needed to grasp and hold objects. Wearing a single pair of gloves can reduce grip strength up to 40%. Wearing two or more pairs can reduce grip strength up to 60%.
- Lift only as much as you can safely handle by yourself, and be realistic about how much you can lift.
- 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.

While Lifting

- Get a secure grip.
- Use both hands whenever possible.
- Use smooth, even motions.
- Keep the load as close to your body as possible.

- To the extent possible, use your legs rather than your back to push up and lift the load.
- Do not twist your body. Step to the side to turn.
- Alternate heavy lifting or forceful exertion tasks with less physically demanding tasks.

Staying Warm

Our health and comfort in the field depends on staying warm and dry — we make better decisions, sleep better and are happier. It is far easier to stay warm than warm up once cold.

Ways We Lose and Generate Heat

Lose	Gain	Mode	Description
x	x	Conduction	Direct transfer of heat from one object to another (e.g., while sitting on ice/ snow with no insulation, picking up cold objects with bare hands)
x	x	Convection	Movement of air between the body and air outside (e.g., via open collars, untucked shirts, unzipped jackets, no hat)
x	x	Radiation	Transfer of electromagnetic energy from a hot object to a cold object, primarily through exposed skin
x	x	Evaporation	Heat exchange when moisture evaporates from wet clothing or skin
x	x	Respiration	Heat exchange via breathing, which can occur rapidly when breathing is heavy in cold weather
	x	Activity	Bodily movement or exertion (e.g., shoveling snow)
	x	Food	Consuming food, especially simple sugars, which the body can break down quickly to produce' heat
	x	Clothing	Wearing light/medium/heavy layers to trap “dead” air space around the body

PRO TIPS

- Take short, frequent breaks while doing strenuous work to avoid sweating, which can cause chills via evaporation and perspiration.
- Change out of wet clothes, or if clothes are only damp, layer up and do light activity. Synthetics and wool dry as your body creates heat.
- Eat throughout the day! Lunch starts as soon as breakfast is over and ends when dinner begins. This helps regulate body temperature during the day.
- Stay hydrated! Not only will the dry environment take its toll on your body, but also drinking fluids will keep you warm.
- Wear a warm hat and gloves most of the time.
- Always have layers available so you can fine-tune for the activity and location.

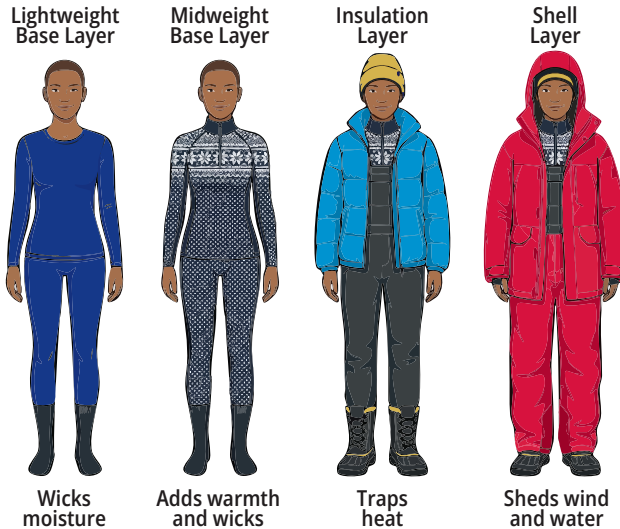
Clothing

In addition to the extreme cold weather (ECW) gear that USAP issues, you will need several layers to be comfortable and thrive in the field. Before leaving home, you should have received a gear list from your team to help you acquire the proper gear.

A good rule for living in cold environments is to get lots of insulation between you and the environment and then remove that insulation, layer by layer, as you warm up. You need a clothing system that allows you to shed layers quickly and easily before you get damp from perspiration. Several thinner garments are better than one bulky layer.

Layering

Layers ensure you can be comfortable in a variety of temperatures and work conditions.



Base Layers

Your first base layer should fit snugly against your skin and be lighter weight. This layer works by wicking away water and keeping your skin dry. Merino wool or synthetic fabrics (e.g., polypropylene aka polypro) work great. Cotton is a poor choice and should be reserved for hanging out around camp and sleeping in warmer temperatures. Depending on location, you may wear two to three base layers of varying weights. This will help trap air and prevent heat loss.

Insulation Layers

An insulation layer can be thick long underwear (e.g., light fleece, wool), whose role is to absorb and maintain heat.

Thickness is warmth! Insulation layers are often worn while working, but avoid wearing your thickest layers for high output. Have an outer garment with several inches of loft during sedentary activities or extreme cold. Down is best for dryer conditions. Synthetic insulation is best for wetter climes.

Shell Layers

Shell layers are often the most important layer in your system and the most used after your base layers. Wind shells over any garment can add up to nearly 4°C (25°F) of warmth and 10°C (50°F) in very windy conditions. In places like Antarctica, we need constant protection from wind. Ensure your wind shell can fit over all layers before going into the field.

PRO TIPS

- Bring comfortable, synthetic fabric underwear, which is easy to wash and fast drying. (If allergic, try merino wool.) Also, bring cotton underwear for sleeping.
- Sports bras are popular and comfortable but often thick and slow to dry. (You will sweat in the cold.) Test before deploying.
- It is tempting to go to sleep with all your layers on but best to remove wind-resistant clothing and sleep in breathable layers to avoid sweating.
- Bring lots of good-quality socks. Our feet can be some of the hardest working parts of our body. Change into sleep socks at night (affectionately called "sacred sleeping socks," which live in your sleeping bag only).
- Wear materials that wick moisture from the skin (e.g., synthetic materials, wool).
- Wear clothing that retains its warming properties even when wet (e.g., wool, fleece, synthetic insulation like Primaloft).
- Try on all layers together and test a variety of layering strategies before going into the field, to ensure your clothing is not constricting and lets circulation take place.
- Avoid excess clothes while active, so they do not saturate with sweat and cause you to lose heat through evaporation.

Damp or Wet Clothes

More often than not in Antarctica, clothes will not dry on their own or when hung outside while you work. Keeping clothes dry takes effort.

PRO TIPS

- Your body is often the best "dryer" for damp clothes. Sandwich them between your layers as you work around camp to dry them.
- Putting clothes in your sleeping bag is usually not enough to dry them. Hot water bottles in the bag will help with drying.
- Socks are the most likely clothing to become damp, as you wear them all day while working. To dry them overnight, you can put socks between your clothing layers so your body heat dries them while you sleep.
- Beware of hanging clothing too close to heaters. Synthetic fibers can melt!

Sleeping in the Field

Part of thriving in the field is getting a good night's rest. Insufficient sleep can affect your physical and psychological well-being. Everyone has different sleeping needs and metabolic rates, so you may need to experiment with sleep during the first few days in the field.

PRO TIPS

- Always use multiple pads for comfort and insulation from the ground. Foam and inflated air mattresses are standard issue.
- Eat well before going to bed, ensuring you have both fats and carbohydrates. Fats take longer to digest, keeping your furnace stoked throughout the night.
- Do not wear all your clothes to bed. Start with base layers and add if needed. The goal is not to sweat.

- Urinate before getting into your sleeping bag, and do not ignore the call to urinate in the middle of the night. Use your pee bottle.
- Do some light calisthenics as you get into your bag to heat up your body.
- Consider wearing a warm hat as significant heat is lost from the head.
- Take a hot water bottle (or two) or hand warmers to bed with you. Place them under your arm pits, in between your legs or at your feet. You will not regret it.
- Have a pair (or two) of sacred sleeping socks that are solely for the bag.
- If your sleeping bag is somewhat big for you, consider filling the voids with other dry clothing to warm up the dead space.
- Keep sugary snacks nearby for midnight refueling.

Staying Found

While most fieldwork happens during the austral summer months, with 24-hour daylight, getting disoriented or lost can happen. As you set up camp, discuss a plan for this. It can be easy to become disoriented in the wind, fog and snow when moving between tents or huts at larger camps. In bad conditions, visibility can plummet in minutes. It is essential to have a plan if you are moving around camp in bad weather:

- Tell someone where you are going.
- Carry a radio.
- Have a check-in time.
- Set up rope lines in advance of bad weather.
- Determine how a person would signal distress if lost around camp (e.g., use of whistle, radio).
- Determine the minimum time-distance from camp in which a person must carry extra supplies (e.g., survival bag, food, layers). Starting this requirement at ~15

minutes from camp is suggested, but it may need to change by location.

If you become disoriented or lost, do the following:

- Stay calm, positive and alert.
- Stop once you know you are disoriented. Make a plan and take a deep breath.
- Do not wander around aimlessly. You are better off staying where you are.
- Make contact or noise.
- Minimize heat loss by putting on additional layers if you have them.
- Stop and think. Try to remember your movements and figure out a way back.

Hygiene

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

Camp

- Designate a handwashing 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 (e.g., containers, shovels, ice axes) and do not use it for

anything else. Alternatively, sterilize 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.

Personal

A big part of self-care is personal hygiene. You will be better focused and able to make good decisions if you are comfortable. If you have any anxiety about hygiene during your prolonged time in the wilderness, then this information can help.

Bathroom

You will learn how to "pee and poo" in the field in a way that is environmentally responsible and sanitary. Depending on the field location, there will be different parameters on human waste containment. Many camps require all gray water (pee) and human waste (poop) to be contained in buckets and barrels. Toilet paper is provided for all camps.

You will be issued at least one pee bottle along with your sleep kit. If you have a vagina, you can ask for a urinary adjunct (e.g., Lady J, "shenis") from Peninsula field gear. It is best to practice before leaving for camp, in the comfort and warmth of an indoor bathroom stall.

Handwashing is an important aspect of maintaining backcountry hygiene and health. Alcohol-based hand sanitizer is readily available, but traditional handwashing is best when possible. All camps should plan on having a handwashing system with soap and water.

If you have a vagina, you are encouraged to wash your pubic area with mild soap and water daily and bring an extra bandanna to clean yourself after urinating. Baby wipes are also a good alternative to soap and water. Bandannas can be hung outside of your tent in the sunlight to dry. Consider sleeping in cotton underwear instead of synthetic fibers.

Menstrual

If you menstruate, your cycle may change while living in the outdoors, so plan to bring extra menstrual supplies. You can use a reusable menstrual cup in lieu of tampons or pads. If you are using a new method, be sure to practice using it before deploying.

All camp outhouses should have both a human-waste bucket and a sani-waste bin. Dispose of menstrual products in sani waste. When away from camp, it is also helpful to carry a stuff sack containing menstrual products and a zip-top bag for their disposal and carryout. Placing one or two aspirin tablets (not acetaminophen aka Tylenol) in the disposal bag will help keep odors down.

If you experience menstrual cycle changes or genitourinary symptoms (e.g., itchiness, soreness, excess or smelly discharge, painful or more frequent urination), do not hesitate to contact the field medical lead or whomever you feel most comfortable talking to. USAP field medical kits have medication to treat common infections (e.g., urinary tract infections, yeast infections).


COMMUNICATIONS

If deploying to a field camp from a USAP support vessel, pick up communication equipment from the Peninsula field supervisor in Punta Arenas. At Palmer Station, the communications technician issues equipment. All field camps must have at least two official forms of long-range communication that do not depend only on satellite: a high frequency (HF) radio and at least two Iridium phones. Field camps are also issued very high frequency (VHF) radios for local communication.

As a field camp manager, field coordinator or field team lead, it is your job to familiarize yourself with the components, setup and use of all communications devices. Field parties may opt to bring their own InReach satellite communication devices for personal use. Include all their device or part numbers and their contact information in the field plan. Note that InReach devices are handy but not considered an official source of communications within USAP.

Do the following when checking out equipment:

- Test the HF radio, Iridium phones and VHF radios by calling the USAP support vessel or station to ensure they work correctly.
- Ensure there are spare batteries for each device and that the batteries hold a charge.
- Communication devices should have a list of frequently used numbers. If you do not have one, ask for a list.
- Save frequently used numbers in the Iridium phones.
- Tune VHF radios to the correct channels.
- Charge all batteries, including spares.

Radio and Phone Best Practices

If a shore party cannot check in with the support vessel or reach a boat driver, messages may be relayed via a third party. Otherwise, radio the Bridge of the USAP support vessel or the Palmer Station communications technician when the field party has arrived at the destination and/or returned to the vessel or station. If 20 minutes have passed since check-in

time, Palmer Station will mobilize the ocean search and rescue (OSAR) team.

Use the following phonetic alphabet when letters or groups of letters must be pronounced separately (e.g., unusual words, call signs, during noisy conditions).

Phonetic Alphabet for Radio

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

Best practices for radio or phone calls are as follows:

1. Listen before transmitting to ensure the channel is not in use.
2. Hail the vessel or Palmer Station (e.g., “Palmer Station, Palmer Station. This is shore party.”).
3. Pause for a moment after pressing to transmit, to ensure the entire transmission gets through.
4. Wait for acknowledgment.

5. Transmit the following information:
   A. Party name
   B. Destination
   C. Number of people
   D. Estimated time of return to station or USAP support vessel, or estimated time of arrival at the destination
6. Keep the batteries warm, and always carry a spare battery or spare radio.

VHF Radios

VHF radio is the primary form of wireless communication at and around Palmer Station and on the USAP support vessel. The radio is a shared resource monitored by multiple users. VHF radios require a line of site around the Palmer Station boating area. There are repeaters around station to extend the VHF range (see the next table).

VHF Frequency Assignments for Palmer Station

Channel	Frequency (megahertz [MHz])		Description
	Transmit	Receive	
25	156.250	161.850	Channel 27 Relay (use when not in line of sight of Palmer Station)
27	157.350	161.950	Palmer Station Radio Watch

If you are not within line of sight or repeater coverage, you may not reach your audience. In this case, move to higher ground to acquire line of sight, or have a third party relay messages for you. If you are still unable to make contact, use the Iridium phone or HF radio. Use the best practices described above during radio communications, which should be brief and on topic.

Iridium Satellite Phones

Field parties working away from the USAP support vessel or Palmer Station may also be issued Iridium satellite phones. These are administered by the U.S. Department of Defense. Dialing sequences to and from other commercial Iridium phones may vary. If a field party has multiple Iridium phones, the one with the lowest phone number is designated as the "Alpha" (i.e., primary) line. The next ones are "Bravo," "Charlie" and so on.

Frequently Used Numbers

Contact	Type	Number
McMurdo Station		
Central Comms	Iridium	00-8816-763-12464
McMurdo Medical	Iridium	00-8816-763-15142
	Non-iridium	00-697-720-568-1048
Palmer Station		
Station	Iridium	00-8816-763-15071
Station Manager	Non-iridium	00-697-720-568-2776
Communications Technician	Non-iridium	00-697-720-568-2795
After Hours	Non-iridium	00-697-720-568-2775
Denver Office		
ASC Main Line (leave message if after hours)	Landline	00-697-303-790-8606
Medical Emergencies		
Palmer Station Medical	Non-iridium	00-697-720-568-2778
ASC Medical Director (Dr. Jim McKeith)	Mobile	00-697-707-974-9969
UTMB Medical	Landline	00-697-855-300-9704

Dialing Calls

Iridium to Iridium

1. Power up the Iridium phone.
2. Wait for the telephone to register with the network and display a signal level.
3. Dial 00 to access the satellite network.
4. Dial the 12-digit numeral subscriber number (i.e., MSISDN).
5. Press the green button to initiate the call.

   Example: 00 8816-763-15071 for Palmer Station

Iridium to Commercial (Non-USAP) Iridium

Dial 00 698, then the 12-digit subscriber number.

Example: 00 698 (8816 or 8817) XXX-XXXXX.

Iridium to Standard U.S. Phone

1. Power up the Iridium phone.
2. Wait for the telephone to register with the network and display a signal level.
3. Dial 00 for an international call.
4. Dial 697 to connect to the Federal Telephone System.
5. Dial the area code. Do not dial "1" before dialing the area code.
6. Dial the seven-digit telephone number.

   Example: 00 697 (720) 568-2775 for Palmer Station

Iridium to U.S. Toll-free Number

Dial 00 699 1 (800 or 888 or 877) XXX-XXXX. The Xs refer to the phone number you would like to dial.

Iridium to International Phone

All calls originate from Hawaii, so “international” is relative to the U.S.

1. Power up the Iridium phone.
2. Wait for the telephone to register with the network and display a signal level.
3. Dial 00 698 to access the satellite network.
4. Dial the international number as “Country Code” “City Code” “Destination Number”
5. Press the green button to initiate the call.

   Example: 00 698 64 3 358 8139 for USAP Clothing Distribution Center in Christchurch, New Zealand

Iridium to International Number

Dial 00 698 + country code + city code + local number.

Any Phone to USAP Iridium

Any USAP Iridium phone may be dialed from a U.S. phone by using a Hawaii area code. Replace the following Xs with the last four digits of the Iridium number. If the SIM card’s last five digits start with a

1, then dial 808-659-XXXX;

2, then dial 808-434-XXXX;

3, then dial 808-684-XXXX;

4, then dial 808-851-XXXX; or

5, then dial 808-852-XXXX.

Example: If the Iridium number is 8816 763 2XXXX, then dial 808-434-XXXX.

Getting Text Messages

Friends and family can send short text messages to an Iridium phone. However, unless there is an email data kit installed, the Iridium phone cannot send outgoing text messages. 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, camp members will not know the intended recipient of the message.

Generally, friends and family should have only the Bravo (i.e., secondary) Iridium number so the Alpha line is used for work purposes only. They should be informed that the Iridium phones are a shared resource. As a team, you can determine which phone can be used for texts.

Text messages can be sent from a computer to Iridium phone as follows:

> **Option 1:** The message can be sent via https://messaging.iridium.com. The sender fills out the form on the webpage by entering the Iridium phone number (e.g., 8816763XXXXX) and composing a message that is no more than 160 characters.
>
> **Option 2:** The message can be sent via email, using the 8816763XXXXX@inah.pac.disa.mil format, where the last five digits of the Iridium phone are inserted at the Xs. Your message will be sent in plain-text format (not rich text or HTML). Leave the subject line blank, type 160 characters maximum in the body of the email, starting with the recipient's initials and abbreviating when possible. Exclude hyperlinks, signatures, photos, documents and other attachments.

Persons in the field can check for Iridium text messages as follows:

1. Power up the phone and place a call. This places the Iridium in the satellite constellation and begins the download of messages.

2. If there is no need to talk to anyone, call 00-697-720-568-2211.
3. Once the device connects you, end the call.
4. The satellites should forward any queued messages.

Troubleshooting the Phone

If the Iridium phone is malfunctioning, first disconnect and reconnect all accessories (e.g., battery, antenna, adapters) to ensure there are solid contacts. If possible, move to an area clear of obstructions. Then try operating the phone again.

Also protect the antenna, as plastic will become brittle and crack in cold environments. Be gentle when swapping out Iridium components. Most of the adapters are made of thin plastic, especially the 9575s. Work from sheltered environments when possible, and do not force any connections. Replacement phones are limited.

HF Radio

All deep field camps are issued an HF radio as they are beyond the range of VHF. HF can provide long-distance communication via groundwave or skywave, surpassing VHF's line-of-sight limitations.

HF radio can be adjusted to change how the signal is controlled. However, users should follow the standard setup instructions for the Barrett 2090 HF transceiver and verify that radio settings are correct before making adjustments.

The handset and whip antenna must be attached to the radio before operation. Select channel/frequency using the up/down arrows for Palmer Station individual frequency.

Alternately, a long-line dipole antenna may be used in place of the whip antenna. The long-line dipole must be elevated at least four feet off the ground. Ensure all shorting bars are connected, except for the desired frequency. **Remember when plugged into the radio, the long line is an active wire and electrical shock can occur.**

PRO TIPS

- Speak loudly into the microphone, and follow the radio best practices described above.
- The loss of saved frequency programming in the nine available channels indicates an internal battery failure and does not render the radio inoperable. Manually tune the radio to the desired frequency, and operate using radio best practices.
- Charge the battery (alternating current [AC] or direct current [DC] power) by setting up and attaching supplied solar panel.

Check-ins for Overnight or Multiday Camping

Field camp personnel must check in once per day with the USAP support vessel or Palmer Station by calling the Palmer Station manager or POC. Some camps may request a secondary daily check-in for weather reports or updates. Call times are established in the field planning phase and agreed upon by the station manager or POC. Check-in times are in local time and account for set mealtimes.

If the field team is unable to reach their check-in at the designated time, the field team will call hourly, at the top of each hour, until contact is made. If the field team is supported by a USAP support vessel but is unable to contact the vessel, field team members should also try to contact Palmer Station, Central Comms, or a direct manager at ASC's office in Denver, in that order. If no contact is made within six hours of a designated check-in time, the POC or Palmer Station manager will notify the ASC office in Denver that the field party has missed its check-in.

Communicating Over Poor Signals

If the Iridium phone or HF communication signal is weak, use a green-yellow-red system to convey camp status information during initial contact:

> **"Green":** This means all is well and no further contact is required until the next scheduled time.

“Yellow”: This indicates an issue requires further consult. Have all pertinent information about the situation at hand during this initial contact. Establish additional contact times and methods.

“Red”: This means emergency and immediate vessel or outside assistance is needed. If the camp is supported out of Palmer Station, station personnel should immediately notify NSF to determine whether OSAR will respond or to ask the nearest vessel to proceed to the camp. For a vessel-supported camp, the Palmer Station manager, vessel captain and NSF initiate a request for additional SAR assistance as required.


FIELD CAMP
OPERATIONS

Overview

USAP opens Support Information Packages (SIPs) between March and April for PIs to fill out. The SIP covers science objectives, grantee participant team information, USAP equipment requested, cargo, lab consumables, camp equipment needs and personnel support requested. During the SIP process, the Peninsula field supervisor, science implementer and PI discuss the project's scientific objectives and field gear.

Landing sites, alternate landing sites, camp sites, sampling sites, fresh water sources and all-terrain vehicle (ATV) or snowmobile routes must also be discussed. Locations must be identified using ArcGIS maps or satellite imagery and submitted to the ASC Environmental team for review, which may submit a report to NSF for approval based on the project's environmental impacts. Available satellite imagery, weather reports and tide charts must be used to plan for primary and alternative landing sites, camp sites and tent orientation. (It is important to more closely inspect local features upon arriving at a site.)

As planning progresses, a virtual meeting with all field party participants (e.g., camp managers, camp assistants, mountaineers, scientists) is held to discuss field gear and criteria for running a successful camp. At the meeting, the list of USAP-supplied camp gear and a recommended packing list for participants are distributed and discussed, as are approved locations of landing sites and camp sites, camp timing, and restricted areas.

Peninsula field camp participants must deploy early for field safety training and to pack field gear. Plan to spend four workdays in Punta Arenas on these activities. Camp managers, field camp assistants and mountaineers may need to be in Punta Arenas anywhere from 10 days to two weeks in advance to test, repair and pull gear.

Gear must be manifested, packed and onloaded using Maximo the day before the vessel departs. All time in Chile for grantee

field participants is paid out of the grants. PIs should budget for hotels and meals accordingly.

Ensure you follow USAP HPAI guidelines and do not visit seabird colonies or come into contact with concentrations of birds — particularly Magellanic penguin colonies — in or around Punta Arenas before departing for Antarctica.

Punta Arenas Schedule

A typical grantee schedule in Punta Arenas spans six days, with more time required if science gear must be assembled, calibrated or tested.

Day 1: Arrive in Punta Arenas in the afternoon or evening.

Day 2: Try on ECW gear. Choose and pack sleep kits and set up sleep tents to ensure all pieces and parts work and to gain familiarity.

Day 3: Set up the communal tent. Pack kitchen gear, field gear, medical kits, water, fuels, tools and science gear. Discuss waste management.

Day 4: Pack and label dry food. Test Iridium phones, VHF and HF radios and any personal InReach devices. These items should be stored as break bulk on the ship so batteries can be charging en route.

Day 5: Load gear into the container or as break bulk onto the USAP support vessel. Fresh, frozen and refrigerated food will be delivered directly to the vessel. Assist crew with stowage. Use any excess time to discuss and create a field plan.

Day 6: Set sail. Attend all shipboard safety trainings.

Shore Landing

Antarctic shore landings involve a level of risk. Dynamic conditions can occur across four areas: ship, small boat, surf zone and shore. The weather, wind, sea state and sea ice are capable of rapidly changing during installation or removal.

Day Trips

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

Field Camps

Field camps must maintain enough food, water and fuel on hand for seven days beyond the planned stay, in case of vessel pickup delays. Generally, extra food is made up of dehydrated meals. Extra water can be sourced from containers, snowmelt or streams based on the location.

Plan for five liters of water per person per day, which includes water for drinking, cooking, cleaning and personal hygiene. Team members must also bring enough personal medication and other supplies in case of an extended stay in the field.

Field Plan

Before going into a field camp, the Peninsula field supervisor or field risk manager, camp managers, field camp assistant and participants are responsible for creating a field plan for the camp. The plan names the participants, GPS coordinates, medical lead, science objectives and relevant contact information (i.e., Iridium numbers, InReach information).

The field plan is submitted to the USAP support vessel or Palmer Station manager and the field risk manager (i.e., the check-in party), providing them a quick guide for emergencies. It does not constitute the safety detail for camp participants. Rather, it starts the conversation among the group about the who, what, where and how of responding to an emergency. Safety concerns while in camp may evolve and change during the season, but the details of the plan will not.

The safety of all members of the party is paramount. During the field plan meeting, take the following steps to develop the plan, revisiting it after camp is established:

- Develop a general emergency plan.
- Discuss how it should be implemented in different situations the team may 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 advocates and raise any work or camp safety issues they observe.
- 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.

Camp Put-in

While crossing the Drake Passage, use the time to meet with the vessel captain, any shipboard support staff, ASC staff or Palmer Station management whose support you will need during camp put-in or takeout:

- Ask the vessel captain for galley support on put-in day (e.g., bagged lunches, build-your-own sandwiches).
- Review the daily communication schedule, and confirm check-in times with Palmer Station or another designated POC.

- Ensure Iridium phones are programmed with contact numbers (e.g., vessel Bridge, Palmer Station manager, Palmer Station Medical). The entire project team must test all VHF field radios and Iridium phones and review the communications plan with the USAP support vessel or Palmer Station manager. All team members must know how to use the equipment and know where emergency phone numbers are stored.
- Charge batteries for Iridium phones, VHF radios and all other electronics.
- Review the cargo plan with the ship's crew and support staff and the order in which items will go ashore. Life safety and communication equipment must go in first. Identify who will assist on deck to create cargo loads, who will facilitate cargo operations at the shore landing zone, and who will lead the camp setup.
- One or two days before put-in, coordinate a safety briefing with the field team, ship's crew and any ship volunteers who will help. Assign duties, outline communication protocols, review what to bring and wear and conduct a safety briefing for camp put-in activities.
- Review the HPAI and environmental EOS report forms and instructions. Be prepared to record EOS data daily.
- Each member of the field camp party and any volunteers must pack their own day pack with the following items at minimum: rain gear, warm layers, extra hat, gloves, socks, water, lunch, snacks, sunscreen, lip balm, sunglasses and any personal medications.

HPAI Prevention

All USAP participants must decontaminate boots, clothing and equipment before and after any shore landing, using a broad-spectrum disinfectant (e.g., 70% ethanol, Virkon S, F10, soap + 10% bleach solution, 0.1% iodine solution). If you are accessing multiple islands, bring a spray bottle of disinfectant to use between sites. Only approved personnel may access

wildlife colonies. For more information, see Palmer Area HPAI Response (PAL-SOP-0030) on the USAP Master List.

Put-in Day

On the day of put-in, the vessel captain, chief scientist, field camp manager, Palmer Station manager and any supporting ship crew meet to discuss the viability of the operation based on 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 continue to monitor environmental conditions and the safety of the operation. If weather deteriorates, the attempt is abandoned and all personnel are recalled until conditions abate and another attempt can be made.

Camp put-ins require multiple trips in small boats (i.e., inflatable, RHIB or landing craft) operated by vessel crew. Prioritize cargo so that 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, satellite phones and survival bags. The next loads should include tents, sleep kits, stoves, matches, field-party personal bags and enough food, fuel and water for an extended period. Field teams must be flexible.

Order of Operations

1. Send out a reconnaissance boat to evaluate shore landings. Two landing sites are preferred in case one is inaccessible by ice, swell or wildlife.
2. Load the first boat with life safety equipment: survival bags, Iridium phone, medical kit, shovels and picks.
3. Subsequent boat loads include tents, tent stakes and web slings, water, the stove and the ATV if assigned.
4. Once on site, determine how to situate the camp. Observe the terrain for hazards to avoid and identify the

most protected areas for shelters. Place the camp well above the high-tide and storm-surge lines and so it is sheltered from wind.

5. Assist in unloading cargo from the boats. Cargo often needs to be moved in stages: from shore, to higher ground, to camp.
6. Guide volunteers on the safest way to move cargo to the camp site. (See the Risk Management section for lifting techniques.)
7. Place the cargo in staging areas that keeps it out of the way of small boats that are offloading and away from where camp is being constructed.
8. Confirm the viability of the fresh water source. Determine whether it needs to be melted, filtered or boiled. Do not to trample this area during put-in and taint the water source.
9. Set up the toilet tent and waste and hygiene stations.
10. Establish a survival cache away from camp, in a well-sheltered area.
11. Set up all sleeping tents.
12. Outfit the kitchen tent, and create a food storage area.
13. Identify disposal locations for human waste and gray water.
14. Check that all tent anchors are well set and all guylines are taut.
15. Secure all cargo, or stow it inside a tent.
16. Place all fuel containers and equipment with a fuel tank (e.g., generators) in secondary containment.

Before Vessel Departure

- Establish a shelter. Set up at least the communal tent.
- Establish a heat source (e.g., lighting a camp stove).

- Establish Iridium phone communications with the camp POC, confirming a shelter has been erected and a stove is functioning. The USAP support vessel cannot depart until there is a reliable communications link.

Proper Gear

It is imperative to stay warm and dry in Antarctica. This is especially true in Peninsula field camps, where the weather is cold and wet and there are no quick or easy ways to dry clothing or warm up. The marine environment on the Peninsula experiences an average of 28 inches of precipitation per year, with temperatures ranging from -40°C to 4.44°C (-40°F to 40°F).

The standard ECW gear that USAP issues includes two types of waterproof garments: a water-resistant, breathable shell for working on land and a non-breathable, polyvinyl chloride (PVC) rain jacket and bib pant. The PVC gear is generally preferred by researchers working from small boats, who can get soaked from sea spray, and by persons working on land in wet, muddy conditions.

Sunglasses are also necessary. Goggles are provided, and personal, glacier-rated sunglasses are strongly recommended. These protect eyes from sun and wind and help prevent snow blindness. See the "United States Antarctic Program Field First-Aid" manual for details.

Footwear

To keep feet warm, they need to be dry, so you may need to change socks throughout the day. Feet and socks get damp or wet from sweat or stepping in water when exiting a small boat or walking in a stream. Post-holing through snow can cause snow to enter boots. Wearing gaiters can prevent snow and mud from entering boots, but in some cases you may need to carry a second pair.

Peninsula personnel are issued steel-toe, rubber work boots. Steel-toe boots are required when working on the deck of a research vessel. Researchers are advised to wear the issued

rubber boots during boating and shore landings and to change into hiking boots for shore work. Last but not least, dry your feet and socks thoroughly each night to avoid starting the day with wet socks or boots.

Gloves and Mittens

Waterproof rubber or neoprene gloves are essential for small-boat activities, and warm, dry gloves are necessary on shore. Bring several pairs of various gloves (including liners and mittens) as they can get wet during the day.

Small-Boat Clothing

No amount of careful preparation for a shore expedition will help if you get soaked during the ride ashore. Dress for two situations: clothing to keep you warm and dry in the boat (sometimes for a considerable length of time) and clothing to stay warm on shore. In a small boat, all your outer layers must be waterproof (e.g., boots, pants, jacket, gloves).

How you wear your clothes is important too. Waterproof gloves are useless if they fill with water because they were not tucked into your jacket sleeve. And your waterproof jacket is no comfort if a wave splashes down your neck through your unworn hood. Since waterproof layers are not very breathable, it is often best to shed them once arriving ashore to prevent wetting out from sweat.

Site Selection

Camp site selection is determined during the SIP process, following ACA protocols and any relevant regulations for ASMAs and ASPAs. The Peninsula field supervisor, environmental manager, and field risk manager can assist in making recommendations. Details such as terrain, weather patterns, flora, fauna, distance to the work site and logistics are considered when choosing the camp location. Once on site, the field lead is responsible for adjusting the camp site as necessary.

Wildlife, Vegetation and Sensitive Areas

Participants must not interfere with wildlife unless they have an ACA permit and a specific reason to do so. Avoid seabird nests and colonies, paths in which penguins walk to and from the ocean and seal haul-out areas. Consider any existing vegetative ground cover (e.g., mosses, grasses, lichens), and avoid trampling and disturbing it as much as possible. Also avoid camping in areas that drain into sensitive sites (e.g., 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 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 wall calving and rock fall hazards. In addition, select an area where topography does not interfere with VHF radio and Iridium satellite communications. This will be particularly important if you have an emergency.

When possible, position camp near the research study sites to decrease commute times. Conversely, it may be best to establish camp as close to the put-in area as possible to maximize the efficiency and safety of camp put-in and takeout. Identify alternative boat landing sites in case weather or ocean conditions during camp takeout differ from those during camp put-in (i.e., varying wind and wave action may prohibit boat landings at previously used sites). These factors may play a role in determining the best location for camp.

Camp Layout

The layout of camp can be discussed ahead of time and adjusted once actual conditions are observed. Consider where to erect tents (e.g., for berthing, kitchen, meeting). Establish a bathroom area with or without a tent. Store outside gear. And

establish an emergency cache. Discuss camp layout regarding possible whiteout conditions, accounting for 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, about 200 to 300 meters (655 to 985 feet) upwind, in case the main tent with food and supplies is destroyed by fire or storm. The cache must contain a basic assortment of survival gear, with the minimum amount of each item determined by the number of people in camp and remoteness of the location. Critically, this cache must be securely anchored and its items kept dry.

The survival cache can consist of the issued survival bags, 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 wind. Spend some time looking around camp and investigate locations for physical features that provide a break from the prevailing wind and could be used in an emergency. Identifying those locations ahead of time can be crucial to an emergency response. 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 or rain in an emergency.

Shelters

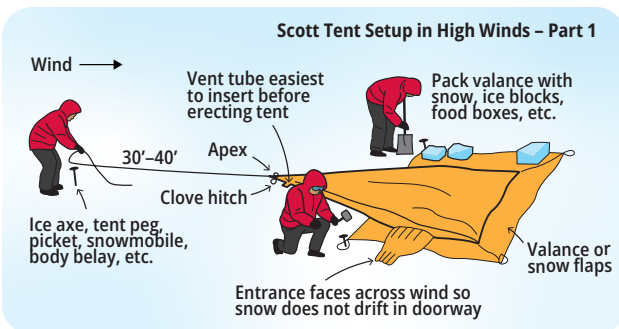
Tents must have a solid anchor for every guyline, and these should be checked daily to ensure they are tensioned. Loose guylines make the tent more prone to wind damage and make catastrophic failures in a storm more likely. Avoid using "hard" knots (i.e., any knot that cannot be adjusted). Instead, use taut-line hitches or trucker's hitches, as they are easy to

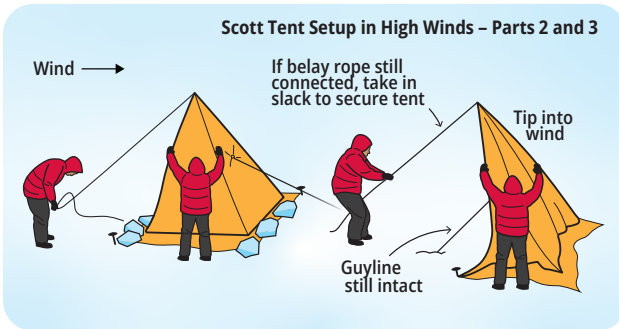
tension and undo. Field team members should practice and become familiar with such knots before deploying. See the References section for steps on making a variety of knots.

Establishing Wind Direction

The most important factor in setting up a tent is securely anchoring it to withstand high winds. Field teams must first determine the prevailing wind direction by observing patterns in the snow or sand. Long rows of snow drifts (i.e., sastrugi) in, for example, a north-south orientation indicate 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. Sand can also form sastrugi-like drifts that help determine wind direction. Shorebirds often face into the wind, so wildlife can be an indicator too.

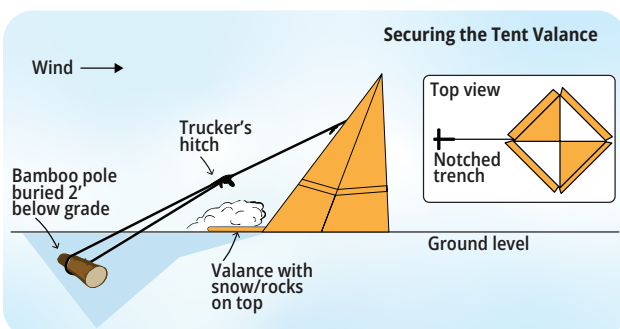
Orient the tent with the main door opening downwind, at a 45-degree angle to the prevailing wind. This helps prevent drifting that blocks the door and sheds the wind load.





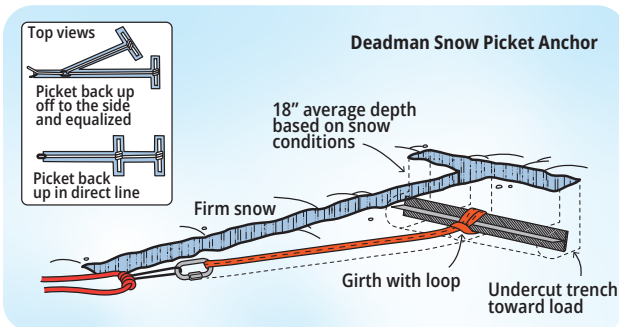
Anchoring the Tent

If tents have a valance (i.e., skirt) on the tent fly or body (see figure part 1 above), these should be fanned out flat and weighted down with snow or rocks to help keep the tent anchored in windy conditions. This also prevents wind from going underneath the valance and lifting and damaging the tent and helps keep it warmer. Do not to pile rocks onto the tent wall, which could wear and tear the fabric in high winds.



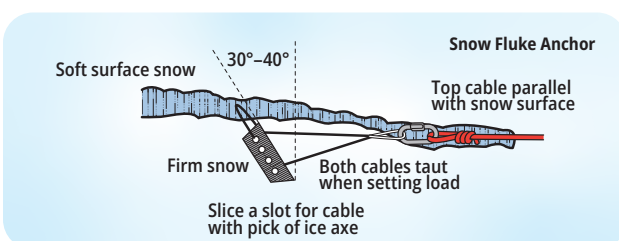
Substrate conditions inform how best to anchor a tent. If the snow or soil surface is **firm** (i.e., hardpacked), hammer in long stakes or sections of bamboo angled slightly away from

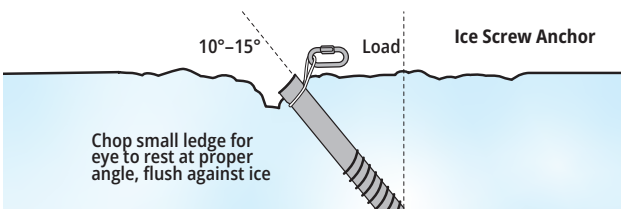
the tent and attach guylines to the stakes. If the snow is **soft**, bury a long stake or piece of bamboo (i.e., deadman) in a slot perpendicular to the angle of pull, with a guyline attached at the midpoint.

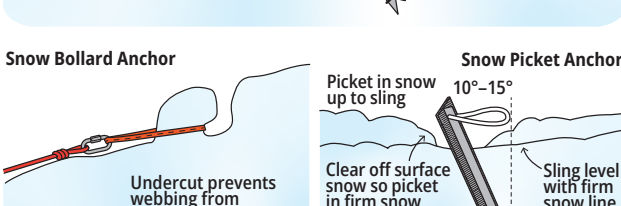


The guyline runs in a straight line from the deadman to the tent via a slot cut in the snow. Do not bury deadman too close to the tent, or it will be pulled upward when the line is tensioned. In very soft snow, the deadman anchor must be buried two feet deep or more. In soft sand and rocky terrain, rock bags can be the best way to anchor a tent. Fill rock bags with rocks, tie them up, then guy the tent to the bag. Use a looped line or web sling around the deadman so the guylines can be easily tensioned or adjusted daily.

Snow flukes and snow bollards are other ways to anchor tents or other objects in hard snow areas.







PRO TIPS

- If anchoring on rocky land, especially in a volcanic area with sharp rocks, be aware that the guyline exiting the ground from the deadman could wear down in windy conditions. Frequently monitor the line, and replace it if necessary.
- Alternatively, create a makeshift sheath around the line using rock sample bags or whatever may be on hand. Placing a length of bamboo between the guyline and ground may also help keep the line off sharp rocks.

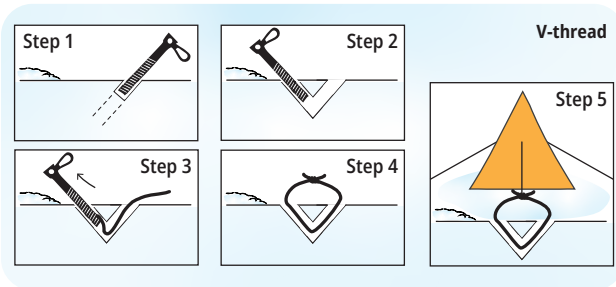
Snow Walls

Having enough snow to create snow walls (i.e., blocks cut from snow) that will shelter tents is rare on the Peninsula but not out of the question. If it is a windy day or the camp is at a windy location, field teams may need to construct snow walls before setting up a tent. Ideally, blocks are cut from hardpack with a saw, 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 only soft snow conditions exist, try packing down the snow with boots then check if it hardens (i.e., sinters) after an hour or more.

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. Use an ice screw or ice drill to create the holes, and feed a guyline through the channel. 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.



On sea ice, a glacier, rock or dirt, create a wind break by repositioning snowmobiles, sleds and ATVs. In thick snow, you can opt to dig a trench.

Camp Medical

Before arriving at camp, team members must discuss relevant medical concerns with the appointed field safety or medical lead. First-aid kits will be supplied and located in an agreed central location. The field lead (ASC camp manager, field coordinator or grantee) will most likely be in control of the prescription 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 or support vessel medical staff. Ensure everyone is familiar with the location of medical supplies and knows what to do in case of a medical emergency. See the "United States Antarctic Program Field First-Aid" manual for more information.

Drinking Water

Depending on the location of the camp, there may be access to fresh drinking water. Any fresh water from lakes, streams, a glacier or snow must be filtered, sterilized with chlorine (e.g., household bleach) or boiled. The Peninsula field supervisor determines if your campsite has a reliable fresh water source and provides filtration and sterilization materials.

The fresh water source may need to be supplemented or be altogether unavailable. In these cases, bottled water is purchased in Punta Arenas and supplied to the camp. The Peninsula field supervisor calculates the appropriate amount of bottled water needed for the group, including an emergency stash in case camp resupply or takeout is delayed. Practicing water conservation at camp is important, as is maintaining a rolling inventory of bottled water during the field season.

Fire Prevention

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

- Minimize hazards in areas where combustible equipment is set up. Move stove and heater away from tent walls, and keep loose materials such as jackets or towels away.
- Ensure all equipment remains in proper working order during the field season.
- Place small propane heaters only on aluminum tables.

- Check propane cylinders for damage or leaks before using them.
- Store propane cylinders outside the tent whenever 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 15 meters (~50 feet) away from any tent to prevent carbon monoxide (CO) poisoning.
- Do not dry clothes 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 (duct tape and string can also be used) 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 ensure all field team members know their location and proper use.

Field Camp Daily Tasking

Communications

- Complete the daily check-in call at or before the appointed time. Some locations may require more than one call during the day.
- Ask for a local weather report during check-in, and communicate any pertinent information.
- Report any medical issues.

Housekeeping, Health and Safety

- Inspect the camp area daily. Ensure everything is secure and all tent guylines are taut. Wind can increase at any time, and snow or rain can dampen objects stowed outside.
- Take daily weather observations, including temperature and wind speed. Maintain awareness of weather conditions.
- Inventory drinking water and cooking water. Haul, melt and boil or filter water as needed. It is imperative that at all times the camp maintain a seven-day emergency supply of water for all persons at camp. If water is running low, alert the supporting vessel or station.
- Check waste levels (e.g., urine, solid human waste, gray water, food trash, biomedical waste), and bag or dispose of waste according to environmental guidelines.
- Check handwashing stations for adequate supplies, and replenish as necessary.
- Ensure the communal tent space is clean, tidy and stocked with essentials.
- Ensure waste is properly sorted per USAP support vessel or Palmer Station requirements.
- Ensure all Iridium phones, HF and VHF radios, other communications devices and backup power pack are charged. Set up solar panels, or start up a generator to charge them.
- Refuel generators, the ATV, stoves, and other items that need fuel.
- Check for leaks, and clean up spills of any kind.
- Restock grab-and-go foods and snacks.
- Prepare and cook evening meals as assigned.

Recordkeeping

- Record any pollutant spills using the Field Spill Reporting Sheet.
- Record the required data in the environmental EOS reports (e.g., water and fuel usage, number of people in camp, estimates of human waste and gray water discharge, weather information).
- See the Environmental Policies section for details on the above.

Camp Takeout

The camp takeout schedule must be coordinated with the USAP support vessel POC or Palmer Station manager, who will confer with other stakeholders. The camp manager or field team member assigned to communications is responsible for providing all requested information to the incoming vessel. This person must know the condition of the landing site and the current wind, sea and ice conditions. Any animal activity that will impact operations must also be noted.

- Communicate with the POC regarding takeout details (e.g., estimated number of cargo loads needed to remove all cargo, samples and personnel).
- Determine how many vessel staff and volunteers can assist ashore.
- Identify a cargo staging area next to the landing zone. Keep it well above the high-tide and storm-surge lines, and tie it down.
- Package equipment and cargo that is no longer being used ahead of time, and move the items near the landing site. This can be time consuming, so begin the process early.
- Move samples to the cargo staging area throughout the season as practicable.
- Repackage and label hazardous cargo.

- Move full waste containers to the cargo staging area.
- Designate roles for camp participants. At shore, haul gear or take down the remaining tents.

It helps to bring a scale to preweigh and group cargo according to the small boats' payload.

Order of Operations

The camp takeout procedure is similar to the put-in but in reverse.

1. Assess the landing site for ice and swell conditions. Report this information to the POC, along with local weather conditions and any other pertinent information regarding the takeout.
2. If the weather window allows, take down all personal tents. Leave the toilet and communal tent as the final tents.
3. Direct volunteers and staff in the order of cargo.
4. Transport all remaining items to the cargo staging area.
5. Scan the camp site to ensure all items are removed, including tent stakes, deadmen and waste.
6. Make survival bags and lifesaving equipment the final load.

Tasks on Vessel

Many tasks must be performed on the vessel after returning from the field. These include cleaning and drying tents, drying sleep kits, sanitizing pee bottles, storing food properly, cleaning and sanitizing kitchen gear, cleaning generators and emptying their fuel, rinsing the ATV and trailer with fresh water, washing dry bags and plastic bins and labeling broken or damaged equipment. All cargo and samples must be entered into the USAP cargo system (Maximo) for offload. Work with the field supervisor, science implementer or Palmer Station logistics personnel (Palmer.Logistic@usap.gov) to achieve this.

There are no cleaning facilities at the Punta Arenas warehouse. Hose off, scrub or brush off muddy and dirty items on deck. Use the boot wash station, and clean all equipment, including camera tripods and dry bags. Review the Environmental Policies section for preventing cross-contamination when visiting multiple locations. See the next subsections for details on specific items handled on vessel.

Tents

All tents can be scrubbed, rinsed and dried on ship, including the communal tents. Ask the ship's crew for a space to dry them. Tents may need to be set up in the Punta Arenas warehouse for inspection. If there are holes in the tent or any other problems (e.g., cut guylines), affix a tag explaining the problem on the outside of the tent bag.

Kitchen Items

Dishes, Thermos bottles, food coolers, stoves, water coolers and five-gallon buckets must be cleaned. Coordinate with the ship crew to use the galley or best location on the vessel to wash and dry kitchen items.

Pee Bottles and Toilet Seats

Soak pee bottles, toilet seats, waste buckets and carboys with 10% bleach solution (1:10 bleach-to-water ratio) for 10 minutes. Do not leave these items for other people to wash. Do not dump bleach overboard or down drains. See the laboratory protocols for proper waste disposal.

Fuel Cans aka Jerricans

Label any full or partially full fuel cans with (1) the type of fuel and (2) the text "PEN FIELD." These items must be given an SN in Maximo and put in the appropriate hazardous storage in the yard.

Stoves

Clean stoves with a degreaser, and dispose of grease in the designated sink onboard. Dry the stove before putting it away.

Backpacks

Empty all pockets and scrub backpacks with soap. Hang to dry.

Punta Arenas Gear Return

Grantees using field gear are responsible for unpacking, sorting and helping to return all equipment to the Field Room in Punta Arenas. Work with the Peninsula field supervisor if present. Otherwise, arrange gear return with the Palmer Station lab supervisor or Palmer Station Logistics. Returns can take from one hour to two days based on the gear and its condition. Most groups redeploy three days after the vessel arrives in Chile, so plan accordingly.

- To return cargo and field gear from Palmer Station or a vessel, use the Peninsula field project code (879), enter the information into Maximo, and email a list of items by cargo number to the Peninsula field supervisor.
- At the Punta Arenas warehouse, empty the contents of the sleep kits. Count, bag and label all items to be laundered. Track wool or special-wash items separately.
- Remove all duct tape and tags from the gear.
- Report any damage to the field supervisor, or affix a tag to each damaged item with an explanation of the problem.
- The field supervisor inspects the gear and compares it to your Research Support Plan (RSP) allocations. Discrepancies can delay your redeployment.
- Inform the field supervisor, in person or by email, if there are any problems with field equipment, including broken, missing or non-working parts. There is no penalty for regular wear-and-tear on gear. This information is critical to the next user's safety.


FIELD GEAR

Predeployment

Most group and personal camping gear you take into the field will be issued to you upon arrival in Punta Arenas. All gear you receive will be tagged "RFI" (ready for issue). This means it has been serviced, checked and ready to deploy into the field. Your team must inspect all its gear before going into the field. This ensures that participants are familiar with operation and setup in a controlled environment and helps catch any problems (e.g., malfunctioning equipment, broken parts) before deploying. The field team lead builds time into the deployment schedule to accomplish this, during gear issue in Punta Arenas or at Palmer Station.

The Peninsula field supervisor, camp assistants and, in some cases, vessel technicians provide equipment operation and maintenance training to science team members before they deploy to the field. This section of the manual covers safety, basic operation and troubleshooting of stoves, heaters, sleds, generators, snowmobiles, ATVs and renewable-energy power systems. Contact the Peninsula field supervisor for further assistance.

Stoves

Propane and white-gas cooking stoves (liquid fuel stoves) are issued to field parties. This guide provides information on stove safety, basic operation and troubleshooting.

Safety

Liquid-fuel stoves are potentially hazardous due to the flammability of the fuels and the toxicity of the CO they produce. It is important for field personnel to follow these safety measures when using stoves:

- Test all stoves before field deployment.
- Do not use stoves without adequate ventilation.
- Use extreme caution when refueling. Skin contact with supercooled fuel can cause instant frostbite.

- Check for leaks before every use.
- Release pressure in the fuel tank before packing and storing the stove.
- Pack stoves and fuel away from food.
- Do not cook in mountain tents, except in emergencies. Cooking in the Scott tents is safe with proper mitigation (see the next subsection).
- Use caution when priming the stove, as it can flare up when fuel is lit.
- Insulate the base of the stove so it does not melt through the tent floor. Use a rock-box lid, preferably covered in aluminum foil, a metal platform or another non-fabric surface.
- Do not release fuel tank pressure near an open flame.

Residues of evaporated gasoline are combustible. Designate a pair of rubber gloves for fueling operations, and do not use them near stoves. Should someone's clothing ignite, have them stop, drop and roll to extinguish the flames.

Use in Scott Tents

It has been common practice in Antarctica to use stoves inside Scott tents. Historically, many camps were small, and Scott tents were the main "home" for a field camp, so stoves were used inside. This is still a practice in various locations, either for full kitchen duties or to heat water and the tent in places with extreme cold or dampness. Stove use in tents is a strategy to stay warm and comfortable but can lead to complacency. Do the following to use stoves safely:

- Ensure all sleeping bags, pads and personal clothing are stowed away from the stove before starting it.
- If running the stove, put a kettle on to boil water for hot water bottles, which also prevents an open flame.
- Communicate any signs or symptoms of CO poisoning.
- Use a CO monitor.

CO Risks

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

Inhaled CO displaces oxygen in the bloodstream, starving the heart, brain and other vital organs. People are even more susceptible to CO poisoning at altitude. Several cases of CO poisoning have occurred in Antarctic field camps due to improper stove use. The best way to avoid CO poisoning is by ensuring any structure in which cooking occurs is well ventilated. Because CO has no color, taste or smell, it is better to be safe than sorry:

- 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**.

Field teams must use a CO detector (issued by the field supervisor) when cooking. D not directly attach the detector to the stove. The detectors are not foolproof, so all team members must be vigilant about CO risks and symptoms. See the “United States Antarctic Program Field First-Aid” manual, or contact Medical for more information.

MSR WhisperLite Stove

Assembly

1. Fill the MSR fuel bottle to within two inches of its cap.
2. Screw the pump snugly into the fuel bottle.
3. Pump the plunger 15 to 20 times for a full bottle. Additional strokes are necessary if the bottle is not full.

4. Insert the fuel line through the hole in the heat reflector.
5. Rotate the stove legs into the slots in the flame reflector.
6. 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.
7. Securely snap the catch arm into the slot on the pump body.

Priming

1. To preheat the stove, the priming flame must contact the generator tube.
2. Open the control valve until fuel flows through the jet and fills half the priming cup.
3. Close the control valve.
4. Light the priming cup or wick.
5. Place a windscreen around the stove.

Lighting

1. As the priming flame diminishes, slowly open the control valve.
2. If the stove goes out, wait for the stove to cool and reprime it.
3. 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

1. The stove should burn with a steady blue flame.
2. To simmer, operate the stove with low pressure in the fuel bottle. There will be a delay between control valve turns and changes in flame intensity.

Shutoff

1. Turn the control valve off.
2. Wait for the stove to cool before disassembling.
3. Before depressurizing the fuel bottle, move away from heat, sparks and flames. Turn the stove assembly upside down, and open the control valve. Pressure will be eliminated through the jet.

PRO TIPS

- Do not use these stoves in mountain tents, except in an emergency.
- 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.

Troubleshooting

MSR WhisperLite Stove Troubleshooting

Problem	Fix
No/low pressure	Tighten loose pump on fuel bottle.
	Replace damaged pump cup.
	Oil the dry pump cup to loosen plunger.
Yellow flame	Reduce fuel bottle pressure and allow more oxygen through windscreen.
	Close windscreen around stove and use heat reflector. (Generator tube may be too cold.)
	Ensure flame rings in correct order from top (burner cap) to bottom (flame reflector). **7 rings on wire-leg stoves** = wavy, flat, wavy, flat, wavy, flat, wavy. **8 rings on flat-leg stoves** = wavy, flat, wavy, flat, wavy, flat, flat, flat.

Problem		Fix
Weak flame		Pump plunger to increase pressure in fuel bottle.
		Ensure correct jet installed for fuel type.
		Clear jet and fuel line of any obstructions.
		Allow more oxygen through windscreen.
		If burner cap is bright red and stove makes dull roar, flame is burning under cap instead of flame rings. Clean jet, confirm correct jet installed, and ensure flame rings are clean and installed correctly (see last fix at "Yellow flame").
Fuel leak at	Control valve	Replace control valve O-ring if damaged.*
		Replace pump if control valve threads damaged or stripped from overtightening.
	Pump connection	Ensure only MSR fuel bottle is used.
		Replace bottle if threads damaged or bottle dented.
		Replace O-ring for bottle or fuel tube if damaged.*
		Replace fuel tube bushing if damaged.*
	Fuel line	Replace fuel line or entire stove if line damaged.
	Shaker jet	If fuel leaks through jet when control valve off, pump is damaged from overtightening valve. Replace pump.
		Tighten if necessary with jet and cable tool.*
		Replace jet if damaged.*
Note: Based on information from Cascade Designs, Inc., "MSR WhisperLite Stove Instruction Manual," https://cascadedesigns.com/cdn/shop/files/11368_Instructions_WL_All_Lang_33-946.pdf, and from USAP's Berg Field Center. *Stove/pump replacement parts are available in the repair kit.		

Coleman Gas Stove

Setup

1. Close the valve and unscrew the tank cap. Do this carefully if the tank has pressure inside.
2. Use a fuel funnel with a filter. Use white gas only.
3. Wipe off any spilled fuel, and replace the cap.
4. Never open the tank around an open flame or remove the cap while the stove is running.

Tank Pressurization

1. Close the cap, and ensure the generator valve is closed.
2. Turn the pump plunger handle to the left to open.
3. Place a thumb over the small hole in the handle and pump 35 to 50 times.
4. Turn the plunger handle to the right to tighten.
5. 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

1. Close the auxiliary burner valve.
2. Turn the fuel valve lever to the “up” position.
3. Hold a match above the main burner, and open the fuel flow valve wide.
4. Let the stove burn for one minute with the fuel valve lever up.
5. When the flame is blue, turn the valve lever down.
6. Add pressure if needed while firmly holding the tank.
7. If the flame does not burn fully, open and close the valve to clean the tip.
8. 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 and the next Troubleshooting subsection here.

Shutoff

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

PRO TIPS

Most problems with Coleman stoves occur in extremely cold temperatures, which the stove was not designed for. Take these measures to enhance its performance:

- Use only clean, filtered white gas.
- Do not overfill the tank, as this impedes performance.
- The pump mechanism becomes impaired as temperatures drop. Keep the pump plunger oiled. Also keep the rubber or leather pump cup oiled and pliable, as it can dry out.
- In temperatures below -6°C (21°F), 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, ensure 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.
- Place the stove where it can be thrown out of the tent in an emergency. Keep a small fire extinguisher nearby.

Troubleshooting

If the fuel does not vaporize, liquid gas collects in the manifold assembly 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 (i.e., the small, black nylon bag). Replace the tank assembly, and repeat the lighting process.

Access the control valve assembly (behind the knobs and under the burners) as follows:

1. Unscrew the burners.
2. Turn the stove over and unscrew the nuts on the bottom.
3. 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.
4. Remove the metal tray for access to the burner and control valve assemblies.

Additional troubleshooting tips are provided below.

Coleman Gas Stove Troubleshooting

Problem	Fix
No pressure	Remove and inspect pump for cracks, dryness, creases, or tears. Replace and oil.
	Check tank lid gasket for pressure leak.
	Check for flooded pump cylinder. If so, pump valve is faulty and needs replacing.
	Check for broken seal at valve assembly and tank junction. Tighten by one rotation if possible.

Problem	Fix
Loses pressure	Tank naturally loses pressure the longer it sits without periodic pumping.
	If pressure is lost soon after pumping, check all joints and gaskets.
	Check for leaky cap gasket. Replace gasket/cap.
Yellow flame	Clean or replace dirty/faulty generator.
	If manifold assembly is flooded, turn stove off, cool, remove tank assembly, and wipe out excess fuel.
	Fuel may be contaminated. Drain and replace with new fuel.
	Ensure tank and generator seated properly.
Flame at generator tip	Tighten tip of generator if loose.
Poor gas flow to burner	If generator clogged, clean or replace.
	Check if cleaning needle at end of generator is bent. Replace needle.
	Ensure tank and generator seated properly.
Weak flame	Preheat generator.
	Clean or replace dirty/faulty generator.
	Increase pressure.
	If manifold assembly is flooded, turn stove off, cool, remove tank assembly, and wipe out excess fuel.
	Fuel may be contaminated. Drain and replace with new fuel.
	Ensure tank and generator seated properly.

Problem	Fix
Flaring	Tighten tip of generator if loose.
	Ensure tank and generator seated properly.
	If burner flooded, shut down and dry out.
	Reduce excessive pressure in tank.
	Shut down and reprime insufficiently primed stove.
	Refrain from opening fuel flow switch (i.e., changing to "on" position) too early.
	Fuel may be contaminated. Drain and replace with new fuel.
	If grease in stove, clean grease out, line bottom of stove with foil, and change foil when dirty.
Note: Based on information from USAP's Berg Field Center.	

Coleman Propane Stove

Propane cylinders must 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.

Setup

1. Press on the latch to open the lid.
2. Position the wind baffles.
3. Insert the wire clips into the slots.
4. Firmly close both burner valves.
5. Remove the regulator from storage under the grate.
6. Attach and hand-tighten the regulator to the hose or propane bottle.
7. Inspect the gasket on the stove connection before attaching the regulator.

8. Screw the regulator hand-tight onto the stove.
9. Ensure the regulator and connections are not cross-threaded, as this will cause a leak.

Lighting

For 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.

For standard ignition stoves, hold a lit match near the burner and open the valve. Adjust the flame with the burner valves.

Shutoff

Firmly close the burner valves.

Storage

Remove the propane cylinder or hose, then unscrew the regulator from the stove and store it under the cooking grate.

Partner Steel Four-burner Stove

This stove is 18 inches wide, allowing for large-group food preparation. Operate and troubleshoot the stove similar to a Coleman propane stove, with one critical exception: The hose that connects the Partner Steel stove to the propane cylinder is specialized — a Coleman stove hose will not work. Test the stove before deploying to ensure the correct hose is included and you have a spare. Also double-check that the hose is not cross-threaded onto the propane tank.

Heaters

The Peninsula field inventory has three types of heaters to warm tents. These may be used only in Arctic Oven, Weatherhaven or Scott tents. The heaters are not designed for North Face mountain tents or Polar Pyramids.

Use the heaters only on a non-flammable surface (e.g., aluminum table), keep them far away from combustible materials, and never leave them unattended. Take significant

care to properly ventilate the tent to reduce the risk of CO poisoning. Do not use the heaters to dry clothing.

If you smell propane or gas when a heater or cook stove is in use, stop, turn off all valves, and recheck the 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 or propane cylinders near the open flame of cook stoves. Store propane cylinders outside the tent when they are not in use.

Mr. Heater Single-tank Top Heater

This 15,000-British-thermal-unit (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. Light the heater as follows:

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 about a minute for the heater to warm, during which it may appear to not be working. Be patient and wait before trying again. After turning the heater off, it will remain hot for 15 minutes.

Mr. Heater Portable Buddy Heater

This smaller propane heater provides 4,0009,000 BTU per hour. It can be used with a one-pound Coleman propane cylinder or, preferably, connect to a 20-pound propane cylinder with an optional hose and filter. This heater is easy to use, has a shutoff valve for accidental tip-overs, and is lit by an integrated sparking mechanism. Simply turn the knob to "Pilot" and push. The heater burns a lot of propane, so be diligent with ventilation and use a CO detector in the tent.

Century Primus Heater

This heater puts out 9,000–15,000 BTU and uses an infrared regulated system attached to a 20-pound propane tank. It is a highly efficient heater at cold temperatures and high altitudes. Use it only in larger communal tents.

To set up and light the heater, first ensure it is attached to the propane tank. Then follow Primus Equipment US's "Owner's Manual and Operating Instructions for Century/Primus Propane Heater/Cooker," which advises the following:

1. Always light and operate the heater away from flammable vapors and liquids.
2. Slide the heater onto its stand so the heater head is facing out to the side (not up).
3. Light a match and hold the flame through the wire guard, at the hole in the burner screen.
4. Push down on the heater's black regulator knob, and turn it counterclockwise to the "HI" setting.
5. Remove and extinguish the match after a weak blue flame appears in the heater head. The flame will disappear when the burner screen starts to glow.

Sleds

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

Nansen Sleds

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

Siglin UHMW Sleds

Siglin ultra high molecular weight (UHMW) sleds can accommodate two drums side by side. There are an eight-

foot and a 12-foot version. A snowmobile can tow these sleds, which 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 best towed by a snowmobile.

Paris Pulk Sleds

These are the most common sled used on the Peninsula. Each is 59 × 20 × 6 inches and lightweight (four pounds), making it suitable for a person to haul. These sleds can be attached to a harness and rail system or pulled by hand using a rope.

Loading and Securing Cargo

These next figures on showing how to distribute the cargo on a Nansen sled apply to the other sleds. Load with the heaviest items on the bottom. Place small items in sled bags. Put the survival bag at the top of the load, along with anything the team members may need during the day. Rock boxes (wooden and measuring 18 × 12 × 12 inches) make convenient containers for fieldwork and can be loaded with both samples and 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 retension a cord. Check all lashings periodically and every time the team stops for any reason. During this time, if towing the sled with a snowmobile, also inspect the snowmobile, tow plate, ropes and sled for any developing structural issues. Retighten the lashings if they have become loose. It is prudent to bring extra lashing supplies into the field.

Pulling Sleds by Snowmobile

With ideal surface conditions, a tail wind and light loads, a snowmobile pulling a sled can get seven miles per gallon (mpg) of fuel. Soft snow conditions, heavy loads and strong head winds significantly reduce fuel efficiency, to as low as two to three mpg. Likewise, a snowmobile can pull up to 1,500 pounds when conditions are good and much less when they are not. Keep these environmental conditions in mind when planning loads and fuel consumption.

Snowmobile operators pulling a sled should adhere to the following rules:

1. Attach sleds equipped with rigid tongues directly to snowmobiles. Other sleds attach with a tow rope.
2. Before driving, rock the sleds back and forth to break the runners and the bottom free of ice.
3. Drive slowly. Driving fast over uneven terrain may cause a sled to tip over, which can severely injure people and damage the sled, cargo and snowmobile.
4. Drive even slower if pulling passengers. Everyone must wear a snowmobile helmet, including persons riding on the sled.
5. Maintain situational awareness and regularly look back to ensure everything is riding securely, especially passengers.
6. Stop gradually so the sled does not run into the back of the snowmobile.

Snowmobiles

Safety

- All snowmobile riders and passengers must wear a helmet. This includes people towed on a sled behind the snowmobile.
- Each operator is responsible for checking the machine before each use.

- Ensure the correct fuel is used. Snowmobiles have four-stroke engines and require MoGas (motor vehicle gasoline, or standard unleaded fuel). ATVs also use MoGas.
- A snowmobile's center of gravity is just in front and toward the bottom of the fuel tank. Operators must shift their body weight for turning and as needed for the load, terrain and 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.
- Watch for loose trailing straps and ropes, as these can get tangled in the tracks and around axles.
- Never shift the transmission unless the machine is stopped. Shift gently. If gears will not engage, turn off the engine, shift gears and restart. Abusive shifting can cause drive-train 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.

For advice, contact the mechanic at Palmer Station at PalmerMechanic@usap.gov or the Mechanical Equipment Center (MEC) at McMurdo Station at 720-568-1080 (ask to be transferred to MEC) or MCM-MEC-Supervisor@usap.gov.

Precheck

- Before starting the snowmobile, 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, the shock mount, the shock and tracks. Inspect everything.
- Remove any snow from under the engine hood, drive belt, pulleys, exhaust pipe and lower steering arms.

- Ensure the machine is 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 handlebar. Also, the brake should never go all the way to the floor.

Startup

1. Do the following for the first cold start of the day or if the snowmobile is off for more than an hour:
   A. Ensure the transmission is in neutral.
   B. Insert the key, and push the button to start.
   C. Let the snowmobile warm up, bearing in mind that it will idle up to 12 minutes before automatically turning off.
2. Once the machine is warm, engage the gear then ease into the throttle.
3. If the engine is off for less than an hour, ensure the transmission is in neutral and engage the electric starter. Allow the engine to warm thoroughly before driving it.

Preventive Maintenance

Daily

1. Doing a walk-around of the machine each day before starting, which is the single best thing you can do to keep it running throughout the season.
2. Check the suspension, especially when operating on ice.
3. Look for broken suspension components.
4. Importantly, 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.

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

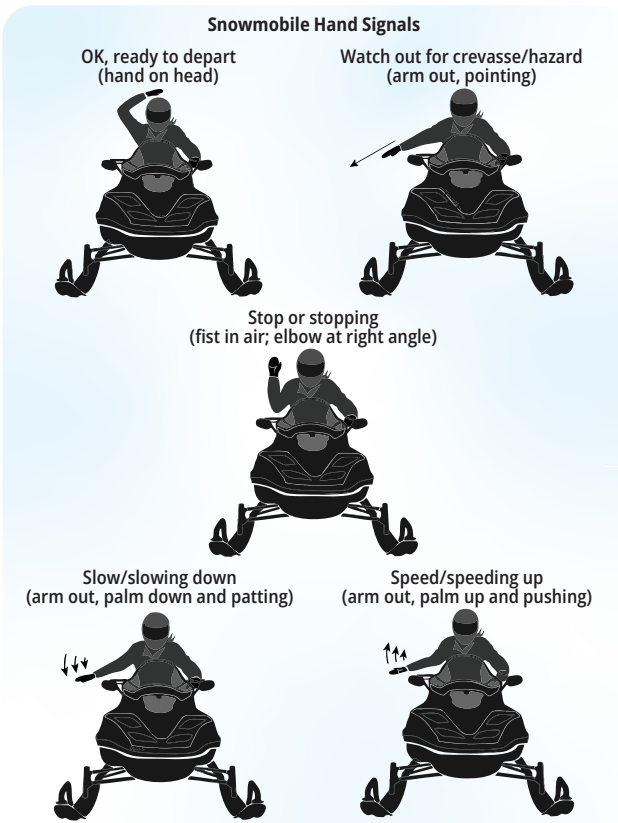
- Maintain a low center of gravity.
- Keep straps tied down, ensuring there are no loose ends.
- Place often used items where they are easy to get to.
- Do not exceed the 150-pound limit for loads on the rear of the snowmobile.

Towing

- Sleds may be towed with rigid tongues (preferred) or ropes, depending on the circumstances.
- Check the hitch mechanisms on both the 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.

Communication

Use these hand signals when driving a snowmobile in a group.



Driving

- Whenever possible, drive on a proven trail or hard surface.
- If the snowmobile begins to bog down while driving in powdery snow, 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, then stop and do not continue spinning the track. Instead, take the following steps:
  - 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.
  - Alternatively, use a tow rope and have another snowmobile pull the stuck one out.
  - 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.

ATVs

The Peninsula Field Work Center owns and operates two Yamaha Kodiak 450 ATVs. The Kodiak 450 has an automatic drive train and two drive modes: Hi/Lo (i.e., high/low) and 2WD/4WD (i.e., two-/four-wheel drive). Test each ATV in Punta Arenas before sending it into the field. Test-drive space can be made available in Warehouse 7.

Familiarize yourself with the options and operation of the machine prior to use in the field. (Contact DENFieldSafety@usap.gov for Yamaha's "Owner's Manual: Kodiak 450," or access it at https://cdn2.yamaha-motor.eu/prod/owner-manuals/ATV/PD28F819960E.pdf.) Upon return to the vessel, ATVs should be rinsed with fresh water, particularly their

undercarriage, before being returned to Punta Arenas. The ATVs must be serviced annually or after a field season.

ATV operators and sled passengers must wear a helmet at all times. ATVs must be in park or neutral to start.

Startup

1. Turn the ATV key to “on.”
2. Flip the red switch on the left handlebar to the “on” position.
3. Hit the gray or green start button (depending on the model) on the left handlebar.
4. With your foot on the brake, put the transmission into gear. Gears are L (low), H (high), N (neutral), R (reverse) and P (park). Change gears only when stopped.

Driving

- There are 2WD and 4WD drivetrain options. Change the drivetrain system only while the ATV is in neutral or park.
- For most operations use High 2WD. For more traction, use 4WD. For slick, slippery or tricky conditions, use Lo 4WD for more torque and less speed.

Braking

- The right-hand lever operates the front brake, while the left-hand lever operates the rear brakes.
- The foot pedal operates both front and rear brakes.
- Letting off the throttle will also slow the ATV.

Shutoff

1. Unlike snowmobiles, always put the ATV in park when stopped or for the night, and position the vehicle in a flat area.
2. Turn the key to “off” and put the red switch in the “off” position when finished, to not run down the battery.

PRO TIPS

- The ATV's maximum load capacity, including riders, cargo and accessories, is 530 pounds. The maximum towing capacity (including the trailer and cargo) is 1,322 pounds.
- Do not ride an ATV in water deeper than 14 inches. If you need to cross a creek, choose your entry point carefully and avoid deep holes.
- Ride slowly when towing cargo, and be aware that stopping distance increases with a load.
- Use the front-right brake lever when operating in 2WD.
- A copy of the manual is kept under the seat. Any spare parts can be kept there too.
- The ATV field kit should include a spare tire, tire patch kit, battery-operated jump and inflater kit, spark plugs with the appropriate socket, engine oil, final gear oil, differential gear oil, brake fluid, coolant and a fuse kit. See the manual for maintenance information.

Honda 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 one meter (~three feet) away from tents or other equipment during operation. Do not place flammable objects close to the generator.
- Know how to operate all the controls and to stop the generator quickly.
- Do not let the generator get wet or operate it with wet hands. The generator is a potential source of electrical shock if misused.

- Gasoline is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks near any stored gasoline or the generator refueling area. Refuel the generator in a well-ventilated area, with the engine stopped.
- The engine muffler becomes hot during operation and remains hot for some time after engine shutoff. Do not touch the muffler or engine or store the generator indoors until the generator has cooled.

Precheck

1. Check and add MoGas to the generator if necessary.
2. Check the engine oil level with each fueling, and add any needed oil (i.e., 0W-30).
3. Check the air cleaner element to ensure it is clean and free of ice and snow. It should feel oily.

Startup

1. Ensure 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 — do not use the choke if the engine is warm.
4. Ensure the auto-throttle switch is off if the generator has one.
5. Move the engine switch to the “on” position.
6. Slowly pull the starter grip until resistance is felt, then pull briskly. 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.

Shutoff

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

Honda Generator Troubleshooting

Problem	Fix
Engine does not start	Turn engine switch on if off.
	If oil-alert lamp flashes when starter is pulled, oil is low. Add oil.
	Ensure all loads are unplugged from AC receptacles.
	Check for spark at spark plug, grounding side of electrode to engine and pulling recoil starter to see if spark jumps the gap. Replace plug if no spark.
	Place suitable container under carburetor, loosen drain screw, and ensure fuel flows freely to carburetor. If not, check fuel valve on tank.
Engine starts but stops immediately	Check for low oil level, fill oil reservoir to top of dipstick, then restart engine.
No electricity at receptacles	Turn on AC circuit breaker if off.
	Check the appliance or the equipment plugged into generator for defects. Fix as needed.
Note: Based on information from USAP's Berg Field Center.	

Solar Recharging Systems

The Mini-Portable Field Power System is a self-contained solar power supply that can be assembled and connected quickly for transportation. The unit includes a lithium-ion battery pack, solar panel and charging cable.

1. Before the season begins, inspect the unit for damage or loose wires. Pretest the battery pack before field work by fully charging the unit, allowing to sit for two to four days and observing how much charge it holds.
2. Decide on the configuration of the solar panels. They can stand independently and be tied down, or they can be spread out to face the sun for maximum input. However configured, ensure the panels are secure in case of wind gusts.
3. Connect the cable to the battery pack.
4. Keep the battery pack in a sheltered place and out of direct sun.
5. Do not allow lithium batteries to discharge below recommended levels, and remove the cable from charging the battery once it has reached capacity. Overcharging and undercharging can reduce the longevity of lithium batteries.
6. For multiple days of subzero temperatures, the battery pack must be stored in an insulating cooler for optimal battery operation.
7. Recharging takes time. Keep in mind there may be several cloudy days in a row.
8. At the close of the season, always store the battery pack fully charged.


CARGO
OPERATIONS

Field teams preparing to set up camps on the Peninsula will be transported by USAP support vessel either via Palmer Station or directly to their camp. Once at the site, team members and cargo are transferred via small inflatable boat, RHIB, landing craft or on rare occasions by helicopter.

During the planning stages, all cargo movement is determined, including how much, when and how it will be transported both southbound and northbound. If changes to northbound cargo or sample shipments occur during the field season, the PI or camp manager should contact the ASC science project implementer, who will make a formal change request.

Cargo Requirements

Weight and Dimensions

Cargo is transferred from the USAP support vessel to the small watercraft via crane and cargo net. In general, all cargo must fit within a four-foot by six-foot space in the net and not be stacked higher than 1.25 meters (~four feet). Loads must be balanced. Poles, picks and long or sharp objects are handed down separately. Larger equipment must be discussed in advance with the implementer and vessel support staff and crew. The vessel crew ensure cargo loads are the appropriate weight and size.

Cargo must be weighed before field deployment, with the weight written on duct tape and attached to the package or equipment. Individual items must not exceed 50 pounds, with 30 pounds being ideal.

It is difficult to transport cargo through waist-deep water, especially in a surf zone or on a beach that could be rocky and icy. Packing cargo so it is smaller, lighter and more easily handled creates more packages but makes loading and unloading at the shore safer and smoother.

Waterproofing

Depending on the field site and sea conditions, the trip from vessel to field site can be wet. All sensitive cargo must be

wrapped in heavy plastic trash bags or packed in watertight packages (e.g., dry bags, five-gallon buckets with sealed lids, sealed and taped waterproof tubs). Plastic bags are slippery when wet and can easily be dropped into the sea. Take extra care when handling bagged items.

Labeling

All cargo requiring special handling must be clearly marked (e.g., "liquid," "fragile," "do not freeze"). For safety reasons, hazardous cargo must be clearly marked as such with its special-handling requirements noted. All items must have the weight clearly noted on the packaging.

Cargo labels must include a general description and camp location (e.g., kitchen, personal, science equipment, power supplies). This facilitates efficient cargo sorting 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 must be loaded separately and stored in designated areas aboard the USAP support vessel while en route to the field camp. Hazardous chemicals are stored in the appropriate hazardous materials locker, and documentation is provided to the ship's crew.

Liquid fuel containers (e.g., drums, jerricans) must have the type of fuel written on them in permanent marker. A hazardous-cargo shipping label must also be affixed to the container. Fuel containers and fuel drums are stored in designated areas only. These areas must be confirmed by the chief mate or ship's crew on the USAP support vessel. Depending on the number of containers and on-vessel space limitations, the captain may authorize other storage areas.

Propane tanks and other pressurized containers must be in good condition and free of rust or damage. The vessel captain has the authority to deny loading for any pressurized container 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 to the U.S.

Retrograde Cargo

Cargo slated for return to the U.S. is called retrograde cargo. This includes samples and grantee-owned equipment. The persons generating retrograde cargo must be the ones who pack it, and a unique shipping number must be assigned to each package or item. Each item or container shipped from a vessel must be entered into the Maximo database, assigned a shipping number (SN) and accompanied by a USAP Proforma/Invoice (TL-FRM-0005), a line-by-line inventory of contents that is available on the USAP Master List. All proformas must be approved by the Transportation & Logistics (T&L) department before shipping northbound. Any hazardous items, including all types of batteries, must be declared along with an attached safety data sheet (SDS) in English and an SDS in Spanish. For this reason, it is imperative to keep accurate records of cargo and begin the process as early as possible.

All Peninsula field gear returning to Punta Arenas from a USAP support vessel or Palmer Station must be entered into Maximo using cargo code "879 (Pen Field)" as part of the SN. For items shipped from Palmer Station, a shipment notification must be sent to Palmer logistics personnel at Palmer.Logistic@usap.gov, who assign an SN from Maximo. A proforma is required for each retrograde item, regardless of its origin.

More About Science Samples

Science samples enter the cargo stream in the same manner as retrograde cargo, but more specific paperwork is required for each box/shipment. Vessel-based or field camp grantees can get assistance from the Palmer Station lab manager, science project implementer, T&L, or Palmer logistics staff.

Palmer logistics personnel help Palmer Station grantees determine how best to package samples. Each sample shipment is assigned a unique SN. T&L requires a strict naming convention for samples. The Palmer Station lab manager or Palmer logistics staff can help locate this information.

Science samples require extensive documentation, and some of the information can be obtained before deployment. Take great care in organizing the documentation. Shipping samples from Antarctica, particularly from the Peninsula, can be complicated and require up to 13 individual forms.

The RSP published before the field season outlines all the approved sample and cargo shipments. This document is the agreement between the PI, USAP and NSF. Discuss samples and cargo again before leaving the dock to ensure you have the necessary supplies on hand. Additionally, field camp and vessel-based researchers, as well as Palmer Station researchers, should speak with Palmer logistics personnel or the ASC implementer.

Be aware that any proposed changes to the sample shipment plan must be approved by T&L and NSF program director. Contact the ASC science implementer to start the process.

Dry ice and temperature-sensitive sample cargo materials should be requested two weeks in advance of the port call. All science sample paperwork must be submitted to logistics personnel at least 72 hours before arrival to Punta Arenas.

The following materials are available to help with this process, as are the Palmer Station lab manager or Palmer logistics personnel:

- MLT Sample Preparation Manual (STPS-MAN-0006)
- Sample Packing Checklist – Peninsula (TL-FRM-0113)
- Packing and Shipping Instructions (TL-MAN-0002)
- Peninsula Logistics Manual (TL-MAN-0004)
- Shipping Retrograde Cargo (TL-MAN-0010)

- 49 C.F.R. regulations on packing and transporting dangerous goods (aka Hazardous Materials Regulations)
- International Air Transportation Association (IATA) Dangerous Goods Regulations
- International Maritime Dangerous Goods (IMDG) Code

Grantee Tasks in Punta Arenas

Upon return from a field camp, researchers must pack “keep frozen” and “keep chilled” samples the first day the ship is in port. Researchers must also assist in unpacking and cleaning all field camp gear. This may take one to three full days, and teams should plan accordingly.

Any known issues with the gear should be noted at this time. This is extremely important and helpful for other groups. There is no blame or penalty for gear that is wrecked or broken under normal circumstances. The knowledge that something needs to be repaired or replaced ensures the safety of the next group.


WEATHER
AND SEA ICE

Antarctic Weather

Weather in Antarctica is characterized by extremes in temperature, wind and the variability of local conditions, making Antarctica a challenging place to work and live. Weather conditions also depend substantially on elevation, topography and distance from the ocean. Temperatures can vary from below -40°C (-40°F) to above freezing (0°C, or 32°F) during the austral summer. Unlike the polar plateau, which is extremely cold due to its higher altitude and distance from the moderating effects of the seas, Peninsula areas can be subject to heavy precipitation and warm days with intense sunlight.

Winds can range from light to sustained hurricane strength. It is an unusual day when there is not at least a breeze. The wind can take its toll on people, making tent setup and other camp chore difficult. Improperly anchored tents can blow away or rip apart. Tent guylines must be continually retensioned. And wind chill raises the risk of hypothermia and frostbite. The wind chill chart in the References section shows how wind affects how we experience temperature.

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

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

Working in the Peninsula Environment

Regardless of the weather or where you are on along the Peninsula, boating, field work or working aboard a research vessel are wet activities. Combined with just-above-freezing

temperatures makes for a work environment that ranges from unpleasant to dangerous.

The ability to install, service or remove a field camp heavily depends on sea conditions. Rough seas or heavy surf can render a normally ideal location unsafe for operations. Storms can radically change the shoreline by blowing in and grounding large icebergs, rafts of sea ice, or brash ice.

Many shore landings also depend on tides. Camp put-ins and takeouts must be timed around high or low tides, which can change the distance that gear needs to be carried by several hundred feet. Tides can also turn a calm landing into one with breaking surf or bring underwater hazards to the surface. Some camp installations take many hours, and the landing site may change throughout the operation.

These factors 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. For some locations, the easiest transiting routes are along shore, so be aware of the initial tidal range at each location and remember that storms and lunar phases can increase that range. Mark high and low tide levels with flagging, and make daily observations.

Forecasting

Weather forecasting for USAP is done under the auspices of NSF and coordinated through the Naval Information Warfare Center Atlantic (NIWC). NIWC also has a presence at McMurdo Station. Antarctic weather forecasters have fewer data collection sites to feed their forecasting models than do forecasters elsewhere in the world. Antarctic forecasters rely heavily on weather observations called in from remote field sites. They also use satellite imagery, data from automated weather stations, and the Antarctic Mesoscale Prediction System, which produces twice daily forecasts for the Antarctic continent. USAP support 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 am area forecast at that time.

For field camps outside Palmer Station, the Peninsula field supervisor can help determine the best location and method for transmitting a weather forecast to the camp. Nearby international research stations may have weather forecasting capabilities, or weather may be relayed during the daily camp check-in.

Weather Observations in the Field

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 note drops in barometric pressure, which signal changing weather and potentially an approaching storm. Watch for changes in cloud cover or appearance, changes in wind direction or intensity, rapid changes in temperature, decreasing visibility, increasing precipitation and changing ocean conditions.

Note sea and ice conditions daily to ensure safe operations. Late in the field season, sea ice can form quickly and cut off boat access. As the takeout 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 POC. Report any large icebergs, rafting ice, changes to snow or ice berms or other changes to beach conditions. Scout out alternate landing sites if access to the primary site is obstructed.

Prepare early for shelter from storms. Have a predetermined set of weather guidelines for field parties. Be aware of the increased risk of hypothermia due to wind chill. Blizzards and whiteout conditions can make any travel hazardous. Double-check the camp area to ensure all equipment and supplies are secure. Check all tent anchors and guylines before gale force

winds arrive. Storms with strong winds may be accompanied by storm surges and ice deposits on the shoreline. Secure all gear well above the high tide line and any potential surge.

Kestrel Setup

Weather observers in remote locations often use a Kestrel handheld weather meter to measure wind speed, temperature, dew point and pressure. This manual covers the Kestrel 4000. Observers using a different meter should refer to its user instructions.

The Kestrel 4000 is available from the Peninsula field supervisor during gear issue in Punta Arenas. The field team member picking up the equipment must ensure the Kestrel is set to measure temperature in degrees Celsius, wind speed in knots, and altitude in feet. Also carry extra batteries in case the installed batteries lose power in the field.

Store the Kestrel 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 is sluggish and eventually fades, although the device will still record data. Return the Kestrel to a warm, inside coat pocket as soon as possible after use.

Reference Altitude and Barometric Pressure

Most field camps put in by small boat from a vessel will be operating at or 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 they know to provide this information before departing.

Navigate to the barometric pressure (BARO) screen and press the center COMMAND button to enter. On the screen, go to the reference altitude (Ref Alt) line. Use the left and right buttons to increase or decrease its value to equal the altitude in feet (0 at sea level). Ensure the Kestrel is set with feet as its default altitude measurement. Notice that the barometric pressure reading changes in response to changes in the

altitude number. Press the COMMAND button to save and exit the adjustment mode.

Next, go to the altitude screen and navigate to the reference pressure line. 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 altitude. Read the pressure from the BARO screen.

Sea Ice Assessment

There is no regular forecasting or analysis available for travel on Peninsula sea ice, so 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, ASC remote sensing analyst or Palmer Station research associate. The remote sensing analyst can also provide sea ice conditions at near real time for vessel movements. The Palmer Station research associate can pull the following data.

Low-resolution visible imagery: This is published daily, but sea ice may be obscured by cloud cover. Historical imagery is available to 2000.

High-resolution visible imagery: This is published five to six times a year, mostly during the summer. The last two years of historical imagery are available.

Radar (SAR) imagery: This is typically published each week and can see through clouds. Only four or five days of historical imagery is available.

Sea ice concentration: This is published daily with a two-day lag. Historical imagery is available to 2002.

Thickness

Strong currents can erode sea ice from below. This is hazardous because there may be no obvious indication of ice 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 temperatures rise later in the season, the sea ice becomes progressively weaker and thinner everywhere.

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 that is at least 24 inches thick. Ice that is sky blue and has a slick, scalloped surface is multiyear ice that is several feet thick.

Ice of different ages and thickness are 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 by 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 investigate areas of gray ice. Sea ice that appears black is thin and must always be avoided. 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.

Temperature

Colder ice is stronger. The colder the ambient air temperature, the more the ice grows. The colder the ice, the stronger the overall structure. Just looking at the surface will not indicate

the true strength of the ice. Sea ice strength is measured according to four periods of ice surface temperature:

Sea Ice Periods

Period	Surface Temperature	
	Celsius	Fahrenheit
1	< -10°C	< 14°F
2	-10°C to < -5°C	14°F to < 23°F
3	-5°C to < -2.78°C	23°F to < 27°F
4	2.78°C to < -1.94°C	27°F to < 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 (e.g., wind, waves, tidal action, 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.

Avoid cracks whenever possible. If one must be crossed, do so in a line perpendicular to the crack. Never cross a system of multiple, closely set cracks in a way that places a vehicle on two or more cracks at once or on a small piece of ice between cracks. Avoid sets of cracks that form triangular wedges, which could break off and flip over under a vehicle's weight.

Snow cover on the sea ice can hide 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 (e.g., feces, urine, seal shadows, 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.

Poor weather conditions and snow can hide or 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.

There are four types of sea ice cracks:

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

Each is described and discussed during sea ice training. Field party members working on the sea ice must learn to identify and evaluate each type of crack.

Sea Ice Travel and Work

Peninsula sea ice must be at least 12 inches thick to allow for travel within 300 meters (~985 feet) of shore or vessel. Ice must be 20 inches thick to allow for travel beyond 300 meters. These thicknesses are the same for ski, foot and snowmobile travel due to the distributed pounds per square inch of ground pressure for each method.

The 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 the ice surface temperature's period. The effective width cannot exceed one-third of a snowmobile track length. Use the following guidelines to determine the required ice thickness and maximum effective width for a snowmobile.

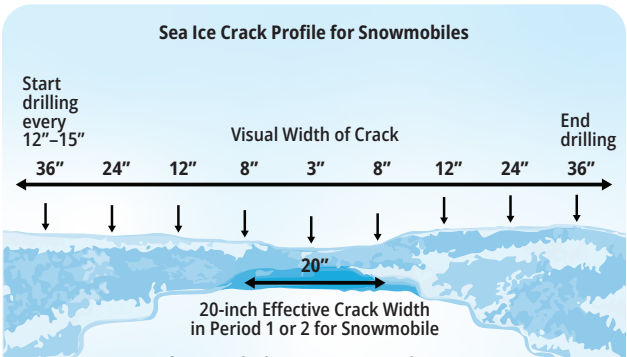
Sea Ice Crack Guidelines for Snowmobiles

Guideline	Inches
Maximum Effective Crack Width	20
Minimum Ice Thickness by Ice Surface Temperature	
Period 1 (< -10°C)	5
Period 2 (-10°C to < -5°C)	5
Period 3 (-5°C to < -2.78°C)	6
Period 4 (-2.78°C to < -1.94°C)	7
Note: If towing a sled or trailer, different ice thickness requirements may apply. Contact Field Safety & Training at x2345 for more information.	

Profiling a Sea Ice Crack

1. Stop the vehicle before reaching a crack, and check for other cracks nearby.
2. Determine the nearest edge of the crack by removing snow down to bare ice.
3. Using an ice ax, probe for open water or weak spots to determine if it is safe to cross by foot.
4. If safe, shovel the snow out of the crack from edge to edge, clearing at least one shovel blade's width of snow.
5. Drill holes every 12 inches in a straight line, beginning outside one crack edge and ending outside the other. Be sure to drill healed shelves and any visible fractures.
6. Drill each hole either to water level or a full Kovacs drill flight length (> 30 inches).

7. Measure the ice thickness in each hole.
8. Pay attention to the characteristics of the ice shavings (i.e., dry, moist or slushy).



Marine Ice Floe Work

Marine ice floes must be at least five meters (16 feet) long and wide and at least 30 centimeters (12 inches) thick for a person to work on them directly. Small boat operators will assist in making the call whether a floe is safe for work.

Take great care to not overload one side of a floe, so it does not break or flip over. If a small boat is utilized, it must remain adjacent to the floe in case someone ends up in the water and requires immediate rescue.

The following are required for marine ice flow work:

- Personal flotation or immersion suit (with flotation) for each participant
- Ice probe

- Two throw ropes minimum, either attached to the small boat or personnel basket
- VHF radio carried by each participant

Also highly recommended are skis, snowshoes or traction devices, depending on what is available and best suited for the location.

REFERENCES

SOAP Note

SOAP NOTE

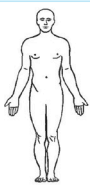
Patient Name		DOB	

SUBJECTIVE

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

OBJECTIVE

EXAM



VITAL SIGNS						
Time	Pulse	Resp	BP	Skin	Temp	AVPU
			/			
			/			
			/			
			/			
			/			
			/			
			/			

ASSESSMENT AND TREATMENT PLAN	
A = Assessment (Problem List)	P = Treatment Plan

Emergency Incident Worksheet

EMERGENCY INCIDENT WORKSHEET

Expand the cells in this form or attach additional pages as needed.

INITIAL INFORMATION					
Time		**Freq/Phone**		**Caller Name**	
Location					
Situation					

INJURY OR ILLNESS			
Information	**Patient 1**	**Patient 2**	**Patient 3**
Name			
Gender			
Age			
Conscious?	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
Symptoms / Injury Type (Area of Body, Bleeding, Deformity)			
Mechanism of Injury (Possible Back / Spine / Neck / Head Injury?)			
Pain Level From 1 (Lowest) to 10 (Highest)			
Highest Level of Caregiver's Training			

SPILL			
Active Spill?	☐ Y ☐ N	**If Yes, Fluid Type (e.g., Fuel, Glycol)**	
Related Injuries?	(Specify in Injury or Illness section)		
Fire or Risk of Fire?	☐ Y ☐ N		
Volume of Spill (Gallons)	_____ Gallons		
Dimensions of Spill Area			

LOSS OF SHELTER OR INFRASTRUCTURE	
Shelter(s) Available (Type and Quantity)	
Already Set up?	☐ Y ☐ N
Fire?	☐ Y ☐ N
Related Injuries?	(Specify in Injury or Illness section)
Food Available? (Estimate Person-Days)	☐ Y ☐ N _____ Person-Days
Fuel Available? (Cooking + Heating; Estimate Days)	☐ Y ☐ N _____ Days
Comms, Power, Batteries?	☐ Y ☐ N

AIRCRAFT MISHAP	
Aircraft Type and Call Sign	
Related Injuries?	(Specify in Injury or Illness section)
Crew Status	
Aircraft Engine/Prop/Rotor Still Running?	☐ Y ☐ N
Fire or Risk of Fire?	☐ Y ☐ N
Spill?	(Specify in Spill section)

VEHICLE ACCIDENT	
Vehicle Type and ID	
Related Injuries?	(Specify in Injury or Illness section)
Vehicle Still Running or Moving? Stable?	☐ Y ☐ N
Fire or Risk of Fire?	☐ Y ☐ N

Knots

Knots are essential for working and living in the field, and it helps to be familiar with knot terminology:

Knot: Ties a rope to itself.

Hitch: Ties a rope to another object (e.g., post, stake, = eye-ring grommet).

Bend: Ties two different pieces of rope together.

Bight: Curved or slack section of rope between two ends.

There are 13 knots you may find useful in the field (see figures at end of section).

Figure 8 on a Bight

The figure 8 on a bight forms a secure, non-slip loop at the end of the rope that is difficult to untie after a heavy load. Use the tail end to make a stopper knot.

Common uses: Climbing and mountaineering; making a loop for a carabiner to attach a sled to a snowmobile.

Bowline

The bowline is a loop knot that creates a closed, fixed circle at the end of a line. This is a secure knot that does not slip when loaded and is easy to untie. Learn to tie it with one hand for fun or for rescue situations. To tie a bowline, make a small loop, then with the running end of the rope, make the "rabbit come out of the hole, around the tree and back down the hole." Use a stopper knot.

Common uses: Tying around a tent loop to use as a guyline; tying down cargo.

Clove Hitch (aka Double Hitch)

The clove hitch is a great all-purpose hitch to secure a rope when pulled from a post in two directions. It consists of two half hitches around an object, with the running end then passing under itself, making it a good binding knot. It is easy to

untie but needs tension or will come undone. The clove hitch can be tied from the middle of the rope.

> **Common uses:** Starting or ending lashing; attaching a rope to a carabiner, eye ring grommet, stake or post.

Round Turn and Two Half Hitches

The round turn and two half hitches ties a rope to an object (e.g., post, ring). It is a great all-purpose knot to secure a rope when pulled from a post in one direction. It is strong, does not slip, and is easy to untie.

> **Common uses:** Lowering survival bags from a ship's deck to a small boat below; securing survival bags to a bamboo or metal stake so they do not blow away.

Sheepshank Knot

A sheepshank knot is used to shorten a rope or take up slack. It requires tension.

> **Common uses:** When you need a short length of rope but do not want to cut the line.

Sheet Bend

A sheet bend knot joins two ropes of different sizes or thicknesses. Use the thicker or more slippery rope as the bight, with the thinner rope going around it.

> **Common uses:** Lengthening a guyline; fixing a boot lace with paracord or string; using scraps of line to make a longer one.

Tautline Hitch

The tautline hitch is an adjustable loop knot that can slide on a line. It easily adjusts under tension and remains secure once the knot is pulled tight. This knot is a combination of the clove hitch and the round turn and two half hitches.

> **Common uses:** Replacing a tent guyline; adjusting the tension on a guyline.

Square Knot (aka Reef Knot)

The square knot is a binding knot used to tie two ends of a single rope together, right over left, then left over right.

> **Common uses:** Lengthening a rope by tying two lines together; tying a bundle of bamboo poles; tying bandages.

Prusik Knot

The Prusik knot is a friction hitch used to attach a loop of 5-millimeter cord around a rope.

> **Common uses:** Climbing and mountaineering; tying items to a guyline so they do not blow away.

Trucker's Hitch

The trucker's hitch stretches a rope between two anchor points. It is essentially a block and tackle knot that uses mechanical advantage and friction. Form the loop with the slack part of the line so it does not tension on itself. It can quickly be undone and retensioned, with more force than the tautline hitch.

> **Common uses:** Tensioning guylines between deadman anchors and the tent; tying and securing sled loads.

Water Knot

The water knot joins two lengths of webbing or straps.

> **Common uses:** Lengthening two pieces of webbing; joining two cargo straps or cam straps.

Double Fisherman's Stopper

The double fisherman's stopper knot joins two lengths of rope and is very easy to tie. It consists of two overhand knots.

> **Common uses:** Making slings in climbing; making adjustable necklaces and bracelets; camping crafts on bad-weather days.

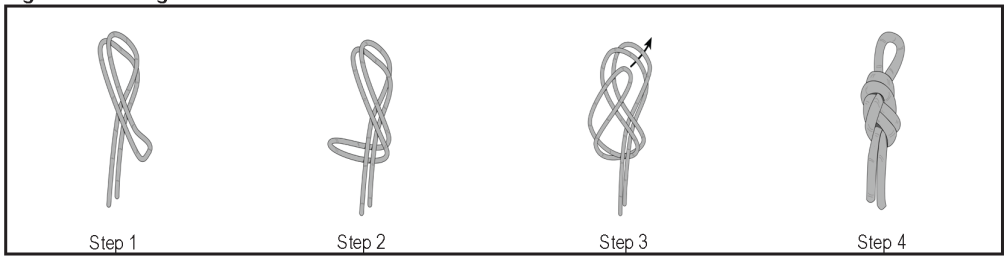
Alpine Butterfly Loop

The alpine butterfly forms a fixed loop in the middle of a rope without needing access to either end. This knot shortens a long climbing rope or creates a bight in the middle of a rope.

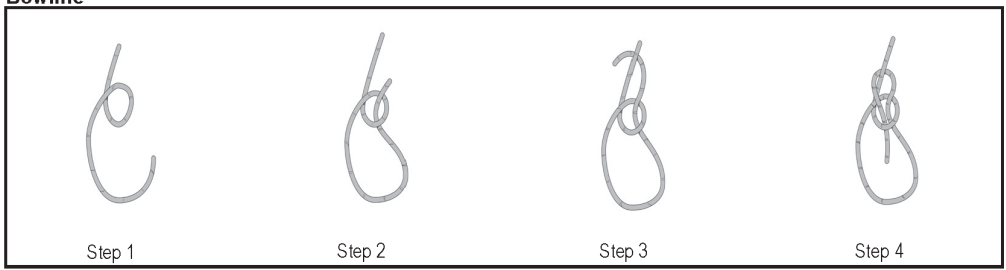
Common uses: Connecting members of a roped-up mountaineering team.

Note: Illustrated by GHG.

Figure 8 on a Bight

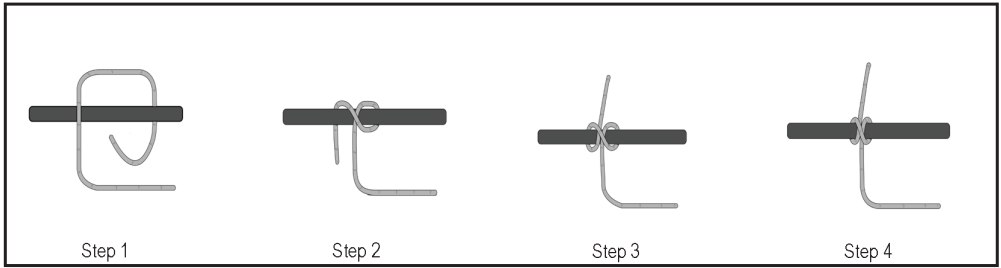


Bowline

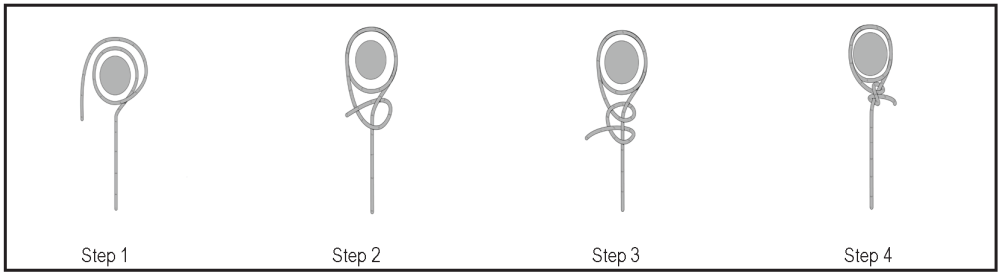


Note: Illustrated by GHG.

Clove Hitch (Double Hitch)

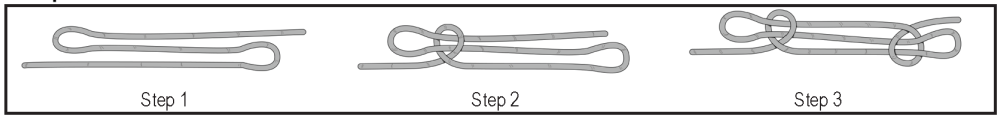


Round Turn and Two Half Hitches

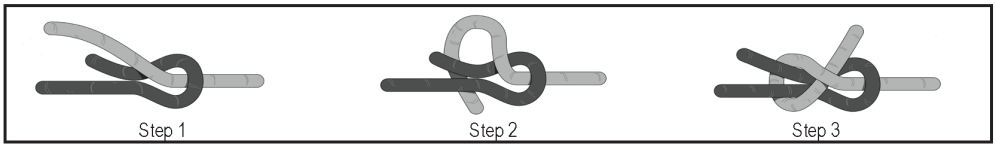


Note: Illustrated by GHG.

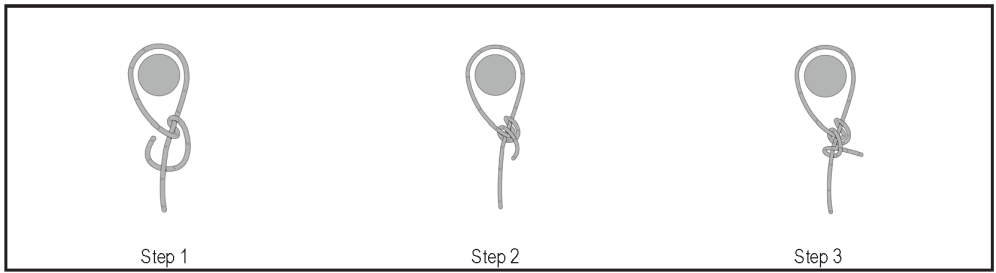
Sheepshank Knot



Sheet Bend

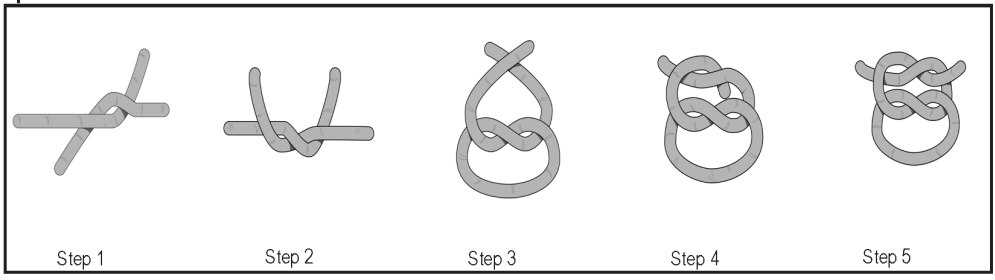


Tautline Hitch

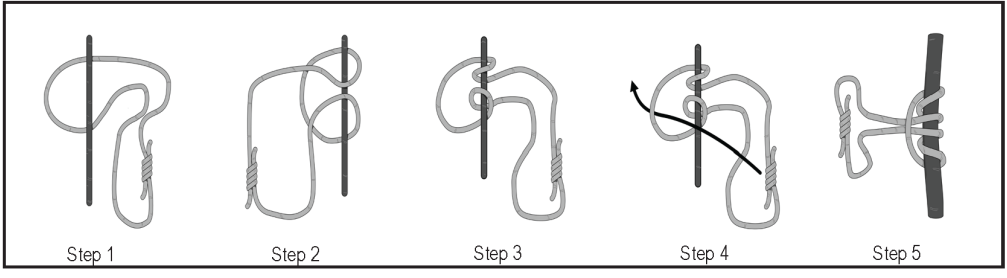


Note: Illustrated by GHG.

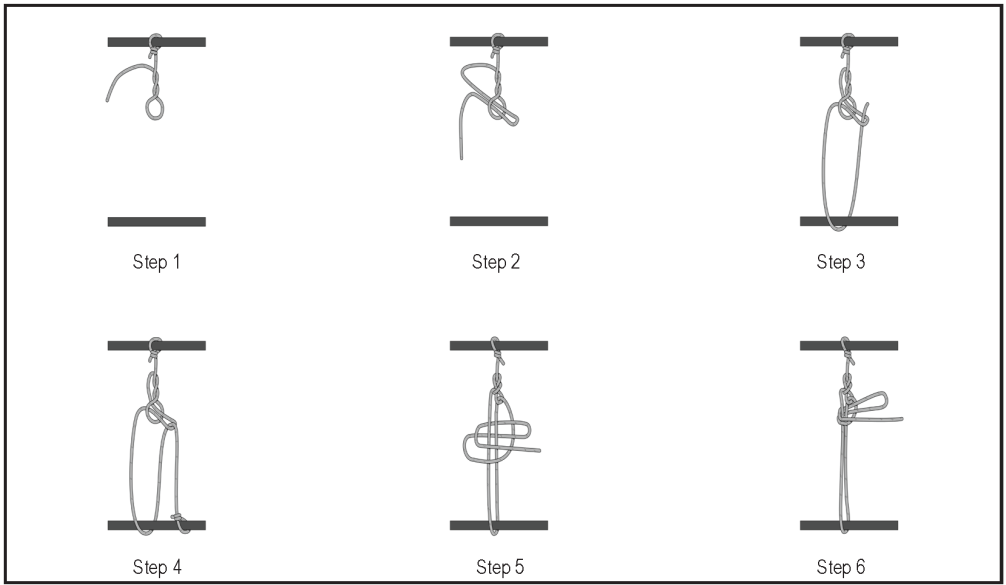
Square Knot or Reef Knot



Prusik Knot



Trucker's Hitch



Note: Illustrated by GHG.

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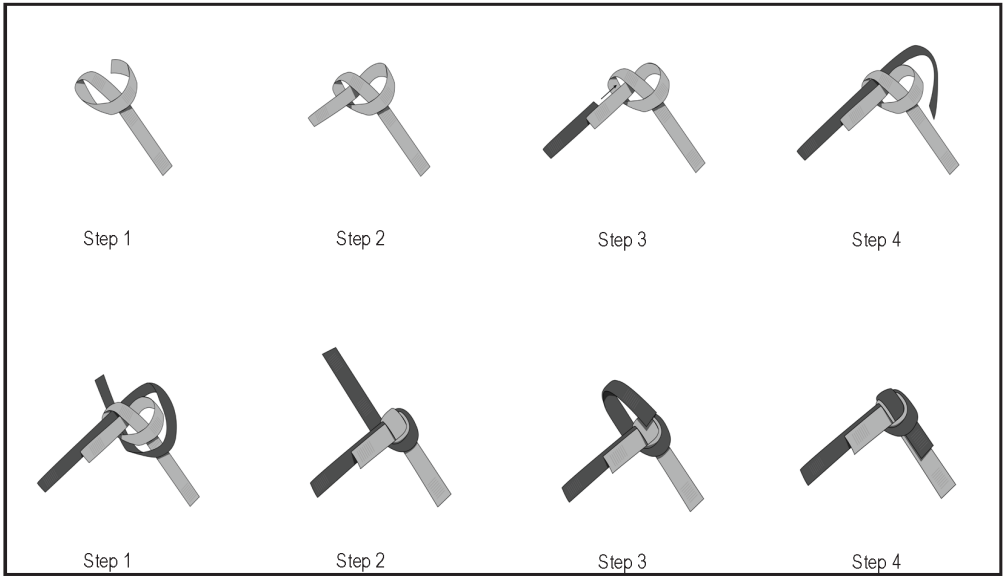
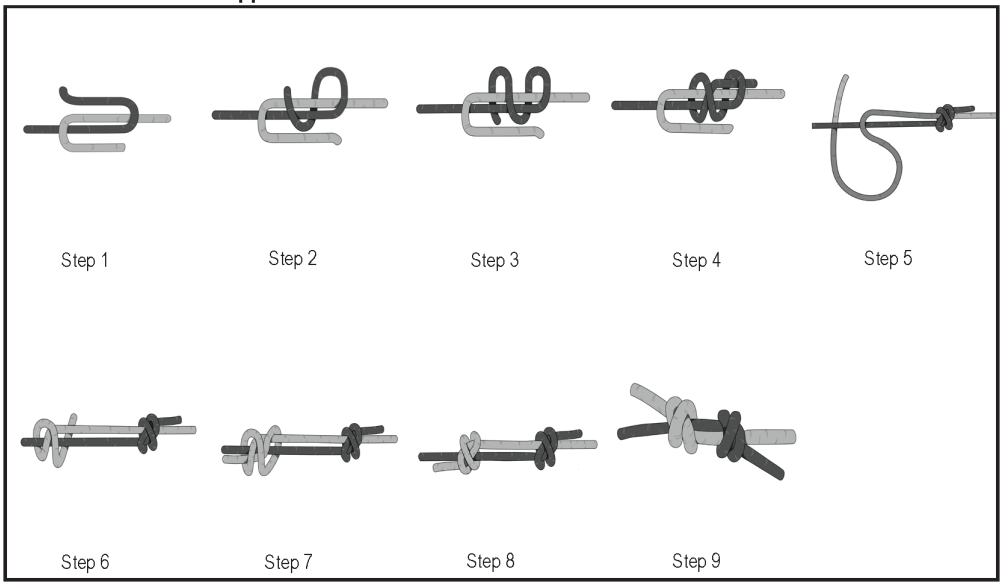
Water Knot



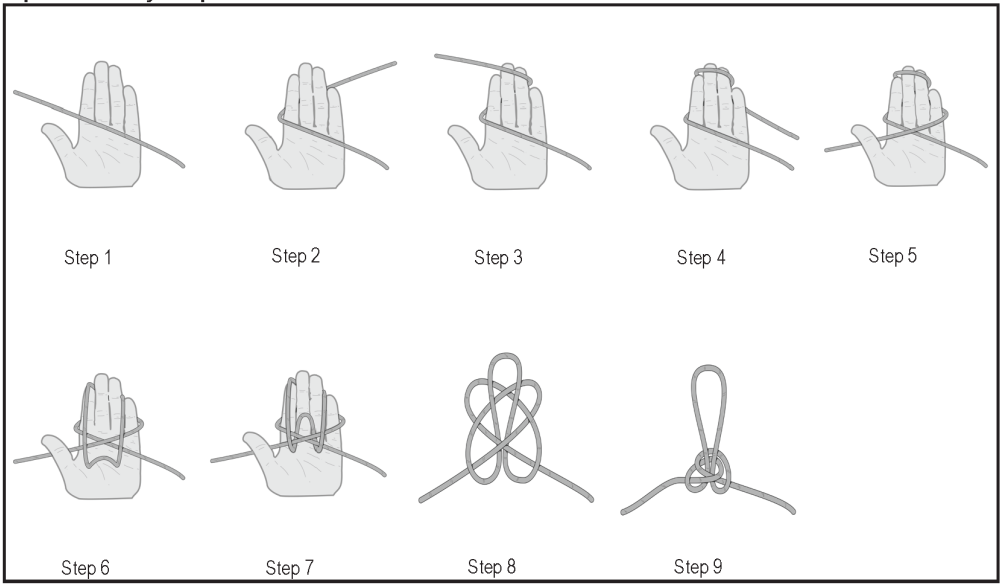
Note: Illustrated by GHG.

Double Fisherman's Stopper



Note: Illustrated by GHG.

Alpine Butterfly Loop



Common Conversions of Measure

Measure	Multiply	By	To Get
Weight	pounds	0.4536	kilograms
	kilograms	2.2046	pounds
Distance	inches	25.4000	millimeters
	millimeters	0.0394	inches
	inches	2.5400	centimeters
	centimeters	0.3937	inches
	meters	3.2808	feet
	feet	0.3048	meters
	meters	1.0936	yards
	yards	0.9144	meters
	kilometers	0.6214	miles
	miles	1.6090	kilometers
	kilometers	0.5396	nautical miles
	nautical miles	1.8530	kilometers
	statute miles	1.6093	kilometers
	kilometers	0.6213	statute miles
Density	cubic feet	0.0283	cubic meters
	cubic meters	35.3145	cubic yards
	cubic yards	0.7646	cubic meters
	cubic meters	1.3079	cubic yards
Volume	liters	0.2642	gallons
	gallons	3.7854	liters
	liters	2.1134	pint (liquid)
	pint (liquid)	0.4732	liters

Chilean Standard Time – Zulu Time Conversions

CLT	Zulu	CLT	Zulu
00:00	03:00	12:00	15:00
00:30	03:30	12:30	15:30
01:00	04:00	13:00	16:00
01:30	04:30	13:30	16:30
02:00	05:00	14:00	17:00
02:30	05:30	14:30	17:30
03:00	06:00	15:00	18:00
03:30	06:30	15:30	18:30
04:00	07:00	16:00	19:00
04:30	07:30	16:30	19:30
05:00	08:00	17:00	20:00
05:30	08:30	17:30	20:30
06:00	09:00	18:00	21:00
06:30	09:30	18:30	21:30
07:00	10:00	19:00	22:00
07:30	10:30	19:30	22:30
08:00	11:00	20:00	23:00
08:30	11:30	20:30	23:30
09:00	12:00	21:00	00:00
09:30	12:30	21:30	00:30
10:00	13:00	22:00	01:00
10:30	13:30	22:30	01:30

CLT	Zulu	CLT	Zulu
11:00	14:00	23:00	02:00
11:30	14:30	23:30	02:30

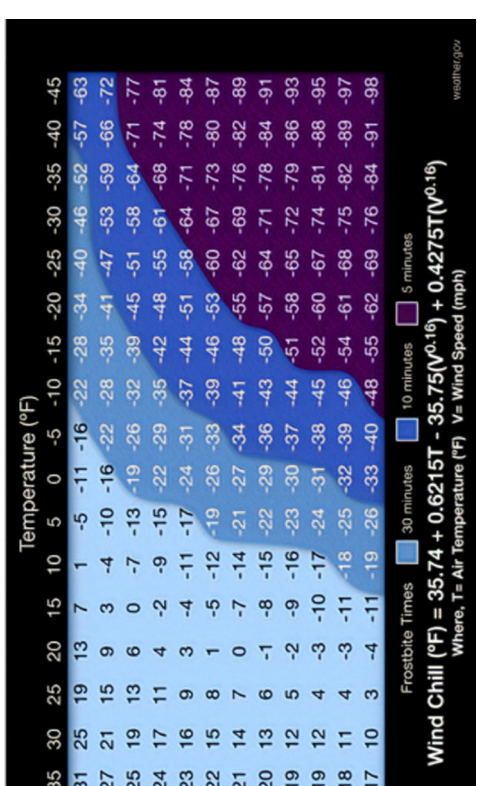
Note: CLT = Chilean Standard Time. Report weather observations in Zulu time (e.g., a Peninsula field camp operating on CLT in the austral summer with an 08:00 weather observation calls it in as 11:00 Zulu).

Temperature Conversions

Degrees Fahrenheit (°F)	Degrees Celsius (°C)
40	4.4
35	1.7
32	0.0
30	-1.1
25	-3.9
20	-6.7
15	-9.4
10	-12.2
5	-15.0
0	-17.8
-5	-20.6
-10	-23.3
-15	-26.1
-20	-28.9
-25	-31.7
-30	-34.4
-35	-37.2
-40	-40.0

Note: Fahrenheit to Celsius = (Fahrenheit – 32) × (5/9). Celsius to Fahrenheit = (1.8 × Celsius) + 32.

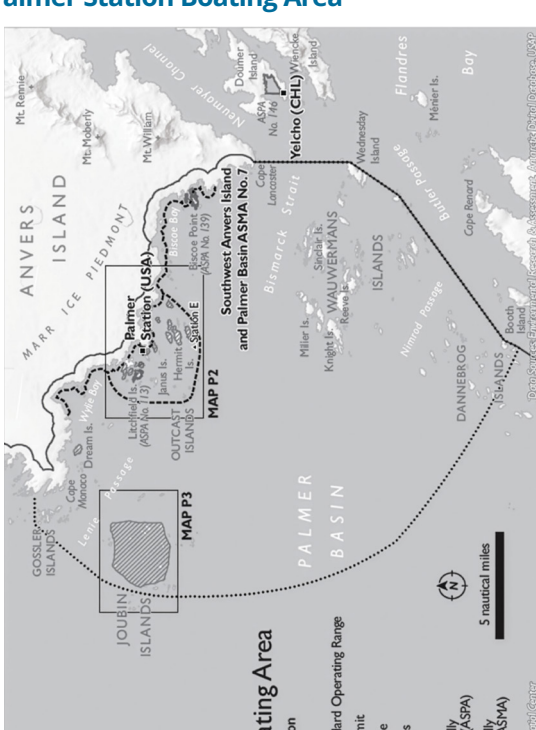
Wind Chill Chart



Note: Reproduced from "Understanding Wind Chill," National Weather Service, https://www.weather.gov/safety/cold-wind-chill-chart.

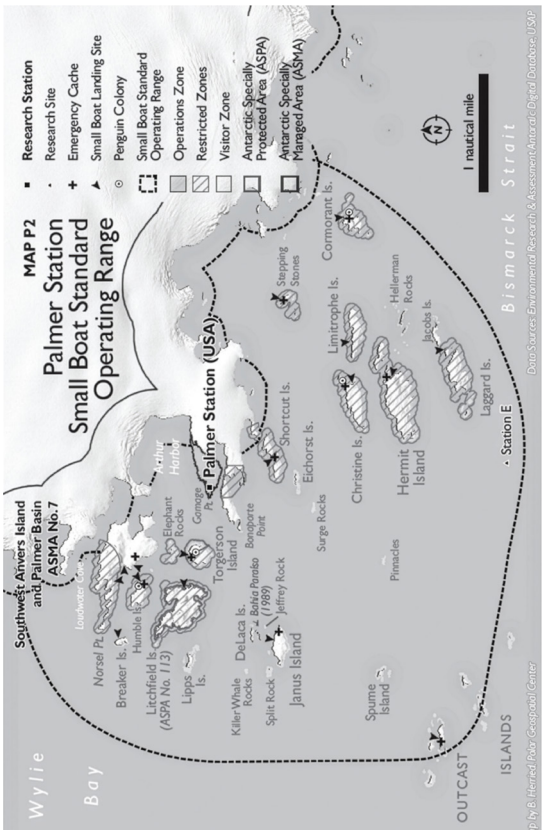
Maps

Palmer Station Boating Area



Note: Produced by Polar Geospatial Center (https://www.pgc.umn.edu), based on data from USAP's Environmental Research & Assessment, Antarctic Digital Database.

Palmer Station Small-Boat Operating Range



Note: Produced by Polar Geospatial Center (https://www.pgc.umn.edu), based on data from USAP's Environmental Research & Assessment, Antarctic Digital Database.

Joubin Islands

Note: Produced by Polar Geospatial Center (https://www.pgc.umn.edu), based on data from USAP's Environmental Research & Assessment, Antarctic Digital Database.

Glossary

For a glossary of helpful nautical terms, visit https://www.marinewaypoints.com/learn/glossary/glossary.shtml. The following terms are used in this manual.

Term	Definition
2WD	two-wheel drive
4WD	four-wheel drive
AC	alternating current
ACA	Antarctic Conservation Act of 1978
Antarctic-Environmental Protocol	Protocol on Environmental Protection to the Antarctic Treaty
ASC	Antarctic Support Contract
ASMA	Antarctic Specially Managed Area
ASPA	Antarctic Specially Protected Area
ATV	all-terrain vehicle
BTU	British thermal unit
Central Comms	Central Communications
CO	carbon monoxide
DC	direct current
ECW	extreme cold weather
EOS	end of season
GPS	global positioning system
HF	high frequency
HPAI	highly pathogenic avian influenza
HSMs	Historic Sites and Monuments
IATA	International Air Transportation Association
IMDG	International Maritime Dangerous Goods
Maximo	Software that manages the USAP cargo system

Term	Definition
MEC	Mechanical Equipment Center
medevac	medical evacuation
MHz	megahertz
MoGas	motor vehicle gas
mpg	miles per gallon
NIWC	Naval Information Warfare Center Atlantic
NSF	U.S. National Science Foundation
OPP	Office of Polar Programs
OSAR	ocean search and rescue
PI	principal investigator
POC	point of contact
PVC	polyvinyl chloride
RFI	ready for issue
RHIB	rigid hull inflatable boat
RM	risk management
RSP	Research Support Plan
SAR	search and rescue
SDS	safety data sheet
SIP	Support Information Package
SN	shipping number
SOAP	subjective, objective, assessment, and plan
T&L	Transportation & Logistics
UHMW	ultra high molecular weight
USAP	United States Antarctic Program
VHF	very high frequency


Antarctic Circle
Palmer Station
South Pole Station
McMurdo Station