
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

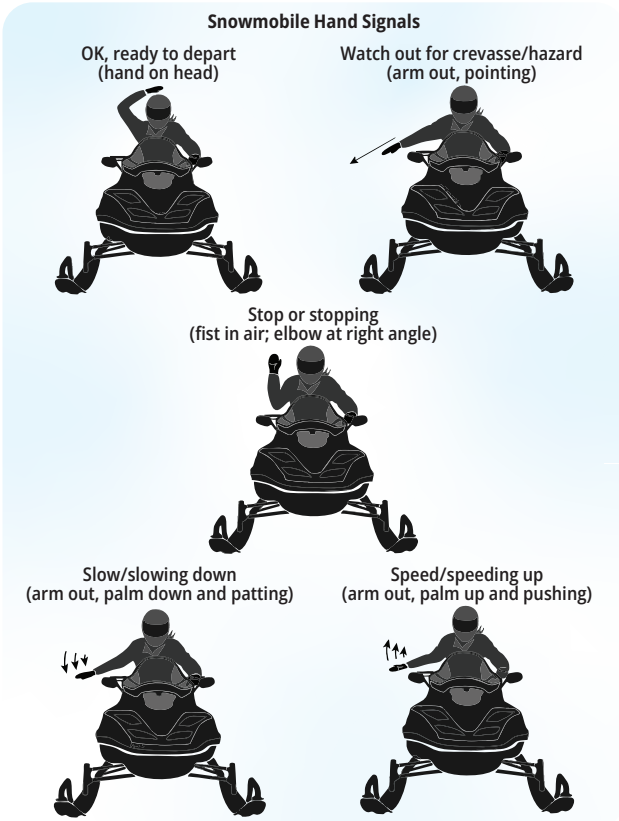
- Maintain a low center of gravity.
- Keep straps tied down, ensuring there are no loose ends.
- Place often used items where they are easy to get to.
- Do not exceed the 150-pound limit for loads on the rear of the snowmobile.

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.