

Field Gear

Pre-Deployment Requirements

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

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

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

Stoves

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

Stove Safety

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

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

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

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

Carbon Monoxide (CO) Risks

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

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

Carbon Monoxide is Dangerous

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

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

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

MSR® WhisperLite™ Stove

Assembling the Stove

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

Operating the Stove

Priming

- To preheat the stove, the priming flame must contact the generator tube.
- Open the control valve until fuel flows through the jet and fills the priming cup $\frac{1}{2}$ full.
- Close the control valve.
- Double check for leaks and fuel overflow before lighting.
- Light the priming cup or wick.
- Place a windscreen around the stove.

Lighting

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

Cooking

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

Shutting Off the Stove

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

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

Safety Tips

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

MSR® WhisperLite™ Stove Troubleshooting

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

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

Coleman® Gas Stove

Operating the Stove

Filling the Tank

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

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

Pressurizing the Tank

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

Lighting the Stove

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

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

Shutting Off the Stove

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

Coleman® Gas Stove Tips

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

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

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

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

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

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

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

Coleman® Gas Stove Troubleshooting

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

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

Coleman® Propane Stove

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

Setting up the Stove

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

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

Operating the Stove

Lighting Electronic Ignition Stoves

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

Lighting Standard Ignition Stoves

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

Shutting the Stove Off

- Close the burner valves firmly.

Storing the Stove

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

Partner® Steel 4-Burner Stove

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

Heaters

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

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

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

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

Mr. Heater® Single-Tank Top Heater

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

Lighting the Heater

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

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

Mr. Heater® Portable Buddy Heater

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

Sleds

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

Sled Types

Nansen Sleds

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

Siglin® Ultra High Molecular Weight (UHMW) Sleds

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

Banana Sleds

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

Paris Pulk Sleds

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

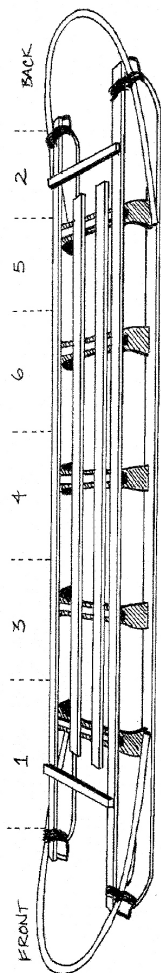
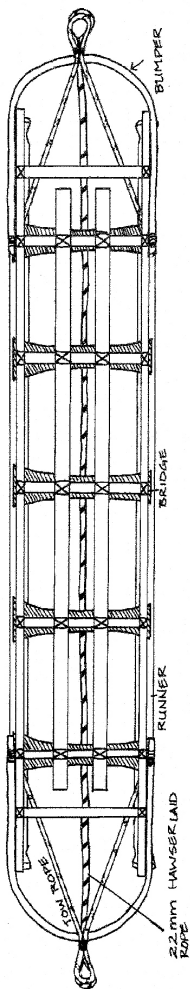
Loading and Securing Cargo

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

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

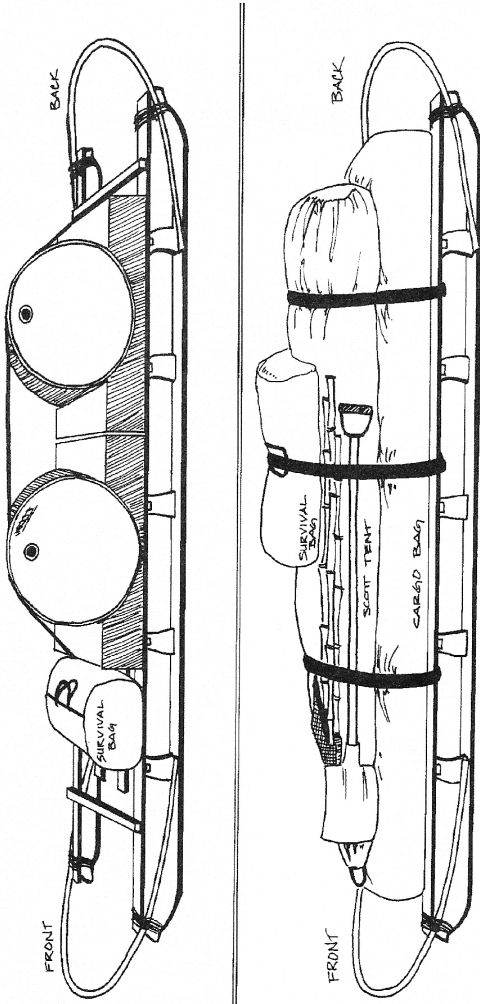
It is best to transport fuel drums on drum cradles for stability. Secure the finished load tightly with cord, cargo straps, or bungee cords. Avoid using hard knots when rigging loads for travel. Use taut-line hitches or trucker's hitches instead, as they are easy to undo if it becomes necessary to re-tension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

NANSEN SLED



WEIGHT DISTRIBUTION WHERE 6 IS THE MOST AND 1 IS THE LEAST.

Nansen sled load examples



Pulling Sleds with a Snowmobile

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

Snowmobile operators pulling a sled should adhere to these rules:

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

Snowmobiles

Operational Guidelines

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

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

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

Pre-Ride Inspection

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

Starting the Snowmobile

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

- c. Pull the engine over three times with pull starter
 - d. Prime the engine twice again (three times if below 0° F)
 - e. Start the engine with the pull starter or electric starter
 - f. Feather the throttle and allow the engine to warm up; feathering the throttle also will allow the belt to warm up as it spins the pulleys
2. Now that the machine is warm and ready to go, allow it to return to idle.
 3. Engage the gear and then ease into the throttle.
 4. If the engine is off for less than an hour, ensure the transmission is in neutral and engage the electric starter. Give it a little throttle to get it to start. Allow the engine to warm thoroughly before driving it.

Starting Tips

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

Preventative Maintenance

Daily

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

Weekly

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

Loading, Towing, and Driving

Loading

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

Towing a Sled

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

Driving

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

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

Driver Communication

Hand signs for group travel on snowmobiles

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

Troubleshooting

Fuel Flow Problems

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

Diagnosis and Repair:

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

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

Starter/Cranking Problems

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

Diagnosis and Repair:

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

Spark Problems

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

Diagnosis and Repair:

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

Note: Use a tool or some other method to ground the plugs. Holding them with your hands will result in unpleasant shocks. Also, it may be hard to see the spark in direct sunlight.

2. If a spark is not present, the problem is in the electrical system. Check the kill switches and all electrical connectors. If they are in the correct position and operational, the solution to the problem depends on the engine type.
 - g. 503/550: These models have an electronic ignition, so the problem is probably the igniter box. Replace the igniter box.
 - h. Other engines: The problem may be a bad coil or a shorted wire.

Power Problems

Symptom: The snowmobile runs but it lacks power.

Diagnosis and Repair:

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

Honda Generators

Generator Safety

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

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

Pre-Operation Check

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

Starting the Engine

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

Stopping the Engine

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

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

Troubleshooting

Symptom: The engine will not start.

Diagnosis and Repair:

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

Symptom: The engine starts but stops immediately.

Diagnosis and Repair:

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

Symptom: There is no electricity at the receptacles.

Diagnosis and Repair:

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

Mini-Portable Field Power Systems

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

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

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

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