


Issue 419

PS

October
1987

THE PREVENTIVE MAINTENANCE MONTHLY



ARE THESE THE
GUYS WE'RE SUPPOSED
TO BE RESCUING?

NO, THIS IS THE
FIRST RESCUE
PARTY THAT WAS
SENT OUT!

BRRRRR!

WE SHOULDA~
DONE OUR COLD~
WEATHER PM!

Approved For
Public Release;
Distribution is
Unlimited

**COLD
WEATHER
ISSUE**

TB 43-PS-419, The Preventive Maintenance Monthly, is an official publication of the Department of the Army, providing information for all soldiers assigned to combat and combat support units and all soldiers with unit maintenance and supply duties. All information published has been reviewed and approved by the agency responsible for the equipment, publication or policy discussed. Application of the information is optional with the user.

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You are invited to send PS your ideas for improving maintenance procedures, questions on maintenance and supply problems, questions or comments on material published in PS. Just write to:

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COPING *with the* COLD!



As you probably learned the hard way last year, trying to get through a cold winter with ordinary maintenance just won't hack it. Operating in the cold calls for something extra. And that something starts with good maintenance habits.

This is simply orienting yourself for conditions that will actually exist—conditions that can frustrate the best mechanics and operators if they're not ready to meet the hazards head on.

WINTER FACTS

1. LUBRICANTS become stiff and hard to use.
2. PLASTIC AND HARD RUBBER PARTS become brittle. A hard knock or sharp bend may snap them.
3. GAGES AND DIALS stick and give wrong readings.
4. BRAKES freeze to drums if left standing when wet.
5. FUEL TANKS, FILTERS AND LINES freeze tight or ice up from condensation.
6. LINKAGES get stiff causing hard operation or delayed response.
7. PAINT becomes brittle and cracks easily.
8. CRANKCASES sludge up from condensation caused by short runs.
9. BATTERY efficiency is cut. They freeze and crack when discharged.
10. ENGINES are hard to start, with threat of hydrostatic lock.
11. MACHINED AND UNPAINTED SURFACES rust and corrode quickly.
12. DRAIN COCKS AND PLUGS freeze tight, discouraging daily or periodic draining.
13. POWER TRAIN BREATHERS AND VENTS clog from slush and freeze closed.
14. WINDSHIELDS CRACK easily when hit by a blast of hot air when being defrosted.
15. PERSONNEL EFFICIENCY drops.

You learn right off that just about any task may take twice as long to do so you make sure you allow enough time to get the job done right.

And since the wind-chill factor can have you operating at -50°F at times, you make sure there're at least 2 people assigned to any outside task. Not only is the extra help needed, but each can watch the other for signs of frostbite, which can strike FAST!

WINTER RULES

1. Be acquainted with the Cold Weather Operation portion of your operator's TM.
2. Lubricate according to the temperature range on your equipment's LO.
3. Arm your outfit with the necessary special winterization equipment that's authorized for the average temperature range of your area. Area climatic conditions are determined by the average temperature range of the season's coldest month.
4. Keep your extreme cold-weather TMs, TB's, FM's and other cold-weather pubs within reach for quick reference. Look 'em over before the cold blast hits to offset any trouble due to lack of know-how.
5. Keep vital spots or portions of your equipment under cover, or out of the weather altogether.
6. Always remember... you're working under unusual conditions, so give your equipment that type of attention and service.
7. Try no short-cuts, alterations or repairs that are beyond your MOS know-how.
8. Never force a cold, stiff, or frozen piece of equipment.
9. Protect your fuel and lubricants from winter's contaminating elements.
10. When in doubt whether winterization treatments apply, check with someone who knows.



MECHS, IT'S A WHOLE NEW BALL-GAME OUT THERE, COME WINTER TIME! SO YOU BETTER LEARN TO PLAY BY SOME DIFFERENT RULES!

Exhaust Danger

Operating equipment or pulling maintenance in a closed area with an engine or fuel-burning heater going can put you to sleep for a long time. Carbon monoxide is not to be fooled with—and nobody is tough enough to withstand its sneaky and deadly consequences.

Regardless of where you're holed up—driving in a closed cab or tuning an engine in a closed shop—you're a candidate for the deep freeze.

In vehicles, keep a window or hatch cracked open—and even with that, never take a nap while the engine or heater's running.

Keep all fuel-burning heater exhausts and their couplings tight and leak-proof. Don't take any chances—it's not worth it.



BEWARE OF DEADLY GAS

When running your vehicle engine indoors, always use a flexible exhaust extension to carry deadly carbon monoxide fumes outside.



A snug fit over the tailpipe is a must—to prevent a leak. Here are flexible tubes to fit some common-size tailpipes:

NSN 4720-00-	Inside Diameter
174-4668	1 inch
278-8030	1½ inches
278-8027	1¾ inches
278-8031	2 inches
174-6818	2½ inches
174-4664	3 inches
174-4671	4 inches

The unit of issue is in feet, so order the length you need.

R-R-R-R-R-R-R-R-R-R
FUEL



FIND OUT WHY IT WON'T START BEFORE YOU RUIN THE STARTER.

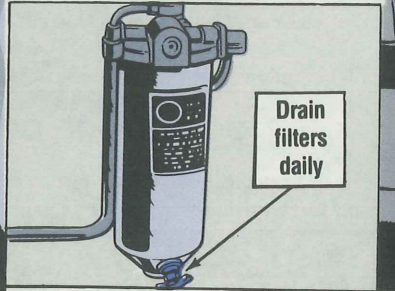
It's no-go when water freezes in your vehicle fuel system. Both diesel and gas need additives to combat ice formation in fuel tanks, lines, pumps and filters.

Additives are covered on page B-1 FM 9-207 (Jan 78).

Diesel gets a 1-pint dose of ethylene glycol monomethyl ether, NSN 6850-00-060-5312, to 40 gallons of fuel.

Use 1 pint of technical methanol, NSN 6810-00-275-6010, to 40 gallons of gasoline. Pour the methanol on top of the fuel and they'll mix better.

You just can't keep water out of fuel. It comes from condensation. So, drain filters daily. If water builds up, you may have to drain the fuel tank.

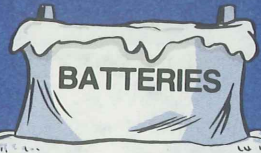


Goats, Goers and TM-260-series 5-tonners have fuel tank drains that'll let you drain as much as you want.

Extra effort should be taken to wipe away snow or ice from fuel tank filler openings, filler cans and hose nozzles before refueling.

In cold weather, you get lots of static electricity—so make certain all your filler nozzles are grounded before pumping any fuel. And do your best to keep fuel tanks full to hold down the condensation.

Bulk fuel containers should be stored with their openings tightly closed and protected. And keep open cans under cover. A little care here goes a long way.

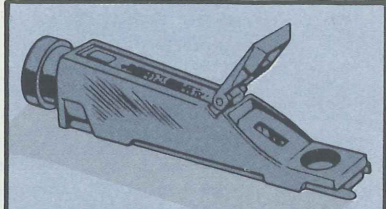


Keeping a battery at its peak efficiency and charge in zero weather is as easy as getting a date with a centerfold.

You've got to watch its specific gravity like a hawk—easy to do with the optical tester, NSN 6630-00-105-1418, in the No. 1 Common shop set.

Even at its best a battery has only 40 percent of its cranking ability at 0°F when fully charged. And at zero temperature it'll freeze and break when reading 1.160 specific gravity.

How to use the tester is explained in TM 9-6140-200-14 (Sep 81), Page 3-2. Complete instructions are right on the tester.



Electrolyte Specific Gravity Reading	Freezing Point
1.280	-90°F
1.250	-62°F
1.200	-16°F
1.150	+ 5°F
1.100	+19°F

Temperature	Specific Gravity	Cranking Ability
80°F	1.280 (Full charge)	100%
80°F	1.225 (Half charge)	46%
80°F	1.180 (Nearly discharged)	25%
32°F	1.280 (Full charge)	65%
32°F	1.225 (Half charge)	32%
32°F	1.180 (Nearly discharged)	16%
0°F	1.280 (Full charge)	40%
0°F	1.225 (Half charge)	21%
0°F	1.180 (Nearly discharged)	9%

HERE'S HOW A BATTERY'S CHARGE AFFECTS ITS CRANKING ABILITY!



If your vehicle is not putting on enough miles to keep the battery charged up, you'll have to keep switching batteries and get 'em charged by your shop.

Before adding water to a battery be sure you're going on a long haul to give it a chance to mix with the electrolyte... it'll need about an hour's running time.

Never add water to a cold battery. Add it only if the battery's ready to be charged or when the electrolyte's about +40°F, if the battery is to be left standing.

If a battery freezes, get it indoors and let it thaw slowly. And anybody who thaws out a battery with a torch or open flame is off his rocker—it can blow like a grenade.

For the whole rundown on battery care read your copy of TM 9-6140-200-14, Maintenance Manual for Lead-Acid Storage Batteries.

COOLING SYSTEMS

Your bible for antifreeze for liquid cooling systems is TB 750-651. It spells out procedures for cleaning and conditioning cooling systems and gives the type and amount of antifreeze needed for various degrees of protection. This TB applies to all Army equipment.

And TM 750-254, tell you everything else you need to know about cooling systems on tactical vehicles.

USE THIS CHART AS A GUIDE WHEN FILLING YOUR COOLING SYSTEM!

Protection Desired	Pints of Ethylene Glycol needed in each gallon of water
+20°F	1½
+10°F	2
0°F	2¾
-10°F	3¼
-20°F	3½
-30°F	4
-40°F	4¼
-50°F	4½
-55°F	4¾

YEAH, CONNIE, IT'LL TAKE THE GUESSWORK OUT OF YOUR PM!

For good operation, a cooling system should heat up to 160° to 180° F regardless of the cold weather. If it won't, have the engine's thermostat checked—it could be stuck open and need replacing.

Cooling systems that constantly go over 200° F also need attention. Again it could be a bad thermostat, a clogged radiator, a bad radiator cap or filthy coolant. Or maybe the flow of air is blocked.

Air cooled systems don't need too much attention. All they need is a good flow of air with all the air-flow shrouds in place. To speed up heating in zero weather, you can partially cover the air intake grills with canvas when starting. Just be sure to take it off after the engine reaches operating temperature.

I CAN'T STAND THE HEAT!

I'M FREEZING!

YOU GUYS LOOK LIKE YOU COULD USE SOME COOLING SYSTEM PM!

YOUR CRANKCASE OIL HAS GONE TO POT OL' BUDDY!

LUBRICATION

Crankcase oil can go to pot much quicker in winter and may need changing more often than the LO specifies. Sludge from condensation and dilution from fuel are the main reasons.

After every daily oil-level check, sniff the dipstick for fuel. And use your eye and fingers to detect sludge. Moisture contamination is hard to detect unless it's really bad. If you suspect it, draw a sample and let it stand in a glass jar. Water will show by separating from the oil.

When contamination is found, change the oil and oil filters.

If you're using OEA Arctic engine oil, check your oil level often because an engine will consume more of this thin oil than OE. Keep an eye on the oil-pressure gage: a pressure drop can indicate low oil. If you're on a long run, check the oil several times a day. And never overfill to cut or skip oil checks. Overfilling causes other troubles, so don't push your luck.

Same goes for the rest of the chassis—don't over-lube. Globbs of cold-stiffened grease can cause parts to bind and lock.

Condensation is always looking for a place to happen. So, in between your regular periodic lube services, check one or two of your gear cases—like a differential, transmission or transfer. Any evidence of water contamination is the signal for an oil change.

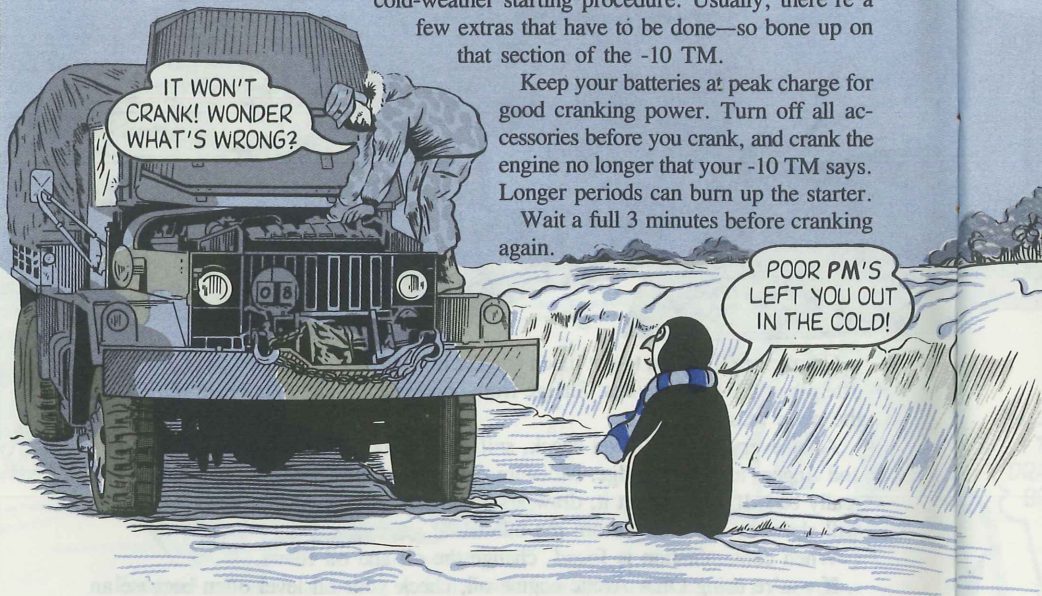
You may have to drain water off the bottom

AND NEVER MIX GRADES OF OIL — USE THE RIGHT STUFF FOR THE TEMPERATURE RANGE!

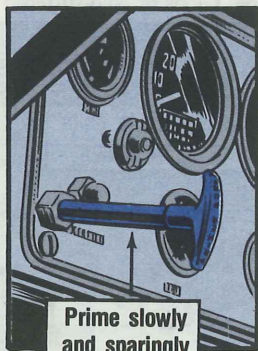
Engines

One thing is for sure, zero weather makes it tougher to start your engine. The best way to help yourself and the engine is to be familiar with the equipment's cold-weather starting procedure. Usually, there're a few extras that have to be done—so bone up on that section of the -10 TM.

Keep your batteries at peak charge for good cranking power. Turn off all accessories before you crank, and crank the engine no longer that your -10 TM says. Longer periods can burn up the starter. Wait a full 3 minutes before cranking again.



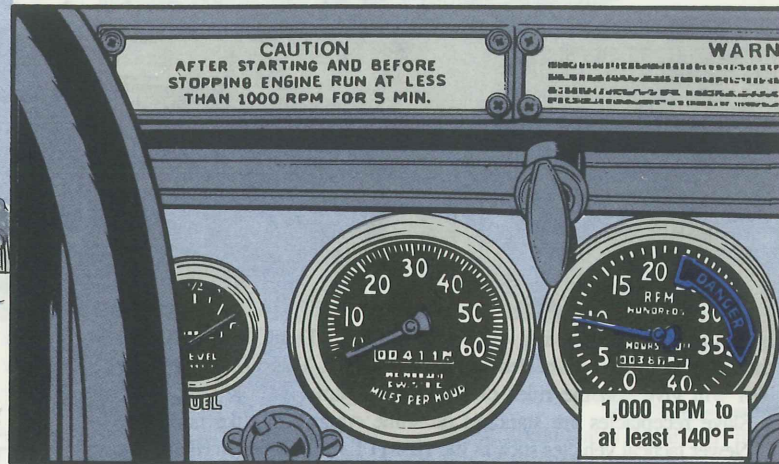
Many operators over-prime. This leads to hydrostatic lock and crankcase oil dilution. Before turning the engine over—prime 2 or 3 slow strokes—no more. Then turn over the engine and prime slowly and sparingly until the engine'll run on the choke and throttle settings alone.



COLD WEATHER STARTING

1. OPEN FOOT THROTTLE ONE-THIRD.
2. TURN ON PRE-HEATER SWITCH - WAIT 30 SECONDS.
3. PUMP PRE HEATER PRESSURE TO 80 PSI AND TURN IGNITION SWITCH TO "START".
4. KEEP 30-60 PSI PRESSURE WHILE CRANKING.
5. WHEN ENGINE STARTS, OPERATE AT 600-1000 RPM. PUMPING 30-60 PSI FOR 2-3 MINUTES.
6. IF ENGINE DOES NOT FIRE IN 30 SECONDS CRANKING. REPEAT STEP 2 THROUGH 5.
7. LOCK PUMP AND TURN PRE-HEATER SWITCH OFF.

Easy on that throttle! Warm up at about 1,000 RPM and don't put a load on the engine until it warms up to at least 140°F (about 5 minutes).



Idling under 800 RPM for long periods causes many problems. If you're required to run the engine to keep your radio in net or to operate some auxiliary equipment off the vehicle's power train, then run the engine at high idle—between 1,000 and 1,200 RPM. Use a separate generator whenever possible. In extreme cold weather, you'll have to idle your engine more than normal. However, keep in mind energy conservation and idle only as much as absolutely necessary. When on a stop-and-go mission, it's best to let the engine run at high idle.

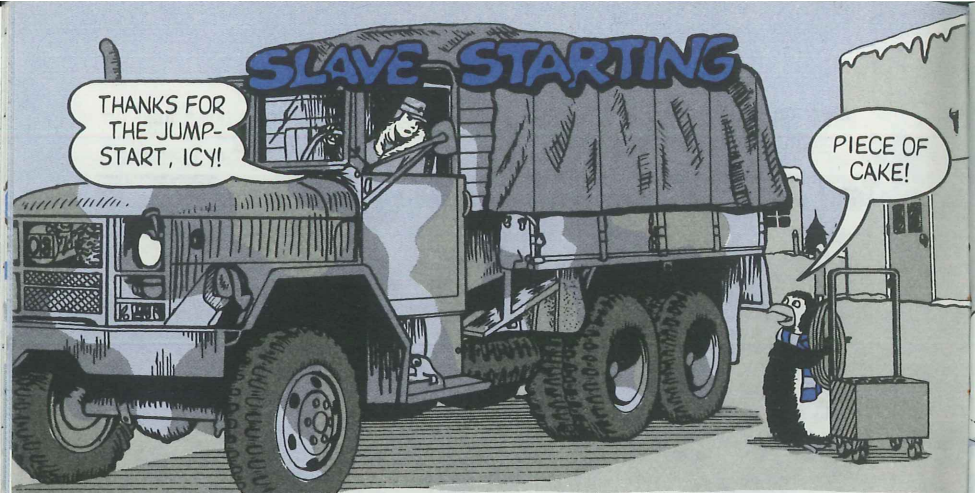
Diesel engines should be kept running during short stops or waits—here again at 1,000 to 1,200 RPM.

Spark plugs foul like crazy and can give you a lot of grief. Cold engines running at slow speeds and low RPM's are the greatest cause.

Zero weather calls for extra attention. Don't wait until your ignition system poops out to clean and reset the plugs. If you have firing problems, be sure to check your plugs when you're troubleshooting.

There's a spark-plug cleaner and tester within reach of every unit. It's found in the No. 1 and No. 2 Common shop sets. If you're new at plug cleaning, dig up a copy of TM 9-4910-422-12. The cleaning instructions in this TM can be applied to all makes of spark plug cleaners.





Before doing any slaving, check out Appendix D of TM 9-6140-200-14. It gives the ABC's of slaving wheeled and track vehicles. This TM along with the vehicle's TM will give you the rules of the slaving game.

Slave receptacles are standard on some equipment, like tanks.

Newer tactical vehicles such as the HEMTT, M939-series, HMMWV and CUCV have factory installed slave receptacles on the vehicles.

And you use the slave cable in the No. 1 and No. 2 Common shop sets.

There are two different slave cables in the field. The old 2-prong job, NSN 4910-04-749-135, is being replaced by the NATO single-prong cable, NSN 2590-00-148-7961. This cable comes with adapters to fit the old 2-hole slave receptacles.

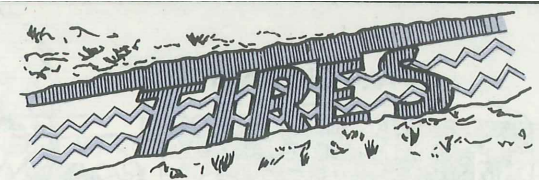
Clamp-type jumper cables, NSN 2920-01-027-0125, are in the No. 1 and No. 2 Common shop sets.

Stay awake and take an extra look when hooking up jumper cable connections. The hook-up must always be positive to positive and negative to ground on the dead vehicle. On alternator charging systems, even a slight flash on a wrong post can burn out a component. One thing you can be sure of is that all tactical and combat vehicles have negative ground. Believe it!!

It's always a good idea to try to keep at least one vehicle in a semi-warm shelter, its batteries fully charged. You use it to slave-start the others.

While slaving or jumping keep the live vehicle running at 1,800 RPM and always pair up vehicles that have a similar battery configuration. For example, never try to slave a tank that has six 6TN batteries with a ¼-ton truck that only has two 2HN batteries. If you do you're just asking for more trouble.

A portable jump-starting outfit can be mighty handy—like the one made from salvage parts, including a battery box from a 2½-ton truck. Starting out with fully-charged batteries, you can haul it around the motor park and give a boost to any hard-starters. The jumper cables come under NSN 2920-01-027-0125.



Zero weather requires no tire pressure adjustment unless you're operating in deep loose snow. Your -10 TM gives the low tire pressure that works best. But after the snow's gone, get those tires back to their normal highway pressure.

If you happen to get a flat spot frozen into a tire, move out slowly and let it round out.

Every valve stem should be capped or else the stems will ice up and freeze solid.

GOT A FLAT SPOT? MOVE OUT SLOWLY.



AIR BRAKES

Water accumulates in an air brake system even in fair weather, but during low winter temperatures it accumulates like mad.

Let the pressure drop before draining the tanks.

Drain the compressed air reservoirs daily, or even twice a day when on long runs. The best time to open the petcocks is after the day's operation.

And never move out until the air has built up to the right pressure. On equipment that's equipped with a buzzer, don't move until it stops buzzing.

If you're towing a trailer with an air line filter, make sure you keep the water drained out of that filter—or you'll suddenly find yourself without trailer brakes.

If your vehicle's air brake system is equipped with an alcohol evaporator, make sure it's operating and the jar is filled with alcohol.

The air compressor's unloader valve shouldn't be frozen or stuck. To check it out, build the air pressure to its rated maximum, apply the brakes and hold 'em, then stop the engine. The pressure should hold for at least a minute.



AIR CLEANERS

KEEP THE AIR INTAKE FREE OF ICE AND SLUSH, SO YOU AND YOUR AIR CLEANER CAN BREATHE EASIER!

Air—good clean air and lots of it—is needed to keep an engine alive and healthy. It's the air cleaner's job to make sure that air's clean, and it can't do this if it's choked up by ice.

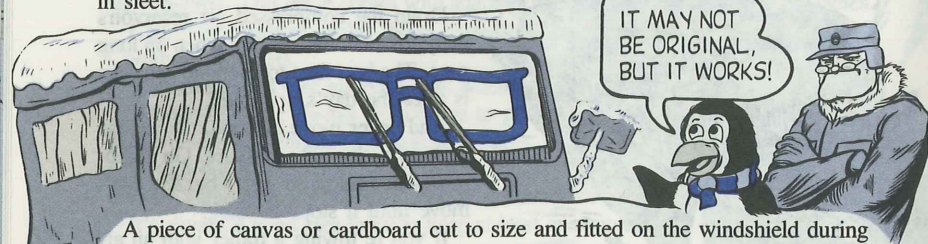
Ice and slush raise the oil level in oil bath air cleaners and cut off air flow.

The air cleaner intake must be protected so the engine can get its needed supply of air. The best way to assure this is to position or shield the intake so the snow and sleet can't get to it. And keep the area around it free of ice and snow.



UNDER COVER

Maintaining equipment in cold miserable weather can be a lesser pain in the end when you keep vital or delicate parts and equipment under cover. The first item that comes to mind is windshields. Especially when the truck's parked overnight in sleet.



IT MAY NOT BE ORIGINAL, BUT IT WORKS!

A piece of canvas or cardboard cut to size and fitted on the windshield during times like that really pays off.

This same technique can be used on many items that're left out in the weather all night—like exposed instrument panels, winches, sighting and fire-control equipment, operating lever, etc.

Many of these items already have their own covers. If so, an extra minute putting one on pays big profits. Ask any operator who's spent half an hour chipping and scraping ice to get his winch cable.

HEATERS

AH, THERE'S NOTHIN' LIKE A WARM CAB!!

In weather that'll make a brass monkey twitch and groan, a little heat—particularly a warm engine compartment—can save many a delicate situation. And no compartment is going to be warm unless you know how to keep your personnel heater putting out.

Keeping a stream of heat flowing from a heater depends on exact operation and constant maintenance, especially on fuel-burning heaters. Knowing the starting and stopping techniques for the heater is mighty important. Since there're several types and models being used, be certain you know how to operate the one you have before you start flipping switches.

When most fuel-burning heaters are turned off, they'll stop burning but the blowers will keep running. This is to cool the heater and purge it of unburned gases. It'll stop automatically when it's ready. So never turn off a master switch when shutting down a vehicle until your heater stops.

When this kind of heater goes kaput, it's usually one of these reasons:

- ✓ Igniter fouled, burned or loose
- ✓ Flame switch out of adjustment
- ✓ Loose electrical connections
- ✓ Clogged or leaking fuel lines

Most heaters have a parts repair kit that includes a replacement igniter. Know which kit your heater gets and have one handy for quick repairs.

When defrosting a windshield with your heater, be careful. A sudden blast of hot air against cold glass will crack it for sure. Always warm up your cab first then start the defrosters on LOW. After a few minutes on this then go to HIGH.

Keep your CF₃B₁ fire extinguisher away from any "hot" spot that gets hotter than 180°F. F'rinstance, never leave it too close to the vehicle personnel heater duct. Same goes for ducts on Herman-Nelson heaters. Too much heat too fast on a cold fire extinguisher can make it blow.



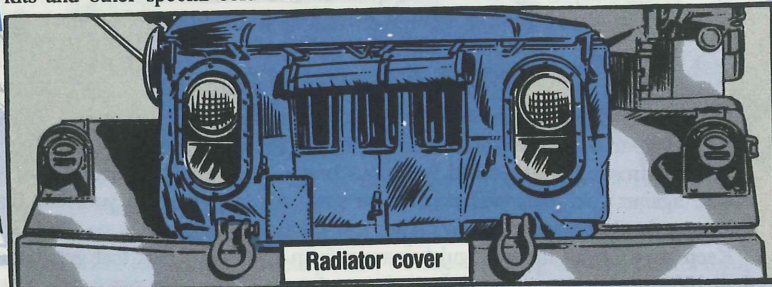
SPECIAL WINTER EQUIPMENT

WINTER AIDS ARE IMPORTANT.

BE SURE YOU GET THE THINGS NEEDED TO KEEP EQUIPMENT SAFE FROM WINTER.

Authorization for heaters, closure kits and cold-weather starting aids is given in SB 9-16.

Assemblies like personnel heater, closure kits, primer pumps, slave receptacle kits and other special cold-weather aids are listed in your equipment's support-



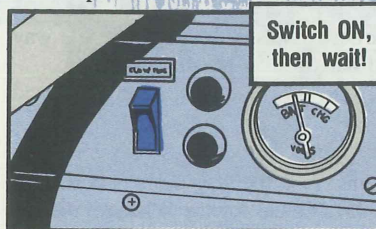
Radiator cover

level parts manuals. So check out your climatic zone with your support unit and get whatever winter aids that're needed to offset the winter's damaging effects on your equipment.

Start Them Off Right

Starting your F5070 20-ton dump truck when the temperature drops is easier when you do it right.

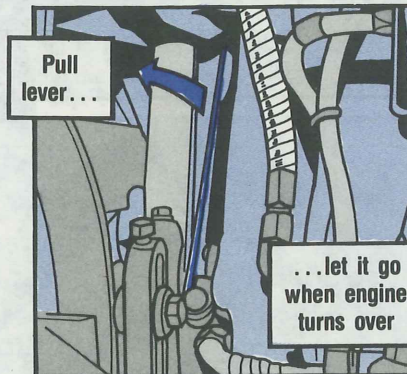
Turn the glow plug switch ON and wait 20 seconds. That lets the glow plug warm up in the intake manifold.



Switch ON, then wait!

Have a buddy pull the compression release lever at the front of the engine. That'll let the engine turn over easier.

Pump the preheater primer until you get 80-100 PSI.



Pull lever...

...let it go when engine turns over

Crank the engine. When it's turning over, have your buddy let go of the compression release.

After the engine starts, pump the primer slowly for a few minutes until the engine warms up and runs smoothly. Then push the primer handle in and lock it. Turn the glow plug OFF so it'll be ready for next time.

LET'S SEE... IS IT COMPRESSION LEVER FIRST...



... OR GLOW PLUG SWITCH FIRST?

If the engine doesn't start after 30 seconds, stop cranking and stop pumping the primer. Let the starter cool for two minutes.

Make sure the glow plug is working. If the intake manifold is warm below the glow plug, the plug's on the job. If the manifold is cold, get your mechanic to check out the glow plug.



Check for warmth!

If the plug's working, try the starting routine again. If you can't get the engine started after three attempts, stop and call your mechanic.

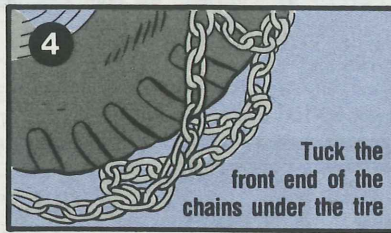
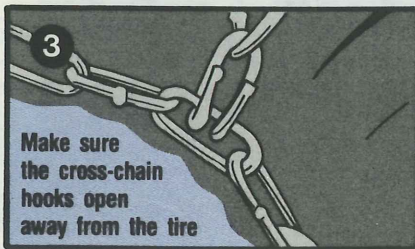
WRAP-UP

When you're driving on slick and hazardous roads, tire chains are the way to go. They keep you on the straight and narrow—on ice or in snow.

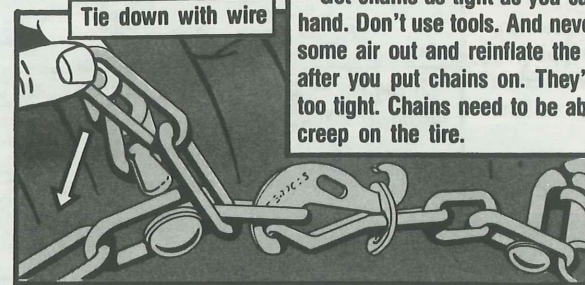
You'll need to take care of your chains, tho. Neglected, they can break and wipe out a brake line or tear up the vehicle.

Putting 'em On

There are several ways to install tire chains. Pick the way that's easiest. One way is spelled out in Page 19-6, FM 21-305, Manual for the Wheeled Vehicle Driver, like so:

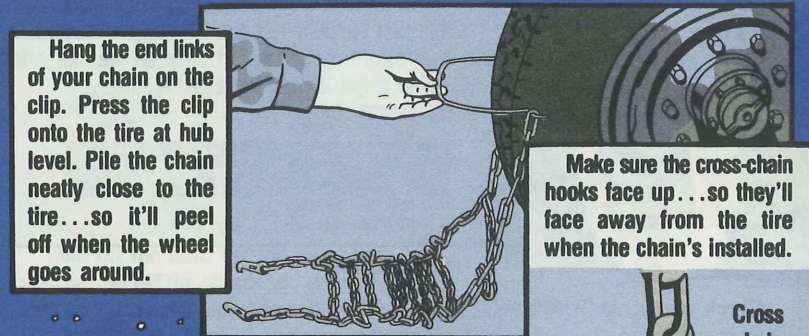


You can also lay your chains out in front of your vehicle and drive on the chains. Then fasten the chains. Remember, fasteners to the rear, cross-chain hooks away from the tires.

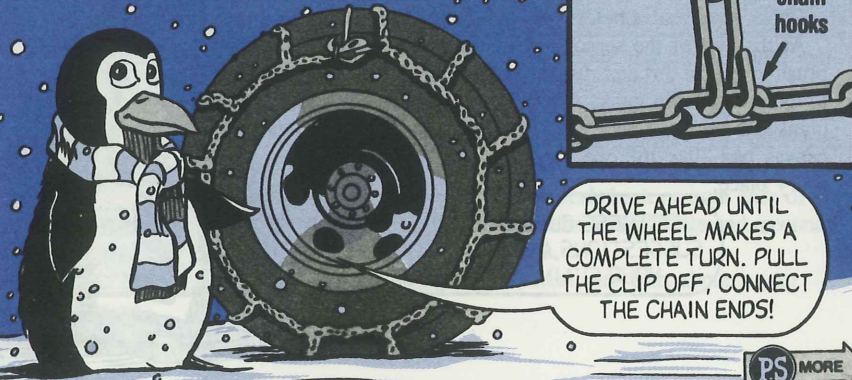
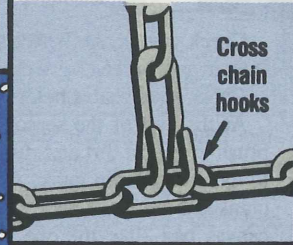


Get chains as tight as you can by hand. Don't use tools. And never let some air out and reinflate the tires after you put chains on. They'll be too tight. Chains need to be able to creep on the tire.

Some people think there's an easier method—the way FM 21-305 tells you to install chains on a mired vehicle. You let the wheel put the chain on. It's pretty much like the instructions that come with a lot of civilian tire chains—which come with a special clip or applicator for hooking one end of your chain to the tire. You can make a clip from some rod or strap metal. Just make sure it's got a little spring to it so it'll grab ahold of the tire.



Make sure the cross-chain hooks face up...so they'll face away from the tire when the chain's installed.



Chain Positions

Chains in the wrong places won't do much good—and can cause damage. Best for traction, starting and stopping is chains all around, even on non-driven front wheels.

IF YOU WANT TO BE SAFE,
WITH ALL WHEELS TOUCHIN'
GROUND,
JUST TAKE MY ADVICE,
'N' PUT CHAINS ALL AROUND!



If your vehicle has a non-drive axle, put chains on the drive axle or axles.

If you have a tandem drive rig, but you have chains for only 1 axle, put them on the front tandem axle.

If you have only single wheel chains, put 'em on the outside tires on dual-wheel axles.

Trailers don't usually get chains, but you may need them if roads are real slick. Put them on the rear axle if the trailer's got tandem axles.

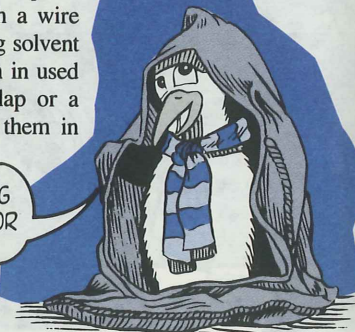
Maintenance

Check your chains before you put 'em on. You'll save taking them off for repair. Repair any broken or worn cross-chains.

Check your chains before you pull out of the motor pool.

At the end of the season, clean the chains with a wire brush to get off dirt and rust. Soak them in cleaning solvent to loosen stubborn gunk. After cleaning, dunk 'em in used crankcase oil, and drip dry. Store chains in burlap or a canvas bag—like the one they came in—and put them in a dry place.

USE THESE CLEANING 'N' STORING SUGGESTIONS, AND A LONG LIFE FOR YOUR CHAINS IS IN THE BAG!



Construction Equipment...

Head Off Control Cable Freeze-Up



TRY PUMPIN' A LITTLE BIT OF ANTIFREEZE THROUGH THE CABLES.

Water inside throttle, engine stop or other control cables freezes in the cable when the temperature drops to 32° F or below.

Water gets past the seal over the outer sheath. Even good seals won't keep out all the water.

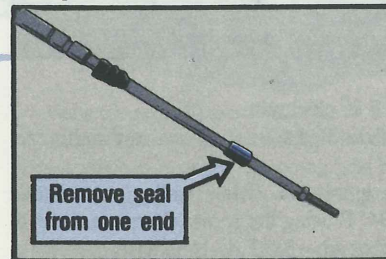
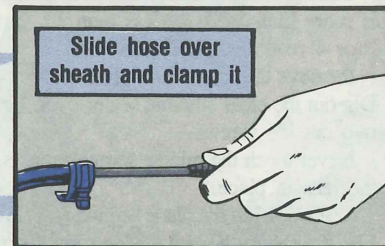
You can keep cables from freezing with antifreeze, NSN 6850-00-181-7929. Besides stopping freeze-up, the antifreeze makes the cable slide easier.

You can use an old hydraulic filler and bleeder, NSN 4910-00-273-3658, to pump antifreeze thru the cable.

It's authorized by Appendix A of CTA 50-970. DON'T use your brake fluid filler and bleeder for this! Unhook one end of the cable and take off any fittings.

Take off the seal. On the other end, slip the seal off the sheath and down the cable a bit.

Slide the filler hose over the sheath. Clamp it there with a hose clamp.

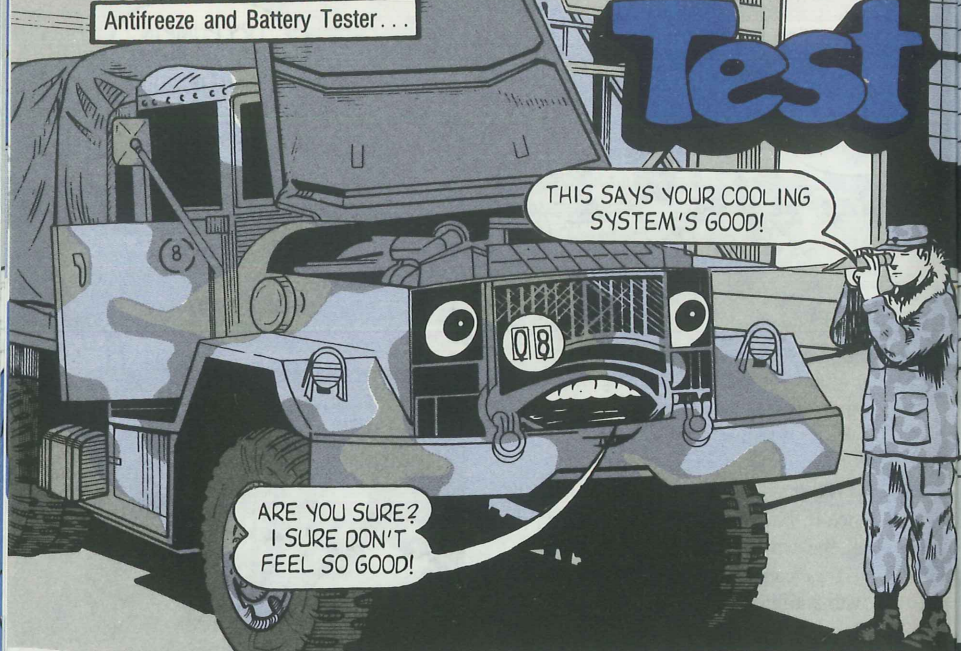


Fill the filler and bleeder with anti-freeze and pump up the pressure. Open the valve until you get clean antifreeze out the other end of the cable, then close the valve.

Put the seals back on both ends of the cable. Put back any fittings and reconnect the cable.

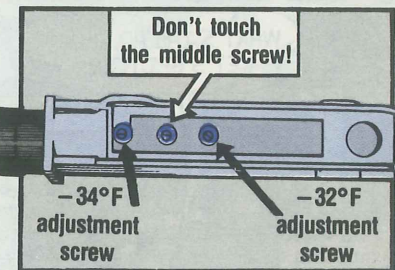
The treatment lasts about a year.

Test Your Tester



Rinse the tester, and recheck with distilled water. Repeat the adjustment for 32°F if needed. Then recheck, using the antifreeze solution. Readjust, if needed, to get the -34°F reading.

Repeat the test until both readings check out. Then use a little adhesive, NSN 8040-00-843-0802, to hold the screws in place. Replace the instruction plate.



The optical antifreeze and battery tester, NSN 6630-00-105-1418, lets you test your rig's antifreeze protection and battery electrolyte. But, it's got to be accurate!

Here's how to check it:

Take a reading using distilled water, NSN 6810-00-682-6867. If the reading is more than 34°F or less than 30°F, the tester needs adjusting to 32°F. Take 3 or 4 readings to be sure.

Remove the instruction plate on the bottom by working a knife under the edge. Dig out the clear silicone sealer over the two outside screws.

Never touch the middle screw. It holds the lens in place.

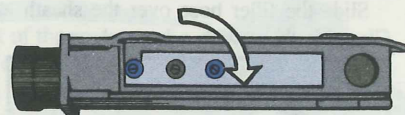
Use a 5/16-in flat blade screwdriver . . . like the one in the No. 1 Common shop set . . . to adjust the screw farthest from the eyepiece. Clockwise increases the reading and counterclockwise decreases it.

Make sure the final adjustment to 32°F is clockwise.

Mix up a solution of exactly one part of distilled water and one part antifreeze, NSN 6850-00-181-7929. Stir well.

Take several readings with the antifreeze solution. If the reading's more than -32°F or less than -36°F, adjust to -34°F using the screw closest to the eyepiece. Again, make sure the last adjustment to -34°F is clockwise.

Final adjustments are clockwise!



Down With Ether Cans!



Vehicles are often a headache to start in cold weather.

Some engines—like multifuels and diesels—have starting aids built right in, other don't. So-o-o-o, when the going gets rough, some drivers want to get tough—and use ether in spray cans to start engines.

But don't!

You can damage—or ruin—the vehicle's engine.

Start Them Out Right!



WHAT'S THE HOLD-UP?
LET'S GET GOIN'!



MY OPERATOR DIDN'T TAKE THE
TIME TO PUMP MY PURGE PUMP!



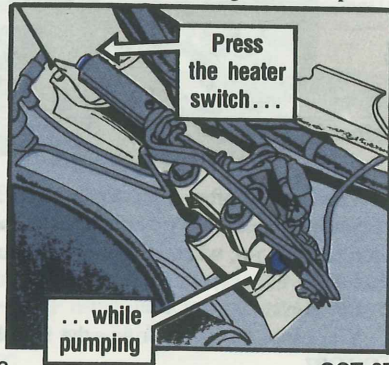
Starting an M60-series tank engine in cold weather can be an adventure. Getting it to run smoothly can be another.

One or more cylinders may not fire because it's not hot enough for complete combustion in all cylinders. The engine will idle rough. It'll blow a lot of blue or white smoke. You may even see raw fuel on the exhaust grille doors.

Here are a few tips for coping with a cold engine:

- Use your -10 TM to the letter. Test for hydrostatic lock. Make sure all your controls are in the right positions.

Pump the purge pump until you feel a firm back pressure. This will take about a minute.



- If the engine starts, keep pumping the purge pump and hold the manifold heater switch until the engine reaches



450-500 RPM. Use the accelerator to keep the engine at 1,000-1,200 RPM and continue to use the manifold heater until the engine runs smoothly.

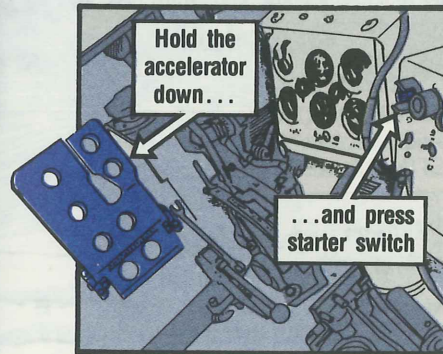
If the engine won't fire, stop cranking after 15 seconds. Wait 3-5 minutes and try again. If it still won't start, don't grind away on the starter. It'll burn up, and you don't need that problem.

Follow the troubleshooting procedures in the -10 TM to get the tank started. If that doesn't work, call your mechanic.

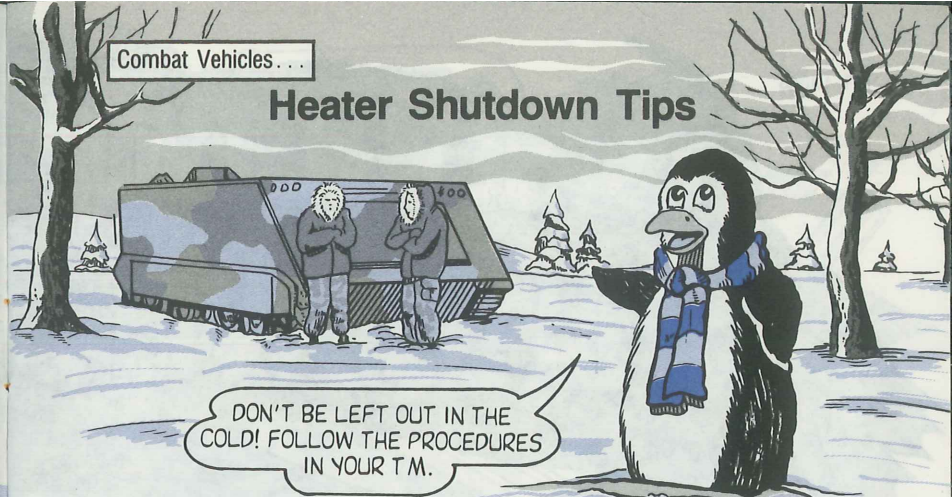
- When you've got to idle your engine for a long time, use high idle—1,500-1,600 RPM.

- If you must idle at a lower speed, watch the exhaust. If you see white smoke, use the manifold heater. When the exhaust smoke returns to its normal color, stop using the heater.

Continue pumping with slow, steady strokes. Press the manifold heater switch, hold the accelerator down to 2/3 to 3/4 of full travel and press and hold the starter switch.



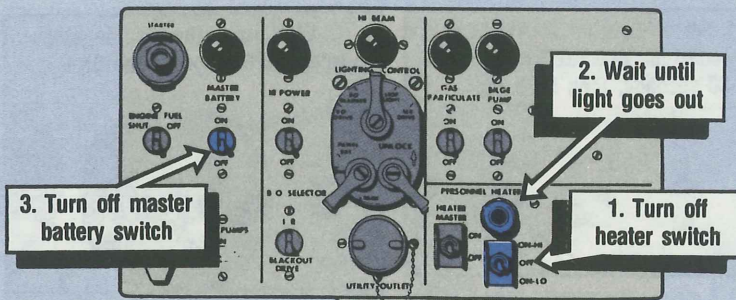
Heater Shutdown Tips



There are a few things you need to remember, crewmen, when it comes to shutting down your vehicle's personnel heater.

If you don't remember all of them, you'll face some cold days and nights without heat. Once you've started a personnel heater, let it run for at least five minutes.

If you shutdown before then, the heater may flood. You won't be able to restart it for a long time.



Allow the heater to purge itself at shutdown. Some vehicles' circuitry lets the heaters run and purge themselves even with the vehicle master switch off. Other vehicle heaters **MUST** be allowed to run until purging is finished before you hit the master switch.

Don't guess how the heater works! Check out your vehicle's -10 TM and follow the instructions to the letter. You mechanics check out the new heater manual—TM 9-2540-205-24&P.

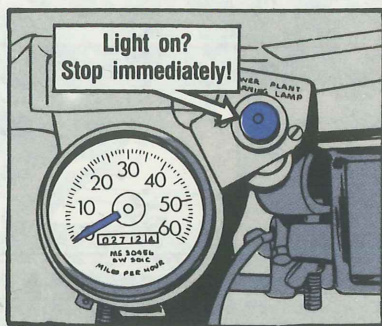
Heaters that aren't purged completely build up carbon and flood easily. Flooded heaters are fire traps. Either way you're out at least a heater.

• Too much idling can over-cool the engine. It'll misfire and blow heavy blue-white smoke. You'll have to blow out the induction and exhaust systems. Here's how:

1. Set the parking brake and clear the area in front of the tank.

2. Rev up the engine to 1,800-2,000 RPM and hold it for 30 seconds to 1 minute. **CAUTION:** Stop the engine immediately if the power plant warning light comes on.

3. Reduce engine speed to 1,000-1,200 RPM.



M60-Series Tanks...

Braking Loose

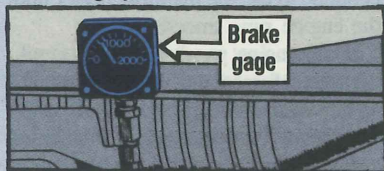
In cold weather, linkages stiffen and become hard to move. This is especially true with your M60-series tank's parking brake.

Here are some things to do to make sure there's as little trouble as possible.

When you set the brake, think of the guy who has to release it.

The TM says to push the pedal until the pressure gage reads between 750 and 900 PSI. That means you don't go over 900 PSI.

It's mighty hard, even in warm weather, to unlock a parking brake that's set at more than 900 PSI. In cold weather, it's almost impossible. Finally, make sure the brake system pressure gage reads 0 PSI before you move out. A dragging parking brake will cause your transmission to overheat.



Heater Hotline

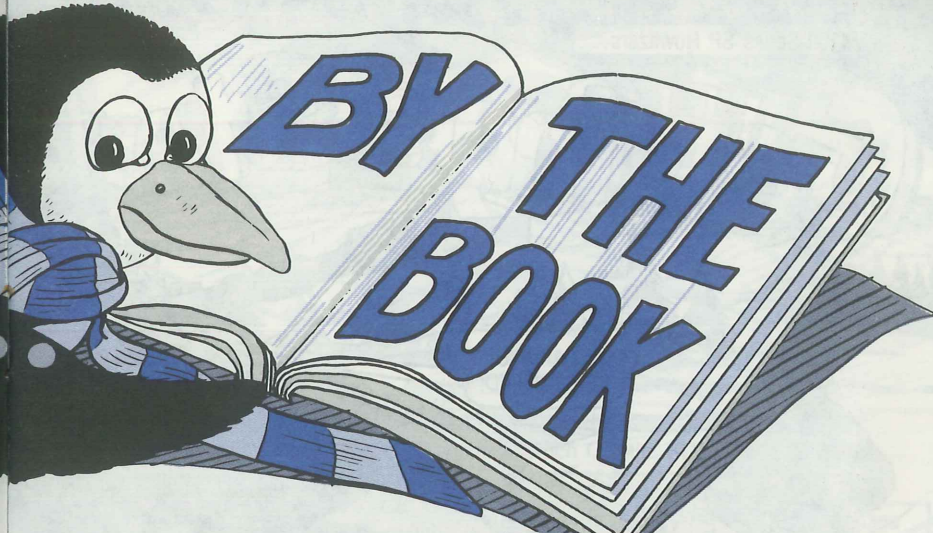
GOT A QUESTION ABOUT YOUR VEHICLE'S PERSONNEL HEATER AND CAN'T GET AN ANSWER?

AUTOVON 786-8291/6993/6998
COMM (313) 574-8291/6993/6998

CALL THE TANK-AUTOMOTIVE COMMAND HOTLINE.

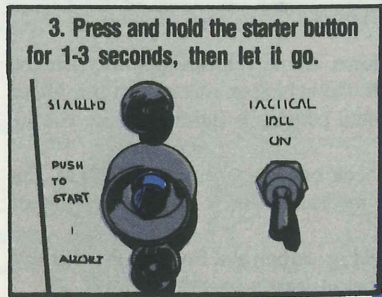
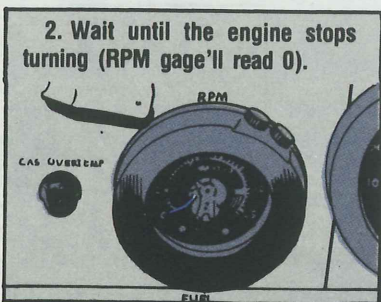


Start and Shutdown...



Do it by the TM. Shortcuts won't hack it. In fact, shortcuts could cut short your life in combat.

- Pay attention to the starting instructions and you'll save your starter.
- If the engine won't start on the second attempt, wait 1 minute.



At shutdown, the name of the game's the same... by the TM. It'll save your engine.

Pay attention to the warning lights for the engine and transmission, as well as the fire light. If any of them are lit, you've got work to do now, not later.

Check the MASTER CAUTION light. If it's lit, see where the problem is on the instrument panel and follow TM instructions to fix it.

But most of all, let the turbine engine idle for 2 minutes before shutdown. None of this "park and cut" stuff, drivers! You're pros. You know that engine needs time to slow down and cool down before it's turned off.



Getting a Start



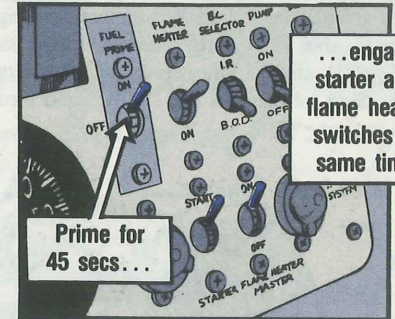
in the Cold!!



To Start

Push in the FUEL SHUT-OFF handle. Switch ON the FUEL PRIME switch and hold for 45 seconds, then release. Set the HAND THROTTLE at idle and turn ON the MASTER switch.

Press the STARTER switch to START and the FLAME HEATER switch to ON at the same time for about 10 seconds. (Never run the starter longer than 30 seconds.) Depress the FOOT THROTTLE about half way and continue to crank the engine for another 20 seconds. Stop cranking if it starts. Don't pump the foot throttle.



If you hear unusual noises such as a shrill whine, or you feel unusual vibrations or see a sudden increase in exhaust smoke, shut down immediately and report it.

Still No Start?

If the engine doesn't start, stop cranking. release the FLAME HEATER switch and let off the foot throttle. Wait a minute before trying again so you won't burn up the starter.

With the hand throttle still on idle, press the STARTER switch and cycle the FLAME HEATER switch ON for 10 seconds and OFF for 3-4 seconds. Don't use the foot throttle.

If the engine doesn't start, wait a minute and try again. Repeat this step two more times, waiting at least one minute between each attempt.

If the engine doesn't start after four attempts, call in your mechanic. Don't make more than four tries, even in good weather. You'll run down your batteries and burn up the starter.



When the temperature drops below 32°F, your vehicle may be hard to start. But the cold weather starting directions in TM 9-2350-311-10 aren't quite right.

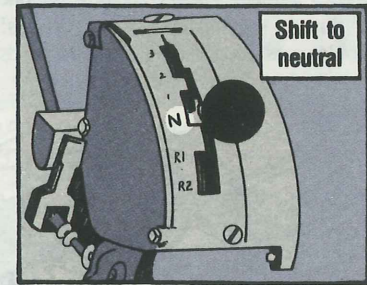
First, set the parking brake and shift the transmission to neutral. Pull out the FUEL SHUT-OFF handle.

Turn the MASTER switch to ON. Next, check for hydrostatic lock.

Push the STARTER switch up to START for a couple of seconds, then release it. Repeat a couple of times while checking for symptoms of hydrostatic lock:

- The engine starts to turn over, then stops or binds.
- The starter makes a clicking noise.

If you think the engine is locked, stop cranking, turn off the MASTER switch, and get your mechanic.





After It's Running

When the engine starts, release the switches.

Watch the engine's oil pressure gage for the first 15 seconds. If it doesn't come up to 5-30 PSI at 550-600 RPM, stop the engine—Now!—and report it. But, if the oil pressure's OK, set the hand throttle for 1,200 RPM.

Warming the Engine

With the parking brake still on, shift to 4th gear and continue to cycle the FLAME HEATER switch until the engine coolant temperature gage reads 120°F to 140°F.

Eyeball the transmission temperature gage, tho. If it gets close to 300°F, immediately shift to neutral. When the transmission temperature goes back to 220°F to 240°F, shift to 4th gear again. Then continue to warm up the engine.

Shift into neutral and set the hand throttle back to IDLE. You're good to go.



M109-Series Howitzers...

Set Air Cleaner for Winter

When the snow flies this winter, make sure your howitzer's air cleaners are set for the season.

The air cleaner locking handles need to be up when the temperature is below 25°F. If you leave 'em down, your diesel fuel can get so cold it'll thicken up and not flow right. Then your engine won't run.

For intermediate temperatures (25-40°F), start the engine with the locking handles in the winter position and place the handles in the "down" position when the engine reaches operating temperature.

Remember, tho, that when the temperature climbs above 40°F, you put the handles in the "down" position.

If you leave 'em up in the summer, your engine will overheat and maybe burn some valves.



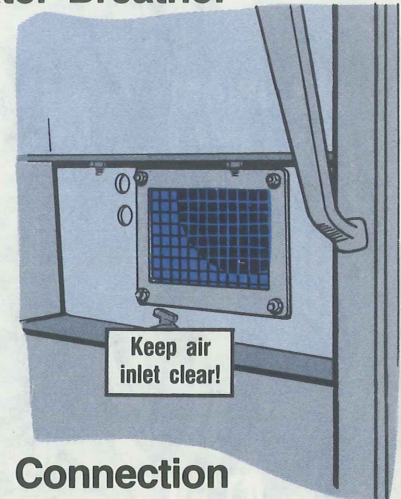
Let the Heater Breathe!

Say, M548, M730 and M1015 carrier drivers! Want to stay warm this winter?

Watch where your jacket goes while your personnel heater is running. If your jacket gets sucked into the inlet grill behind your seat, it'll cut off the air supply to the heater.

It won't take long then for the heater to overheat and shut down. And you know how long it takes to restart a heater.

Just make sure your clothes, and anything else, stay clear of the inlet grill. You'll stay warmer that way.



Slave Cable Connection

Here're the parts making up the complete NATO slave cable, NSN 2590-00-148-7961, found in the No. 1 Common shop set:

NSN 2590-00-398-6527 gets the cable without end connectors

NSN 6150-01-022-6004 gets the cable with end connectors

NSN 5935-00-567-0128 is for the end connector

NSN 5935-00-322-8959 gets the connector-adapter for each end to fit 2-hole receptacles. Two come with a complete cable

Howitzers...

SHOOTING IN COLD WEATHER

Read both the LO for your weapon and FM 9-207, Operation and Maintenance of Ordnance Materiel in Cold Weather (0°F to -65°F).

(Note: Your LO may call for OE/HDO 10 in the transmission, final drive and/or gearcases during normal temperatures. If so, before you get into 0°F to -65°F weather, drain and refill them with OEA or GOS subzero gear oil.)

Get Ready Before You Aim

There are two ways to emplace your weapon in the snow:

1. With the easy way, you just drop the trails and spades and hope they won't freeze so tight you can't get 'em out.
2. With the smart way, you wipe some waste lube on parts of the trails and spades that contact the snow so they'll be easier to pull out. You can also lay something like tree boughs or straw between the trails and spades on the ground.

REMEMBER TO MAKE A CUSHION BETWEEN THE FREEZING GROUND AND THE FIRING JACKS/FIRING PLATFORM, TOO.



Recoil Roundup

In really cold weather, give extra attention to your recoil system.

A recoil oil level that was OK during normal temperature may show low when the temperature drops. After a few rounds, the oil should warm up and the level will rise.

If your recoil has an adjustable respirator, in cold weather have it OPEN as far as it will go before you fire your first round.

A respirator that's covered with ice or snow won't work well, so keep it clear.

Cold Weather Lube

Ordinary lube can get hard in extreme cold. Study the LO for your weapon and use the lubricant recommended for 0°F to -65°F.

The towed howitzers, such as the M198 under LO 9-1025-211-13, mainly use year-round lubes.

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I'M A HOT SHOT FROM WAY BACK... BECAUSE I'M UP ON MY PM!

To shoot hot when the weather is super cold, you need to think ahead.

Things that give you no problem in ordinary weather can break an artillery tube when the thermometer shivers in the -20° to -65°F range.

Take, for instance, bore cleaner. It can freeze in the chamber and keep you from loading a round. It can also freeze in its can, so keep it in a warm spot—if you can find one!

Keep bore cleaner away from the gas check pad and electrical ring mechanism. A dry cloth is all you need to clean these parts.

You have to be specially careful with gas check pads in cold weather.

CLP is an authorized alternate for bore cleaner. You only have to use one-third as much of it, and it is free flowing down to -65°F.

Small arms in the Cold

Lube and PM keeps them operating

Whether it be rifle or machine gun, when you stack or store them outdoors, keep them covered. A poncho or blanket works fine.

When they're covered, you keep ice and snow out of the barrel, off the sights and away from working parts.



If you can, keep weapons in a roofed, wind-free shelter when you're not using them.

NICE OF THEM TO KEEP US SHELTERED.



If you bring your weapons into a heated shelter to clean them, they'll sweat with condensation for about an hour. Wait the hour, let them sweat, and then clean and lube them.

Reason: If you rush the cleaning job, the weapon will keep sweating. When you take it outside the sweat will freeze, parts won't move, and you may get ice in the barrel.

I'M DRY AND READY FOR CLEANING, SIR!



If parts do freeze, move them slow and easy till they're free. That way you won't break anything.

SLOW NOW . . . SLOW!



During firing, keep barrels or other hot parts away from snow, which will turn to ice as soon as the barrel cools.

Using a spare barrel? Don't lay the hot one on the snow. It may warp . . . or head toward China or wherever quick-like.

I NEVER GET TO GO ANYWHERE!



Grenades & Ammo On Ice



Dry gloves are a must when you use grenades in sub-freezing weather.

Ammunition

Small arms ammo needs one basic precaution.

Remove all snow or ice from ammo before you use it.

Keep dry and ice free



Before you pull a grenade's pin, hold the grenade in your throwing hand. If the grenade sticks to your glove, clean the glove and the grenade.

Then try again. But never pull the pin until you're sure the sticking problem's unstuck.

Most large caliber ammo, including rockets, has a minimum and maximum temperature in which it can be used. Some, including LAW, have the info stamped on it. With others, you have to check your weapon's TM. If you operate in sub-zero weather, be sure the ammo you use is made for cold weather.

Before use, clear off snow and ice.

PM Keeps 'em Cookin' in the Cold

YOU SEE, ICY, YOU PUT PADDING UNDER THE FRONT PADS AND BASEPLATE SO YOUR MORTAR DOESN'T SINK IN THE SNOW.

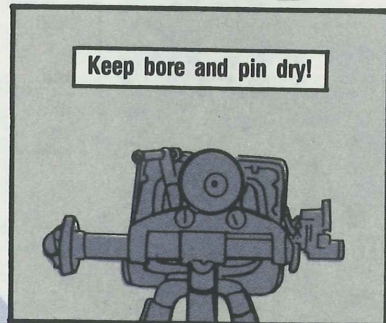
WELL DONE, SOLDIER!



Mortars need PM matched to the cold.

- Keep the bore dry. Keep lube away from the firing pin.
- Keep mortar rounds at the same temperature as your weapon.
- To keep bipods, tripods and baseplates from sinking into the snow, use padding under them. Snow shoes under the front pods or tree boughs under the baseplate do the job. Use whatever's on hand.

• If you must set up the baseplate on snow, coat the bottom with waste oil. That'll prevent pulling up a foot of ice after firing.



- Check the bore for snow and ice before you insert the round.
- Keep snow and ice off moving parts.
- If you move your mortar to a warm area for cleaning, wait at least a half hour before you clean and lube it with CLP. That allows moisture to seep out. The best way to avoid moisture is to keep mortars in an unheated shelter.



Chaparral on Ice

Winter cold demands different settings for some of the components in your Chaparral missile system.

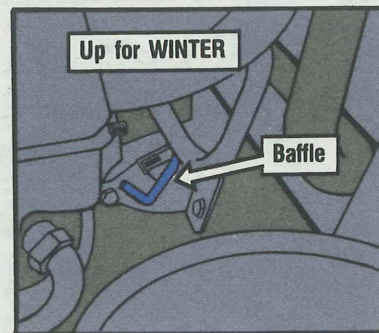
If the settings aren't right, parts of the system will have poor air circulation, overheat, leak oil . . . or just won't work.

The oil pan baffle on your gas powered Main Power Unit (MPU) should be closed—or up—for temperatures that average 0°F and below. Secure the baffle with lockwire.

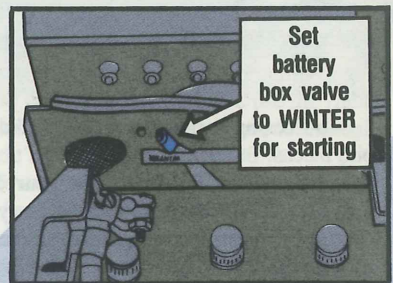


No. 1 and No. 2 ducts on the MPU air duct must both be open in sub-zero weather, and both must be closed above 35°F. No. 1 stays open and No. 2 is closed between 0°F and +35°F.

Set the battery box WINTER/SUMMER valve on WINTER during battery warm-up when the temperature is below 35°F. Keep it on that setting for 5 to 60 minutes, depending on the temperature. Battery heater warm-up time is spelled out in Para 2-39, TM 9-1425-2586-10. After battery warm-up, switch the battery box valve to SUMMER position.



The MPU's carburetor air inlet WINTER/SUMMER valve must be full left for temperatures below 35°F.



Set the oil sump WINTER/SUMMER valve to WINTER when it's below 35°F.





COLD Weather PM Tips

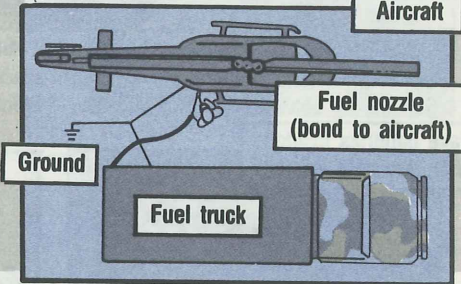


YOU'D BETTER HURRY.
ICE AND SNOW'LL
BE HERE SOON!

WE'LL BE READY,
ICY, I WAS JUST ABOUT
TO DRAIN ANY WATER
FROM THE FUEL TANK!



STATIC ELECTRICITY—The colder the weather, the drier the air; the drier the air, the more static electricity generated. Proper grounding is critical.



Sub-freezing temperatures, snow and ice make maintenance problems for you bird mechs. But minor problems won't become major problems if you use common sense and follow instructions in your TM's.

FUEL CONTAMINATION—Keep your fuel tanks topped off. This reduces the chance for moisture to accumulate in fuel tanks. When you take fuel samples, drain off enough fuel to get rid of all the water.

SEALS—Cold weather is hard on gaskets and seals. Moisture can freeze and cut seals on landing gear shock struts and pistons. Check them often and use a clean rag dampened with hydraulic fluid to remove ice, dirt and grit from struts and pistons.



FLUIDS—All fluids—oil, fuel and hydraulic—get stiffer as temperatures drop. Oil thickens—fuel's harder to ignite—grease gels. So make sure you use the right fuel and lube for weather conditions. The lube chart in your maintenance manual lists the fuel, oil and grease to use.

ICE & SNOW—Use engine inlet and exhaust covers to keep ice and snow out of your engine. This prevents snow and ice from freezing in the engine compressor, causing damage when you start up.

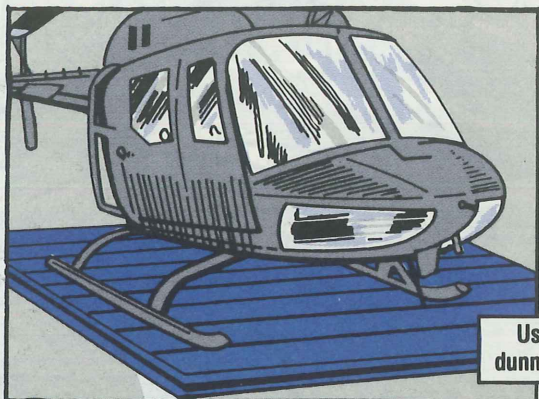


If snow and ice freeze in an engine compartment, roll out that Herman-Nelson and thaw it out.

Keep rotor blades free of ice and snow, too. Otherwise, air flow is changed and you won't get the lift you need.

If you don't have blade covers, clear snow from blades by throwing a cotton webbing strap over them and slowly working it down to the blade tips.

Make sure landing gear tires and skids are not frozen to the ground. Head off that problem, by parking your bird on planks, boards or suitable dunnage.



Use dunnage

BATTERIES—Your bird's nickel-cadmium batteries require special attention during cold weather.

Take batteries inside during very cold weather



If possible, bring batteries indoors. Warm, fully charged batteries give you good cranking power and lots of spark for a good start.

COLD WEATHER GUIDES—For more information on winter maintenance operations, check out TC 1-12 and FM 31-71.

Maintaining your bird during cold weather takes more effort and more time. But if you know about problem areas and how to handle them, pulling maintenance and inspections can be almost routine, even in severe weather.

SHELTERS—If there's no hangar space available, rig a maintenance shelter around the work area. Use a salvaged

Use your Herman-Nelson



cargo parachute shroud and a Herman-Nelson heater to inflate and warm the shelter. Sure beats frostbite.

Preflight Preparations

Getting ready to fly involves more than a short checklist when the temperature is 30 below. The time to find problems is before you leave.

Warm things up with a ground heater. Preheating gets lubricants and hydraulic fluids warmed to operating temperatures. That reduces strain on engines and transmissions and makes for faster starts. Piston engines benefit from less resistance from the oil, and fuel vaporizes better for a quicker start.

Keep fire extinguishers handy while you use a ground heater to warm things up. Keep heaters away from fuel and oil drains, vents and supply tanks.

Never blow hot air—over 250° F—on ignition harnesses, hoses or self-sealing tanks. It'll damage 'em for real!

Be careful when you remove ice or snow from windows. Too much heat can melt plastic windows. Uneven heating can crack glass or plastic. Never use hot water, either; it'll crack 'em too!

Never use de-icer on plastic windows. It'll craze them (a series of small cracks), meaning you'll have to change them.

Water anywhere in the fuel system can freeze and block fuel flow. Top off the fuel tanks after flight to reduce condensation, and drain the sumps daily.

Check oil and hydraulic levels after your bird's warmed up.

Warm up your avionics, too. Let them warm 5 to 10 minutes before changing frequencies or transmitting.



Be careful when removing snow and ice from windows

AVIATION MESSAGES

CAT 1 EIR Phone
AUTOVON 693-2066
(24 hours)

If your unit has not received a message you have an interest in, check with your next higher headquarters.

U-9-87-01, SOF, Technical, One-time inspection of engine driven fuel pump U-8F A/C with Excaltur IO-720 engine, 031600Z Jun 87.
AH-64-87-14, SOF, Technical, AH-64A engine wiring harness inspection, PAS rigging and collective rate pot test, 191105Z Jun 87.

UH-1-87-06, SOF, Maintenance Mandatory, All UH-1/EH-1 series aircraft, inspect for proper grounding of fire warning detector installation, 231700Z Jun 87.

UH-1-87-07, SOF, Technical, All UH-1/EH-1 series aircraft, one-time inspection of tail rotor hub, 232330Z Jun 87.
OH-58-87-06, SOF, Technical, OH-58C aircraft, remove lamps with panel light inserts, 291730Z Jun 87.
GEN-87-02, SOF, Maintenance Mandatory, General, All Army aircraft, local

purchase of time change aircraft components/parts, 291930Z Jun 87.
UH-60-87-08, SOF, Maintenance Mandatory, All H-60 series helicopters, one-time inspection of midsection bellcrank, 302200Z Jun 87.
MIM-OH-58-87-XSOF-03, OH-58A aircraft, correction to message control number (OH-58-87-XSOF-03), 051600Z Jun 87.
MIM-CH-47-87-XSOF-04, CH-47 helicopters, time since overhaul (TSO) on FWD and AFT swashplates, 152020Z Jun 87.

Covers for the Huey



THESE ARE THE NEWEST COVERS FROM PARIS.

DO YOU HAVE SOMETHING IN GREEN?



HOW 'BOUT IN AN ARCTIC WHITE?

If any of your UH-1's are headed for storage, the all-weather covers shown in Fig F3 of TM 55-1520-210-23P-3 go a long way toward protecting your birds.

'Course, a commander decides if the covers are needed in your area, in keeping with the storage info in Appendix E of TM 55-1520-210-23-3. They can also be used in areas of extreme cold weather. Your unit has to shell out the moola for the covers.



HERE'RE THE COVERS.

NSN		Use On	Qty	Approx
	Nomenclature	Model	Per Acft	Cost
1560-00-403-0624	Cover Assy	Pylon	1	\$246
1560-00-403-0626	Cover Assy	Aft Cabin	1	\$636
1560-00-488-5003	Sleeve Assy	T/R Blade	2	\$33
1560-00-488-5004	Body Assy	T/R Gearbox	1	\$36
1560-00-488-5005	Cover Assy	Fwd Cabin	1	\$283
1560-00-488-5007	Cover Assy	Stab Bar	2	\$29
1560-00-488-5010	Cover Assy	M/R Blade	2	\$193
1730-00-148-9076	Cover Aircraft	T/R Hub	1	\$28
1730-00-258-8372	Cover Aircraft	Nose	1	\$197
1730-00-904-9916	Cover Aircraft	Pylon	1	\$125
1730-00-148-9081	Cover Assy	Aft Cabin	1	\$478
1730-01-042-5543	Cover Assy	M/R Blade	2	\$174

COMMO

Keep Peak Power in Cold Weather

KEEP US COLD-WEATHER BATTERIES HANDY!

YEP, WE'LL HANDLE THAT HOT COMMO!



Hot commo and cold batteries won't compute. They do add up, tho—to trouble. Keeping your dry-cell-using gear communicating during cold weather means keeping them supplied with battery power.

Uncle Sam gives you a hand with some gear. He gives them a more cold-resistant battery when temps drop below freezing. A good example is the BA-3030, which replaces the "flashlight" BA-30 battery.

Wonder if your gear takes a cold-weather sub? Scope out your equipment's TM and SB 11-6. The SB lists all dry-cell-using equipment. It has a special column listing replacement batteries for cold-weather operation.

Another big boost for your cold-weather communicating is the lithium battery for your AN/PRC-77 radio set. It's a BA-5598, NSN 6135-01-034-2239. It replaces the old cold-weather replacement for your back pack radio, the BA-398.

Give even cold-weather batteries a hand. First, keep 'em stored at temps between 35-70°F. They lose some zip if the temp goes above that.

Then, warm up only as many spares as you think you'll need. Keep the rest stored.

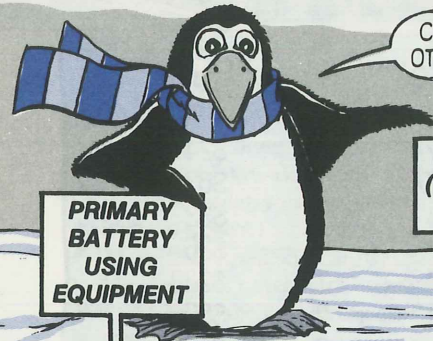
Protect all dry cells, of course. Keep 'em in your clothing, a vehicle or commo shelter when possible. Anywhere out of the cold and wind chill. A wind break is better than out in the open and next to your body is best of all.

Carry as many extras as you can. Then you can switch when the ones in your gear lose zip. Batteries from your gear go in your clothing to warm up. They should regain enough punch to do the job later.

If your gear won't be on line for a while, don't install batteries. Keep 'em warm as long as you can—but not above 80°F for extended periods.

If you warm batteries in a heated place, watch for sweating. Wipe moisture off when you see it or it'll turn to ice in the cold.

CHECK YOUR TM AND SB 11-6 FOR OTHER DRY-CELL REPLACEMENTS!



BATTERY TYPE NO. (FOR TROPICAL AND TEMPERATE ZONES)

PRIMARY BATTERY USING EQUIPMENT

BATTERY TYPE NO. (FOR ARCTIC ZONE)

644	TRANSMITTER, RADIO	5820-00-545-7273	BA/403/U	1	.25	.25	.15	.15	
645	TELEPHONE SET	5802-00-503-2775	BA/416/U	2	1.18	1.18	.81	.81	BA-3030/U
			BA-30	2	.79	.79	.48	.48	
646	SWITCHBOARD SIGNAL ASSEMBLY	5805-00-503-2616	BA-2	2	.14	.14	.10	.10	
			BA-30	2	5.20	1.59	3.20	.98	BA-3030/U



Finally, if your batteries have to mate with plastic pins to do their job, be careful when installing 'em.

PINS GET BRITTLE AND BREAK IF HANDLED TOO ROUGHLY!



When Temps Go Down...

PM Keeps Commo Up

When the mercury drops, a lot of commo stops... unless you follow some basic rules!

And, we mean basic. You know, like you don't work so good on cold days 'til you've warmed up a little. Your commo gear's the same way.

Sheltered gear needs some looking after, of course. But care is critical for gear left outside.

Receiver-transmitters f'instance. Cold soaks right through 'em. Smart operators give 'em 10 to 15 minutes warm-up before they transmit. Go easy on control knobs, too. They get sluggish. Watch shock mounts. They get brittle with the cold.

Accessories

Commo accessories pose cold weather problems, too. Like moving them in and out of doors. Cold to hot and hot to cold causes condensation.

If you can't balance an item's temperature by keeping it in your jacket, try wrapping it in a dry woolen cloth. That absorbs the moisture for you.

Likewise, if your handset or microphone has a moisture or de-icing shield, use it.

Course, if you've got one with the shield inside the mouthpiece—like the AN/PRC-25 or -77's H-189 handset—you need extra help keeping wetness out.

Before going outside, wrap it in the plastic bag from your battery. That keeps out moisture.

Putting accessories inside your clothes protects 'em, too. It also wards off sticking push-to-talk switches.

In really cold times, watch how you use your accessory. Putting it to your lips or ears could cause a "sticky" problem...

... AND A PAINFUL SEPARATION.

OCT 87

I WONDER WHERE I CAN GROUND IT!

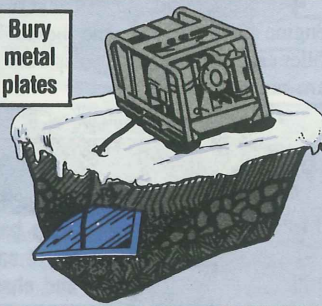
Get Grounding Down Cold

Getting a good ground for your generator set or commo shelter is a real challenge in cold weather—but not impossible.

Buddy up with TC 11-6, Grounding Techniques. It has lots of hot info on cold-weather grounding.

If you use an area in winter as well as summer, bury a 3-ft square metal plate below the moisture line. Mark it, of course, so you can hook up to it when the earth is frozen and covered with snow.

Bury metal plates



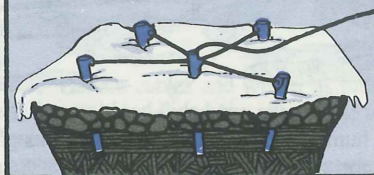
Use an existing ground, like an underground buried metal pipe or a building ground. Never, never hook up to a gas or other fuel pipe, tho.

Use existing grounds



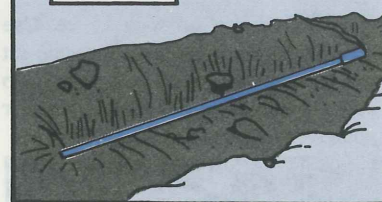
Another way to beat the cold is to install a cluster of shorter rods connected in parallel.

Cluster shorter rods



Bury a rod horizontally. This is easier than driving it through frozen earth. Be

Bury rods horizontally



sure you get the rod below the frostline. If it's not, you get a poor ground.

Whenever possible, drive your ground rod near a heat source. A building or generator set's exhaust are both good.

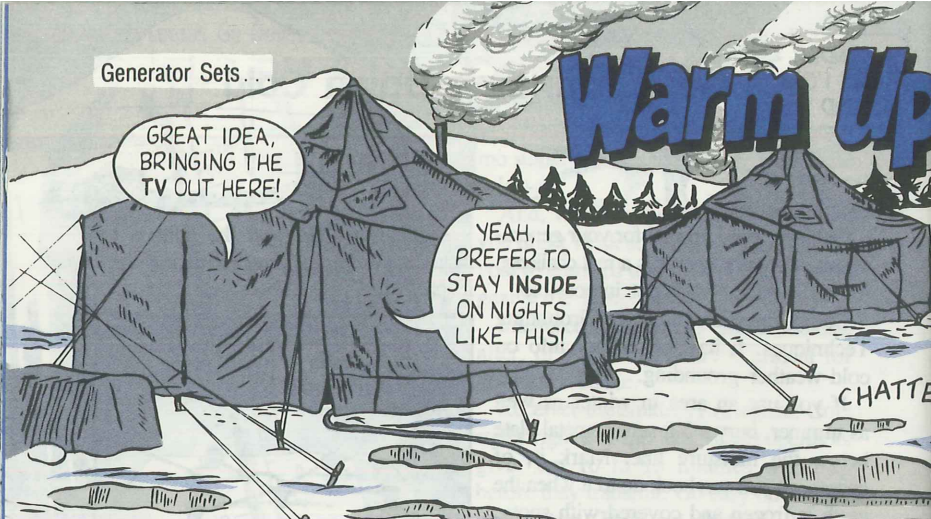
Since a salt solution improves a ground, dissolve a pound of table salt in a gallon of water and pour it around the rod.

Be sure the ground strap is making good contact with the commo gear and ground rod.

OCT 87

47

Warm Up to Winter PM



When the wind chill has blown all the humor out of "Hey, is it cold enough for ya?", it's time to get hot on your small engine PM.

After all, the engine that starts and powers your generator has to sit outside while you warm your tootsies inside.

Here's a double gloveful of PM hints that will keep the volts coming:

- ✦ Keep the set off snow or ice. Use a wooden pallet or a trailer so the set won't freeze to the ground. You can also use vehicles, tents or buildings to shelter your set.



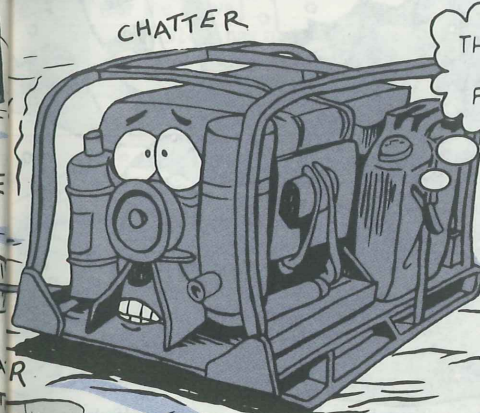
- ✦ Keep ice and snow off the battery, engine and away from the fuel tank and filler cap. Be sure battery cap vent holes are not plugged.



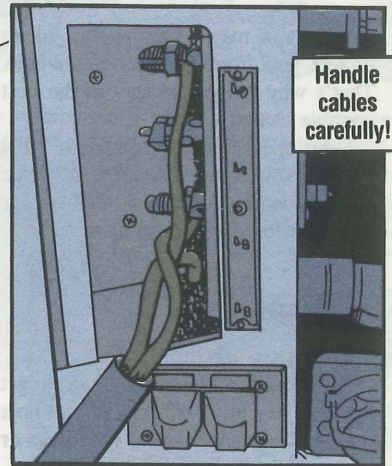
- ✦ Move the air filter's intake shutter to WINTER when temps dip below freezing. That lets warm air from the manifold keep the carburetor from freezing up.



- ✦ Preheat the rest of the set according to TM directions.



- ✦ Handle cables and wiring as little as possible. Insulation becomes brittle in the cold.



- ✦ Store bulk oil and lube inside to make them easier to pour. Lube according to the LO and the temperature range you're in.

- ✦ Keep the fuel tank full to head off condensation that can freeze in the fuel line.

- ✦ Use the right fuel icing inhibitor. Gas uses technical methanol; diesel fuel takes fuel system icing inhibitor. The ratio for both is 1 pint per 40 gallons of fuel. Inhibitor comes in 5-gal cans, NSN 6850-00-753-5061 and 55-gal drums, NSN 6850-00-060-5312. Methanol is NSN 6810-00-597-3608 for 1 gallon and NSN 6810-00-275-6010 for 5 gallons.

- ✦ Keep batteries fully charged. Water added to a battery will freeze if the battery isn't charged for at least an hour.

- ✦ Warm your set before you put it into operation. Run it—at rated speed—until it hits operating temperature. No idling, tho.

- ✦ Check your sets frequently for unusual noises or gage readings.

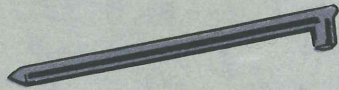
- ✦ Read your TM's for additional cold weather information.

Cold Weather

TENT TIPS

Your tent may be all you've got to protect you from frigid winter winds. That's why it's got to stay in the best possible shape.

Substitute 12-in steel tent pins, NSN 8340-00-823-7451, for the usual aluminum pins. Appendix A, CTA 50-970 is your authority for the steel pins.



If the ground's frozen too hard to get the steel pins in, chop small holes to put 'em in. Then fill the holes with slush or water. It'll freeze and anchor the pins.

Remove tent pins from frozen ground by chopping the ground around them till they loosen.

NEVER POUND 'EM
SIDEWAYS WITH
A HAMMER TO
BREAK 'EM LOOSE.



Tent line tension is important if the tent's to stay up through winter storms. Ropes must be tight to stand up to high



winds. When the weather's wet, tho, they need some slack to allow for shrinkage.

Slide fasteners that won't slide are a nuisance. Slide fastener stick-form lubricant, NSN 9150-00-999-7548, unsticks 'em.

On frame-type tents, cold canvas won't always completely cover the frame like it should. Never force it, tho. Lay it over the frame and secure it. When heat from inside the tent warms the canvas, finish tying it down.

Be careful when you go in or out of the tent wearing extreme cold-weather clothing and boots. The bulky winter gear catches on the door and zipper and can tear the canvas.

FM 31-70 has tips on tent placement and special cold-weather info.

GENERAL TENT
REPAIRS ARE
COVERED IN FM
10-16.



Shake the Chill Out

A little exercise can help you sleep better—and warmer—in your sleeping bag. The insulation settles into the foot of the bag when you roll it up from the top. Shake the bag a few times while holding it by the foot to redistribute the

feathers and make a warm, even layer of insulation.

Leave the bag open for a few hours after you use it so it can air out. Fresh air and sunshine fluff up the feathers, too.



Keep sleeping bags clean for greatest comfort and warmth.

Never dryclean a sleeping bag, tho. The cleaning vapors could be deadly.

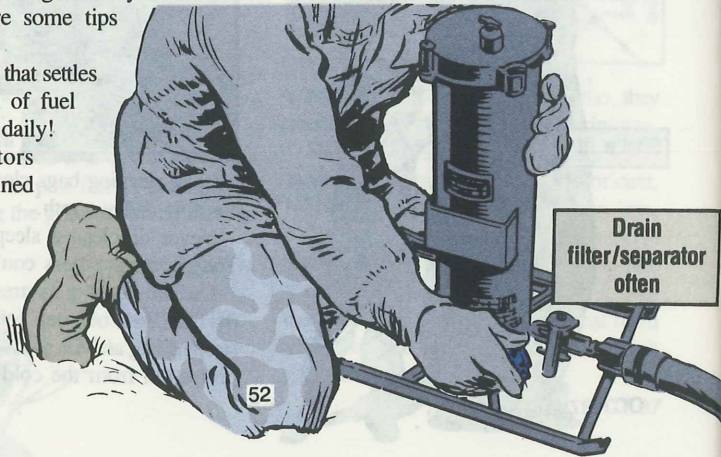
Use the sleeping mattress, NSN 8465-01-109-3364, between your cold weather sleeping bag and the ground for maximum protection from the cold.

WINTER PM KEEPS



POL equipment has to keep the fuel, oil and lubricants flowing smoothly even when the weather gets really cold. It can—with some first-rate PM attention from you. Here are some tips that'll help.

Drain water that settles to the bottom of fuel storage tanks daily! Filter/separators should be drained more often—especially if it's really cold!



FUEL FLOWING

Grounding is especially important in extreme cold weather. The colder it gets, the drier the air is...and that means more danger from static electricity.

Protect POL pumps from bone-chilling winter winds. Build a windbreak out of snow or ice if no permanent shelter is available.

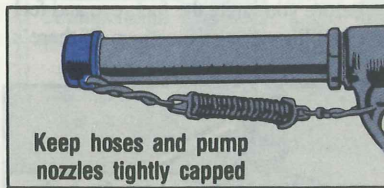


If possible, disconnect and drain smaller pumps so that they can be stored in a building or tent at night.

Use the right winter grade of oil in pump engines. The LO will let you know which one's right for the temperatures in your area.

When you add oil that's cold, leave the level about 1/8 inch below the dipstick full mark. The oil expands when it warms up.

Keep hoses and nozzles tightly capped when you're not using 'em to prevent dirt and snow from getting in. Manhole covers should be kept securely sealed, too.



Hoses get stiff and brittle in extreme cold weather. Rough handling causes them to crack and leak. Treat hoses gently and move 'em slowly.

Collapsible fuel hoses used with the FARE system go flat when they're left out in the cold. A flat hose won't deliver much fuel.

Rigid hoses survive the cold better. If you have to use flexible hoses, try to protect them.

Fuel leaking past frozen gaskets and seals is a real cold-weather problem. Doubling up on standard seals can slow the leaks. Keeping seals and fittings clean will help, too.

BE EXTRA CAREFUL HANDLING FUEL IN EXTREME COLD!

FUEL SPILLED ON BARE SKIN CAUSES FROSTBITE IN AS LITTLE AS 4-5 SECONDS WHEN THE TEMPERATURE HITS -30°F.



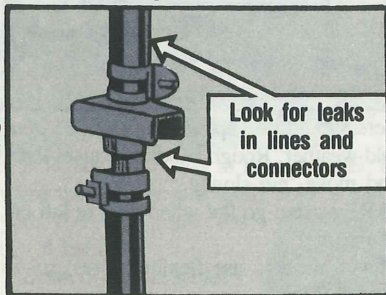
Warm up to Cool PM Operation

DON'T GET LEFT OUT IN THE COLD WHEN IT COMES TO SPACE HEATER P.M.

IF WE'D KEPT UP OUR P.M. LIKE MALECKI DID, WE WOULDN'T BE WAITING FOR A CHANCE TO WARM UP IN HIS TENT!

An open invitation to a tent fire at the ol' campground is a leaky line or fitting or a fuel-flooded burner pot on your M1941 space heater.

Before you ignite the fuel, eye and feel the fuel lines and connections. If there's a fuel leak, stop it!

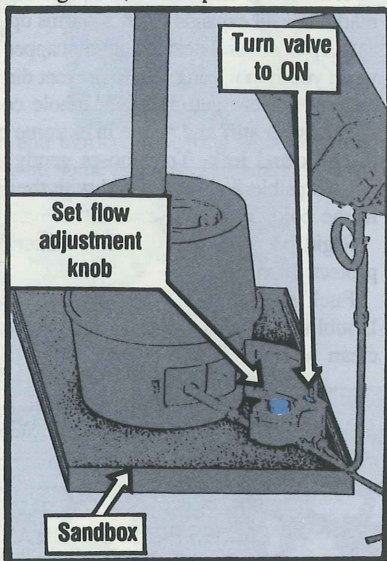


When you hook up the overflow hose to the float valve assembly, do this:

- Keep the hose lower than the fuel overflow connection.
- Keep kinks out of the hose.
- Keep the hose out of the way of big feet.
- Drain the fuel downward, outside and away from the tent, like it tells you on Page 2-7 of TM 10-4500-200-13.

- Use a container to catch the overflow fuel to guard against an unwanted blaze. If there's a wooden floor in your tent, set the stove in a box of sand or on an insulated sheet.

The fuel control valve will work the way it's supposed to when the heater is setting level, so keep it level.



To start the heater with oil, turn the ON-OFF valve to ON. Then turn the adjustment knob to 9.

When the bottom of the burner is wet with fuel, turn the adjustment knob to 0.

Then drop a small wad of lighted paper or lighted oily rag into the burner.

If gasoline is used, drop a lighted match or burning paper into the burner and then turn the ON-OFF valve to ON with the adjustment knob set at 0.

KEEP YOUR FACE AND HANDS AWAY FROM OPENING.

Replace the top lid when the bottom of the heater is full of fire.

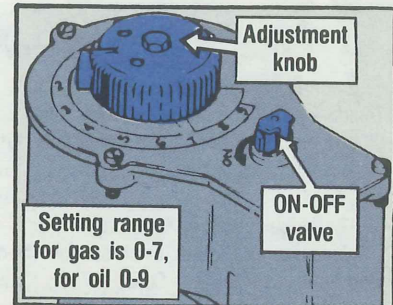


Wait five minutes when gasoline is used or fifteen minutes when oil is used to let the heater warm up.

Then set adjustment knob for size of flame you want.

The setting range, when using gasoline, is indicated by an arrow on the dial from 0 to 7. Any setting above 7 will waste fuel and make the heater smoke.

The setting range, when using oil, is 0 to 9.



If the burner pot is flooded with fuel, the flame may leap up high when you remove the heater lid.

Don't panic, though!

Keep the heater lid closed, turn the adjustment knob to zero and let the excess fuel burn off.

Heavy, black smoke from the stack lets you know there is excess fuel being burned.

After the excess fuel is burned off, reset the control knob.

Never leave knob at maximum (position 9) even in cold weather. It can damage the heater or set your tent on fire.

Stove's Too Hot? Cool It!

Never try to take the heater outside while its burner pot is still lit. It can tip over. This'll set the tent on fire or burn you.

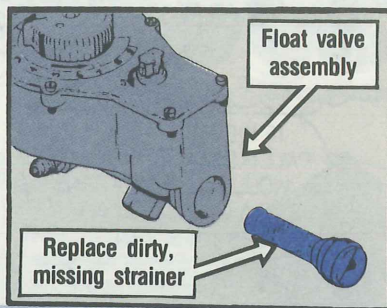
Keep Fuel Strainer Firm

A bent strainer in the float valve assembly of your heater will let unfiltered fuel into the burner. Before you know it, heat's reduced or cut out altogether.

Keep filtered fuel flowing by using care when you take out the strainer to clean it or put it back in.

If it's damaged or missing, replace it.

Use NSN 5411-01-231-1754 to order a new strainer.



Like a Puppy—Warm But Tender

Your boots can't take a lot of abuse. One puncture—either on the outside or inside—puts 'em out of action... for good.

Use cold-weather boot maintenance kit, NSN 8465-00-753-6335, to repair small holes. The patches are only good for emergencies. They won't hold up long in the field.

The patches stick on better if you apply the adhesive to both the boot and the patch.

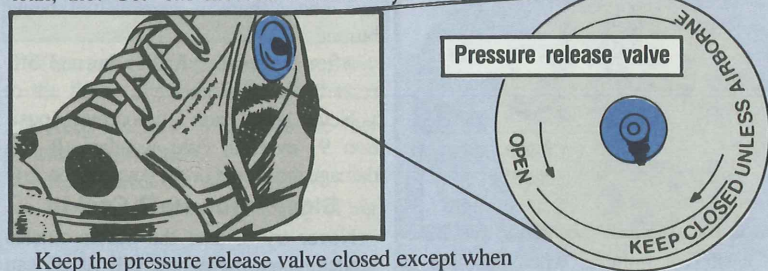
Use soap and water to clean your boots. A spray on/wipe off general purpose detergent—NSN 7930-00-357-7386 f' rinstance—takes care of tough stains. Never dry boots near a fire or other heat source.

Watch out for concertina wire. One touch can be the kiss of death to your extreme cold-weather boots.

One pair of cushion sole socks is all you need to wear, but change 'em often to keep your feet dry.

FM 31-70 has some more cold-weather boot poop.

Turn boots in to support at least once a year for testing. They'll make sure the boots are still serviceable. Don't wait for the yearly inspection if you suspect a leak, tho. Get 'em checked immediately.



Keep the pressure release valve closed except when you're flying in an Air Force transport. Moisture gets in when the valve's left open and ruins the boots.

Liner Learning—Warmer Wearer

The way you put the liner in your extreme cold-weather parka makes a difference. You'll stay warmer with the liner in right.



For the older style liners, the white, fleece side goes toward the parka shell. It creates a space for warm air between the cold outer shell and the inner layer next to your body. It's that insulation that keeps you warm.

Newer quilted liners have a layer of slick protective cloth on each side of the



insulation, so the insulating dead air is trapped between them.

Dirt 'n' sweat rob your liner of its insulating ability, too. Keep it as clean as possible for best results.

Hood Needs Real PM

Your extreme cold-weather hood, NSN 8415-00-782-3004, and extreme cold-weather face mask are the only things between you and a frost-bitten face when you're working outside.

The synthetic fur ruff and the mask keep frigid winter air away from your face if you take care of 'em.



HERE'RE A COUPLE OF PM TIPS THAT'LL KEEP THE FUR SOFT AND COMFORTABLE.

• Keep the hood and its fur ruff clean... the mask, too. Hand washing's the only way. Use warm water and a mild detergent like laundry detergent, NSN 7930-00-985-6904. Rinse the hood in clean water and shake out the excess water; then, hang it up to dry. Never lay it on or near a hot stove or heater, tho. Too much heat ruins the fur. Machine washing does, too.

• Never let snow and frost collect on the fur while you're wearing the hood. Brush them off as soon as you can. The fur can't keep the cold wind out of your face if it's all wet and matted.

Cold Weather Clothing Tips



GET A LOAD OF SMITTY!

YEAH... HE'S TAKEN THAT LECTURE ON LAYERING A LITTLE TOO FAR!


The best defense against cold air is layers of... air?

That's right. Your extreme cold-weather protective clothing is designed to trap warm, dry air between your body and the harsh environment. The idea is to keep you from losing body heat—to prevent cold injury—without making you too warm.

You'll stay snug if you remember a few pointers:

- Wear several layers of clothing. That way, if you start to perspire, you can take off the extra layers.

If the clothes next to your skin get wet from perspiration, they can't trap air. You'll chill in a hurry...



... ESPECIALLY, IF THE WIND'S BLOWIN'!

Shake off any snow, ice or water droplets that get on your outer clothing. Even though the gear's water-repellent, brush off snow and ice before you enter a warm shelter.

- Keep the clothing clean. Dirt and grease, like water, cut out air space and reduce insulation. Brushing your clothing while you wear it helps keep it clean.

SKIN SAVERS

Icy-cold metal can freeze to your skin the instant you touch it. But sometimes cold-weather mittens or gloves get in the way when you're working.


Prevent a painful injury with thin anti-contact gloves that keep your hands from sticking to metal in temperatures as low as -60°F :

NSN 8415-00-	SIZE
227-1220	Small
227-1221	Medium
227-1222	Large

The gloves are cotton with deerskin palms, so they can't take a lot of heavy-duty use. Don't wear them longer than you have to—they won't protect your hands from cold air. Replace them when they get frayed, worn or torn.

- Make sure your clothing fits loosely. It's designed so you can leave some parts open—such as the neck and cuffs—to let cold air in if you get too warm.

Read up on your protective clothing in Section II of Chapter 2 of FM 31-70, Basic Cold Weather Manual. Care and repair instructions for some of the gear, including the extreme cold-weather hood and parka, and the cold-weather coat, are in TM 10-8400-201-23, General Repair Procedures for Clothing and Individual Equipment.



YOU'LL FIND THEM LISTED AS LIN J66420 ON PAGE 02-044 OF CTA 50-900.



Optical lenses in the cold need special care. But it's not the cold that's the major hazard. It's the sudden temperature change when you take the optics in out of the cold.

Cold glass in a warm room collects condensation. Even warm air can cause condensation on cold glass.

This'll rust metal parts. It'll also frost up a lens, or even crack it.

If you try to warm up a frozen optical instrument too fast, say by a hot stove, you'll get cracks and breaks, too.

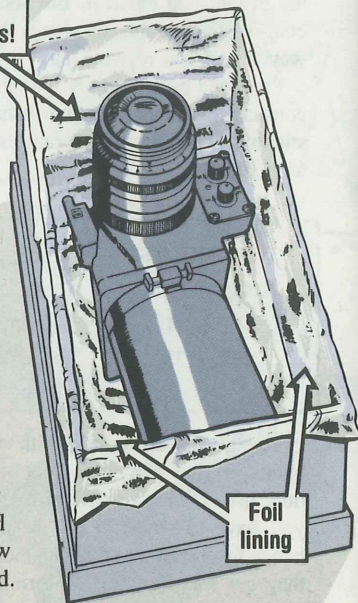
You can dodge that damage, tho, by boxing optics outside before you go in.

You can use a box with a tight-fitted lid and lined with a continuous piece of heat conducting material, like aluminum foil. Put the optics in the box, outside, and then take the box inside.

Never use your own hot breath to clean a lens in freezing weather. Moisture in your breath will fog or frost the lens. Fact is, turn your head sideways when you even look at a lens in the cold. Use a little alcohol for cleaning instead.

Check your instrument's lube instructions for the right cold-weather lubricant. Oil that pours real slow in the cold can put moving parts into slow motion or stop the motion completely in extreme cold.

Never breathe on optical lenses!



Connie's POST SCRIPTS



Windshield Scraper NSN

Need a windshield scraper? Order NSN 7920-00-045-2556. Authority is Appendix A, CTA 50-970.

Wiper Arm Bushing

Getting a bushing to go between the wiper motor and wiper arm on tactical wheeled vehicles has been an impossible mission. But no longer. Order a bushing to fit wiper motors with a 5/16-in shaft, NSN 5365-00-946-2231. For motors with a 3/8-in shaft, order NSN 2540-00-822-8809.

Cold Weather Tie-Up

Use NSN 8335-00-131-6538 to get white laces for your extreme cold-weather boots. NSN 8335-00-945-3969 brings you black laces for the cold-weather boots. Chap 21 of TM 10-8400-201-23 is your authority.

Slave Receptacle Cover

You can get a cover for the slave receptacle for the CUCV and M4K fork lift with NSN 5340-01-059-0114. It's being added to the TM's.

SMART

SMART MSG #74—Provides information concerning changes to TM 9-2320-289-34. Gives procedures for testing the CUCV alternator on the 500 AMP Generator/Alternator tester. Details published in July 1987 EIR Digest. DALO-PLA 281828Z Jul 87.

Maintenance & Safety-of-Use Messages

AMCCOM MSG-87-04—Maintenance Advisory, M3 heaters possibly cause communications interference, AMSMC-MAR-EC, 251400Z Jun 87.

AMCCOM MSG—Replacement and disposition instructions for screws (PN 9326589-4) in repair kit NSN 1015-01-071-2825 referenced in AMCCOM SOU-MSG 192120Z Jun 87, AMSMC-MAW, 261000Z Jun 87.

AMCCOM MSG—Maintenance Advisory, Possible water damage to M1A1/IPM1 tank gun shield, AMSMC-MAW, 151410Z Jul 87.

MICOM SOU-MSG—Advisory, Operational, Inspection of Patriot antenna mast Group S/N 640253, casting may break, AMSM-LC-AM, 202100Z Jul 87.

TACOM MSG—Cancellation of TACOM SOU MSG-87-28 on 4,000-lb RT forklift brake system, AMSTA-MV, 221030Z Jul 87.

TACOM MSG—Cancellation of TACOM SOU-MSG 87-30 on HEMTT M984E1 Wrecker, AMCPM-TVH, 291700Z Jun 87.

TACOM SOU-MSG-87-52—Operational, Potential wheel rim failure on M939A1 5-ton trucks, AMSTA-MTB, 132000Z Jul 87.

TACOM SOU-MSG-87-55—Operational, Resumption of Bradley swim operations, AMCPM-LCV-SP, 171630Z Jul 87.

TACOM SOU-MSG-87-56—Advisory, Operational, M939/M939A1 series truck's battery box and seat can cause explosion hazard, AMSTA-MTB, 241700Z Jul 87.

TROSCOM MSG-87-07—Maintenance Advisory, Possible diesel fuel contamination sources and prevention, AMSTR-MEM, 071802Z Jul 87.

TROSCOM MSG-87-16—Maintenance Advisory, Extension of shelf life

for parachutes listed in TROSCOM Msg AMSTR-MES, 041600Z May 87, AMSTR-MES, 241430Z Jun 87.

TROSCOM MSG-06-87—Technical, Deadline of King Electrical Manufacturing space heater, Model No. KEP 2430, NSN 4520-00-540-2038, AMSTR-MES, 040900Z May 87.

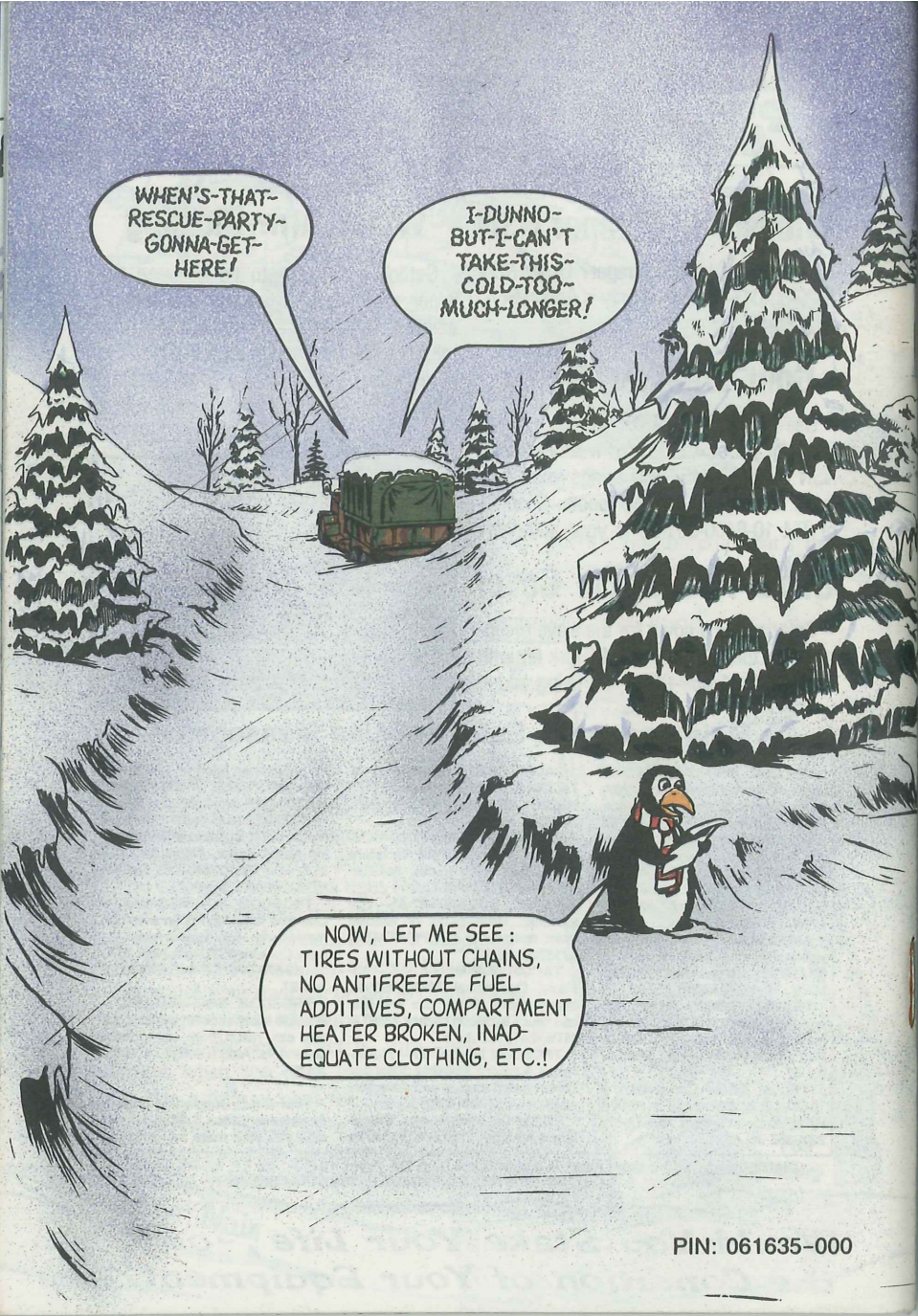
TROSCOM SOU-MSG-10-87—One-time inspection of fin assembly material on High Speed Aerial Delivery Container CTU-2/A, NSN 1670-01-059-5788, AMSTR-MES, 261930Z Jun 87.

TROSCOM SOU-MSG-12-87—Possible injury or death by electrocution can result from ungrounded generators. AMSTR-MEM, 101525Z Jul 87.

Your Direct Support or Logistic Assistance Office (LAO) can provide you with more information.

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Would You Stake Your Life *right now* on the Condition of Your Equipment?



WHEN'S-THAT-
RESCUE-PARTY-
GONNA-GET-
HERE!

I-DUNNO-
BUT-I-CAN'T
TAKE-THIS-
COLD-TOO-
MUCH-LONGER!

NOW, LET ME SEE :
TIRES WITHOUT CHAINS,
NO ANTIFREEZE FUEL
ADDITIVES, COMPARTMENT
HEATER BROKEN, INAD-
EQUATE CLOTHING, ETC.!