



**THE  
PREVENTIVE  
MAINTENANCE  
MONTHLY**

TB 43-PS-599, 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. Masculine pronouns may refer to both genders.

**ISSUE 599 OCTOBER 2002**



**COMBAT VEHICLES**

M1-Series Tank Ice Cleats	2-3
M1-Series Tank Gunner Sight Defroster	3
MLRS Carrier Personnel Heater	4
M113 FOV Intake, Exhaust Grill Covers	5
AVLB Cold Weather Starting	6-7
M109A2-A5 Howitzer Starting	8-9
Combat Vehicle Air Filters	10
Personnel Heater Repair Kit	11



**MISSILES**

TOW 2 Cold Weather Use	12-13
Avenger Missile Bottle, Battery, Panel	14-15



**SMALL ARMS**

Rifle, Machine Gun Cold Weather PM	16-17
M240 Machine Gun Spring Check	18
MK 19 Vehicle Mounts	19
Mortar Cold Weather Care	20



**NBC**

M17, M12 Decon Freeze Prevention	21
M40/M42 Mask Identification Tips	22



**WHEELED VEHICLES**

Starter Burn-Out	23
------------------	----



**COMBAT ENGINEERING 24**

Hydraulic Cylinder Cleaning	24
Parking Locations	25
Air Tank Draining	26



**AVIATION**

Cold Weather Maintenance	35-39
--------------------------	-------



**COMMUNICATIONS**

Cold Weather Grounding	40-43
Commo Cable Handling	44-45
Commo Battery Usage	46-47



**SOLDIER SUPPORT 48**

H120, H120-1 Space Heaters	48-49
Tent Heaters	50-51
Tent Care in the Cold	52-53
ECWCS Cleaning	54-55
Cold Weather Boots	56-57
Modular Sleep System	58-59
Anti-contact Gloves, Mitten Liners	60

EDITORIAL	1
CONTINUITY	27
CONNIE'S POST SCRIPTS	61

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

Just write to:

MSG Half-Mast  
PS, the Preventive Maintenance Monthly  
USAMC LOGSA (AMXLS-AM)  
5307 Sparkman Circle  
Redstone Arsenal, AL 35898-5000

Or e-mail to:

psmag@logsa.redstone.army.mil

Internet address:

<http://www.logsa.army.mil/psmag/pshome.html>

By order of the Secretary of the Army:

**ERIC K. SHINSEKI**

General, United States Army Chief of Staff

Official:

*Joel B. Hudson*

**JOEL B. HUDSON**

Administrative Assistant to the Secretary of the Army

0222404

PS, The Preventive Maintenance Monthly (ISSN 0475-2953) is published monthly by the Department of the Army, Redstone Arsenal, AL 35898-5000. Periodical postage is paid at the Huntsville, AL post office and at additional mailing offices. Postmaster: Send address changes to PS, The Preventive Maintenance Monthly, USAMC LOGSA (AMXLS-AM), 5307 Sparkman Circle, Redstone Arsenal, AL 35898-5000.

# THE OLD MAN AND THE COLD



Many a rough-tough GI has been brought low by Old Man Winter.

Sometimes he attacks directly, sending a deep-freeze right to your bones, making your every move slow and awkward. Sometimes the attack is indirect, wreaking havoc on equipment that worked so well for you when the temperatures were more moderate.

Those of us who have learned from, and lived through, our mistakes know that cold weather brings many challenges to mission completion and survival.

Meeting those challenges demands preparation ahead of time, long before the biting chill of the Hawk sends shivers down your spine.

What you'll find in the pages of this issue of PS is help in preparing for cold weather. Used along with the good info in your regular cold weather publications and equipment TMs, it may provide that one preventive maintenance tip that saves your mission—or your life—in the cold, miserable conditions ahead.



THE  
PREVENTIVE  
MAINTENANCE  
MONTHLY

TB 43-PS-599, 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. Masculine pronouns may refer to both genders.

ISSUE 599 OCTOBER 2002

 <b>COMBAT VEHICLES</b>	<b>2</b>	 <b>COMBAT ENGINEERING</b>	<b>24</b>
M1-Series Tank Ice Cleats	2-3	Hydraulic Cylinder Cleaning	24
M1-Series Tank Gunner Sight Defroster	3	Parking Locations	25
MLRS Carrier Personnel Heater	4	Air Tank Draining	26
M113 FOV Intake, Exhaust Grill Covers	5		
AVLB Cold Weather Starting	6-7	 <b>AVIATION</b>	<b>35</b>
M109A2-A5 Howitzer Starting	8-9	Cold Weather Maintenance	35-39
Combat Vehicle Air Filters	10		
Personnel Heater Repair Kit	11	 <b>COMMUNICATIONS</b>	<b>40</b>
 <b>MISSILES</b>	<b>12</b>	Cold Weather Grounding	40-43
TOW 2 Cold Weather Use	12-13	Commo Cable Handling	44-45
Avenger Missile Bottle, Battery, Panel	14-15	Commo Battery Usage	46-47
 <b>SMALL ARMS</b>	<b>16</b>	 <b>SOLDIER SUPPORT</b>	<b>48</b>
Rifle, Machine Gun Cold Weather PM	16-17	H120, H120-1 Space Heaters	48-49
M240 Machine Gun Spring Check	18	Tent Heaters	50-51
MK 19 Vehicle Mounts	19	Tent Care in the Cold	52-53
Mortar Cold Weather Care	20	ECWCS Cleaning	54-55
 <b>NBC</b>	<b>21</b>	Cold Weather Boots	56-57
M17, M12 Decon Freeze Prevention	21	Modular Sleep System	58-59
M40/M42 Mask Identification Tips	22	Anti-contact Gloves, Mitten Liners	60
 <b>WHEELED VEHICLES</b>	<b>23</b>		
Starter Burn-Out	23		

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

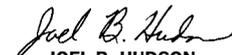
Just write to:  
MSG Hal-Mast  
PS, the Preventive Maintenance Monthly  
USAMC LOGSA (AMXLS-AM)  
5307 Sparkman Circle  
Redstone Arsenal, AL 35898-5000  
Or e-mail to:  
psmag@logsa.redstone.army.mil  
Internet address:  
<http://www.logsa.army.mil/psmag/pshome.html>

By order of the Secretary of the Army:

**ERIC K. SHINSEKI**

General, United States Army Chief of Staff

Official:

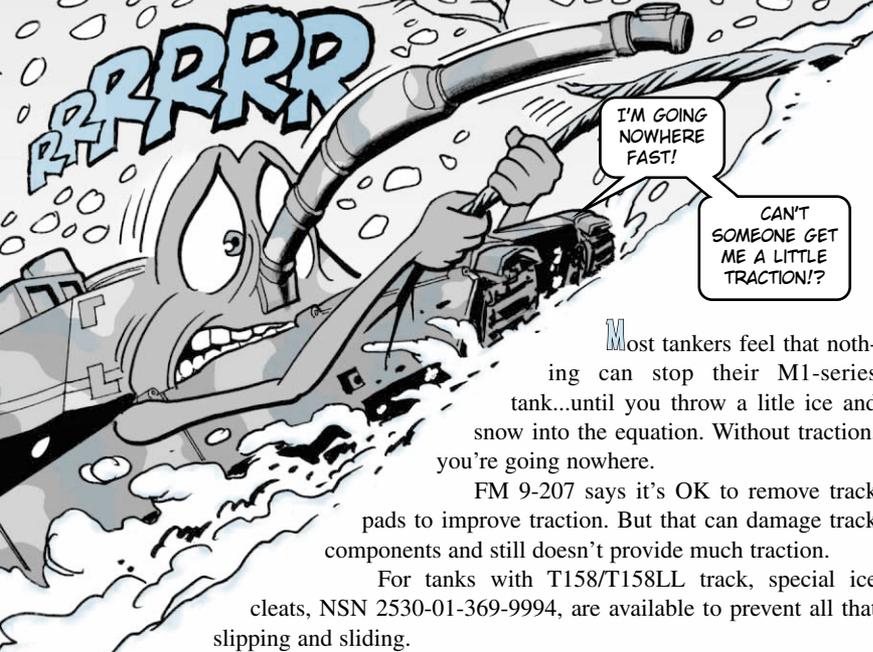
  
**JOEL B. HUDSON**

Administrative Assistant to the Secretary of the Army  
0222404

PS, The Preventive Maintenance Monthly (ISSN 0475-2953) is published monthly by the Department of the Army, Redstone Arsenal, AL 35898-5000. Periodical postage is paid at the Huntsville, AL post office and at additional mailing offices.

Postmaster: Send address changes to PS, The Preventive Maintenance Monthly, USAMC LOGSA (AMXLS-AM), 5307 Sparkman Circle, Redstone Arsenal, AL 35898-5000.

# CLEATS LET YOU GO IN ICE AND SNOW



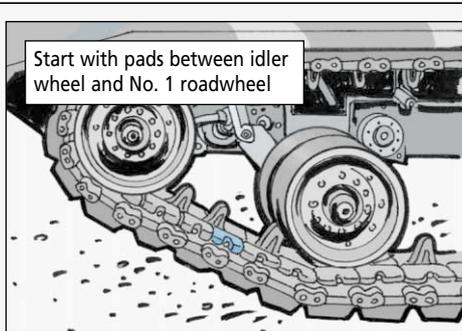
Most tankers feel that nothing can stop their M1-series tank...until you throw a little ice and snow into the equation. Without traction, you're going nowhere.

FM 9-207 says it's OK to remove track pads to improve traction. But that can damage track components and still doesn't provide much traction.

For tanks with T158/T158LL track, special ice cleats, NSN 2530-01-369-9994, are available to prevent all that slipping and sliding.

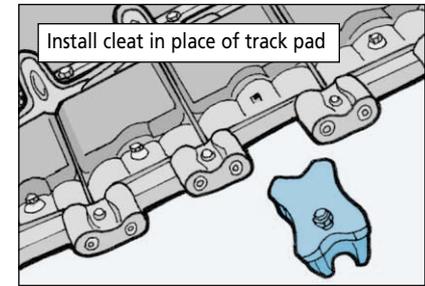


1. Clean the left and right track to remove all dirt and debris.
2. Position the first track shoe between the compensating idler wheel and the number one roadwheel.



3. Remove the track shoe's inner and outer pad and self-locking nut.

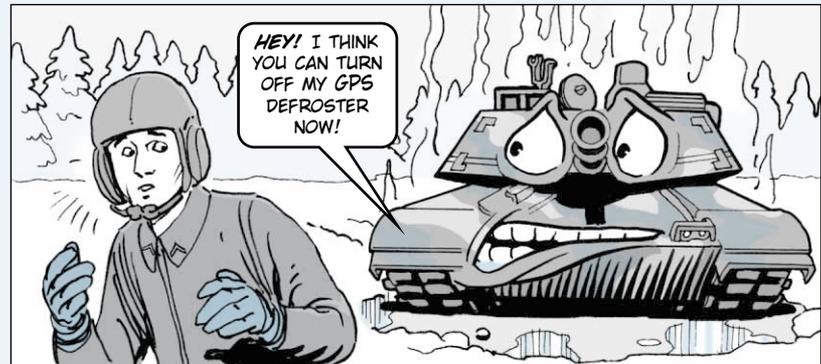
4. Install two ice cleats on the track shoe in place of the removed pads.
5. Lock each cleat in place with a new self-locking nut, NSN 5310-01-102-2711. Torque the nuts to 260-300 lb-ft.
6. Follow steps 3-5 for the track on the other side of the tank.
7. Move the tank forward to position the next track shoe needing cleats.



For best performance, put a set of cleats on every fifth shoe. That means you'll need a total of 60 cleats for each vehicle (30 per track).

Remember, these cleats are for T158/T158LL track only. They will not work with T156 track.

## TURN THE DEFROSTER OFF



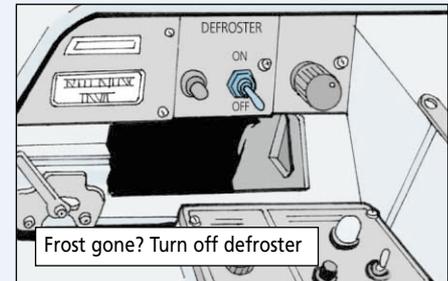
Got a problem with frost on the eyepiece of your gunner's primary sight (GPS)? Just flip on the GPS defroster. In a few minutes your problem clears up.

But if you forget to turn off the defroster, you have a new problem.

The defroster doesn't turn itself off when the frost is gone. It keeps right on running.

A long-running defroster will overheat and crack the daylight window on the GPS.

So when the frost is gone, turn off the defroster.



# CLEAN HEATER KEEPS RUNNING



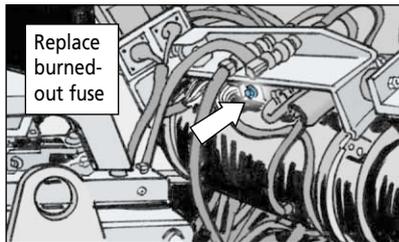
The more your MLRS' personnel heater is used, the more dust and dirt will build up inside.

Enough debris can lock up the exhaust fan. That burns out the heater's 6.3-amp fuse and shuts down the heater. Not knowing what's wrong, most operators send the heater in for repairs.

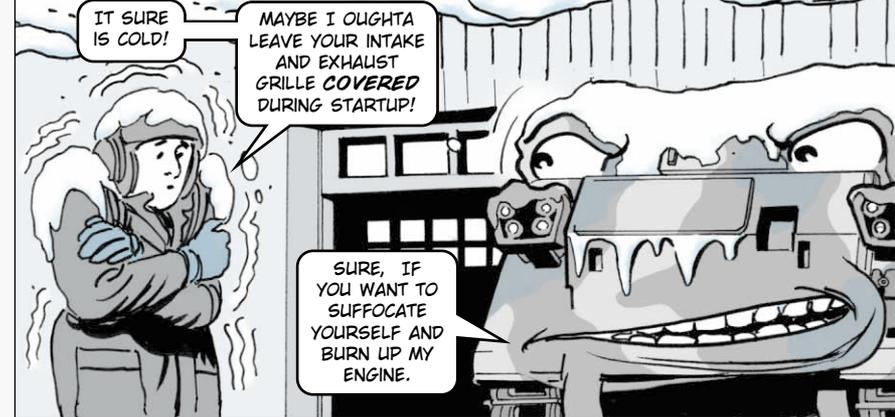
The fix is simple and easy:

1. Remove the air duct hose, NSN 4720-00-535-7615, from the heater.
2. Vacuum the accumulated dirt and dust around the fan.
3. Turn the fan back and forth to loosen dirt at the base of the fan and vacuum again.
4. Replace the 6.3-amp fuse, NSN 5920-12-301-5271.

Of course, you can usually prevent the problem by cleaning the fan at the end of winter and again when the temperatures start to fall. Making sure the air inlet screen, NSN 2510-01-264-0153, is properly installed in the cab will help keep out debris, too.



# No Cover During Operation



Drivers, the canvas cover for your vehicle's intake and exhaust grilles is made to keep ice, snow and other debris out of the engine compartment when the vehicle's not in use.

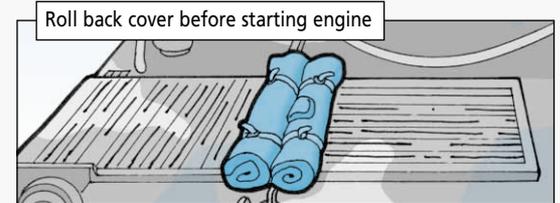
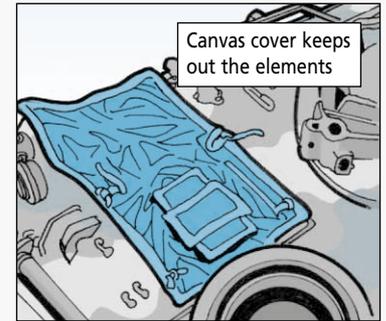
The cover is **not** made to help the engine warm up faster during cold weather.

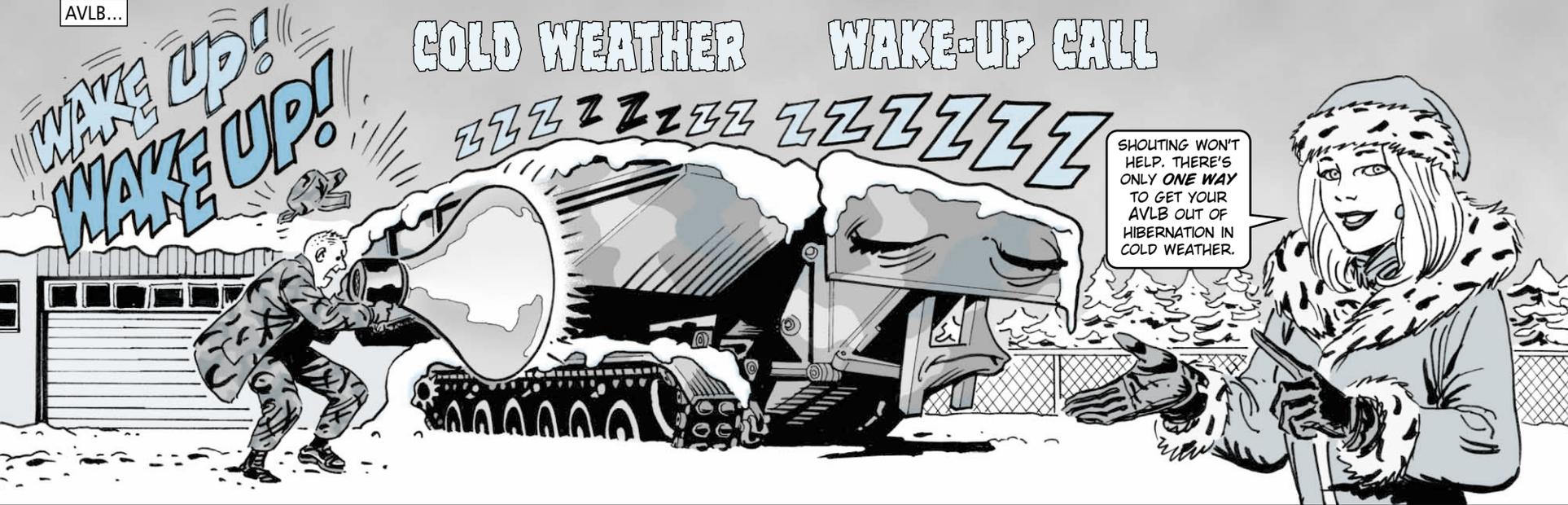
Some operators keep the grilles covered anyway. They figure the faster the engine warms up, the sooner the mission will be accomplished.

Not true! In fact, the mission may not get accomplished at all. Leaving the cover in place heats the engine too fast and can burn it up.

Also, fumes from the engine compartment that would normally be vented through the exhaust grille are forced into the driver and crew compartments. That's a deadly proposition.

Always roll the cover back from the exhaust and intake grilles before starting your vehicle. Secure the cover in place with the straps provided.

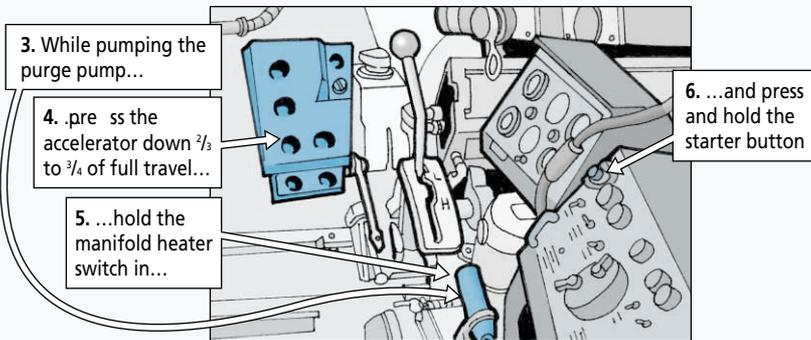




What do a bear and your AVLB have in common, drivers? They both like to hibernate when the weather gets cold!

Follow these steps to wake up that big diesel:

1. Follow your -10 TM to the letter. Test for hydrostatic lock. Make sure all your controls are set right.
2. Pump the purge pump until you feel firm back pressure. It takes about a minute.



### If the engine starts

Keep pumping the purge pump with steady strokes, holding the manifold heater switch and the engine starter button until the tachometer reads 450-500 rpm.

As long as you use the manifold heater switch and the purge pump, you must continue to hold the starter switch. That's because the starter's electrical circuit controls the manifold heater's current.

Once the engine is running smoothly at about 700 rpm, stop pumping. Release the heater manifold switch and starter button, and increase rpm to 1,000-1,200 for the warm-up period.

During warm-up and afterwards, don't idle at less than 700 rpm. Low idling causes engine cooling, not heating. When you idle your engine for long periods, use high idle—1,500-1,600 rpm.

If you must idle at a lower speed, watch the exhaust. If you see white smoke, increase the rpm to 1,500-1,600. If the engine misfires or blows heavy blue-white smoke, you'll have to blow out the induction and exhaust systems.

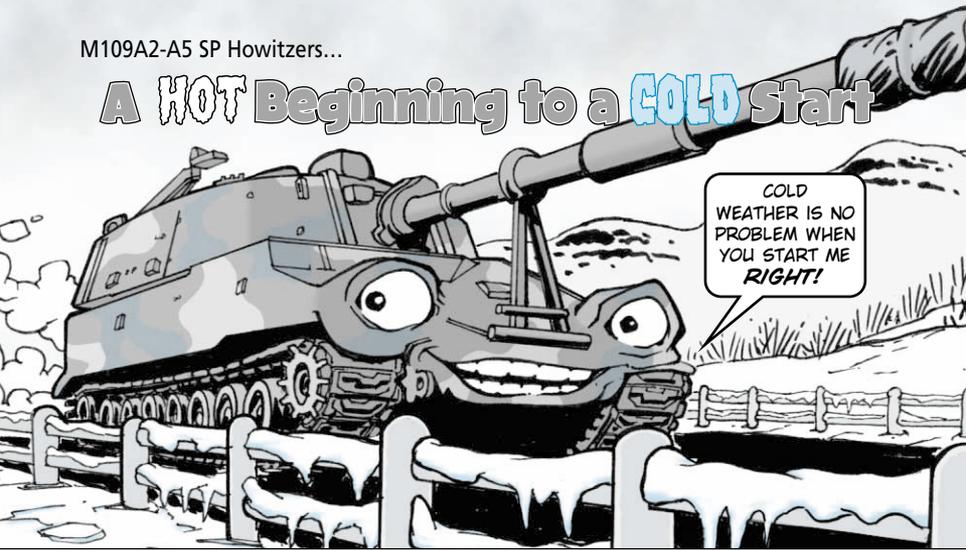
To do that, increase rpm to 1,600-1,800 for 30 seconds to one minute. **Stop the engine fast if the power plant warning light comes on.**

### If the engine won't start

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 then the engine definitely won't start.

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

# A HOT Beginning to a COLD Start



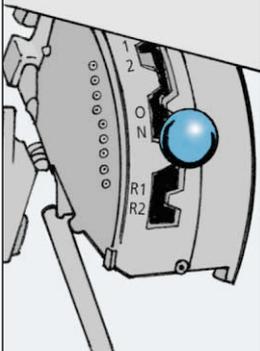
Drivers, you only have to try starting your howitzer once in cold weather to see how frustrating it can be.

To get the best starts, follow these instructions.

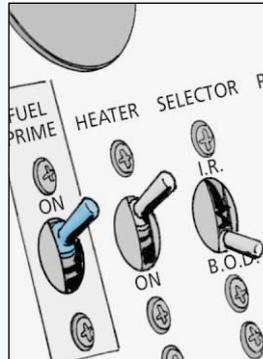
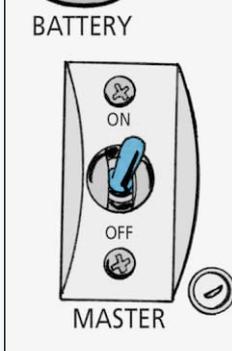
## Before You Start

1. Turn off the personnel heater and shut off the COOLANT HEATER switch.
2. Make sure the battery indicator gauge is in the green range.

3. Set the parking brake and shift the transmission to neutral.

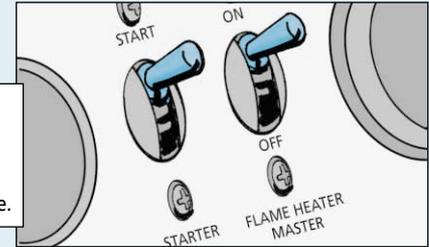


4. Turn the MASTER switch to ON. The indicator lamp should come on.



5. Turn the FUEL PRIME switch ON for 45 seconds, then release.

- ## Starting
1. Pull out and hold the FUEL SHUTOFF handle.



2. Push the STARTER switch to START and the FLAME HEATER switch to ON at the same time. Crank the engine for 15 seconds. Release the FUEL SHUTOFF handle.

3. Keep cranking the engine while setting the FLAME HEATER switch to ON for 1 second and to OFF for 1 second until the tachometer reads at least 300 rpm.
4. Let go of the FLAME HEATER switch. Keep cranking until the tachometer reads at least 500 rpm. The hand throttle may be increased about 1/8 travel to help start the vehicle once 500 rpm is reached. Do not use the foot throttle or the engine will return to idle once it's released.
5. Stop cranking if the engine hasn't started after 2 minutes or you can burn up the starter. Wait at least 2 minutes, then repeat steps 1 through 4. If the engine still won't start or doesn't reach 100 rpm or more after 15 seconds, tell your mechanic.
6. Release the starter switch after the engine starts and follow the engine warmup procedures in the -10 TMs.



## Before Shutdown

Just before shutdown, run the engine at idle and turn on the FLAME HEATER switch. If the heater is working OK, you'll see a slight decrease in engine speed and an increase in exhaust smoke. If not, call your mechanic.

Testing the flame heater also ensures that fuel is in the fuel supply line the next time you start your vehicle.

To increase the chances of an easy start the next time the thermometer takes a nose dive, have your mechanic install a cold start enhancement kit, NSN 2990-01-342-7944.

The kit maintains 1½ psi of positive pressure in the fuel lines. That prevents loss of prime in the flame heater fuel supply line when the engine is not running.

You'll find the kit listed in TM 9-2815-202-24P.

# DRY FILTERS DO THEIR JOB



PRIVATE SMITH!  
WHAT IN TARNATION  
ARE YOU DOING?!

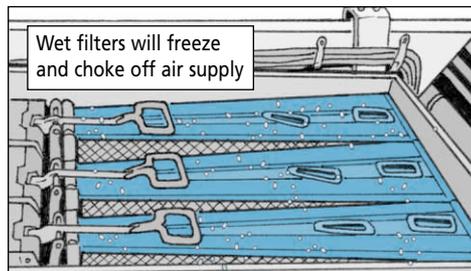
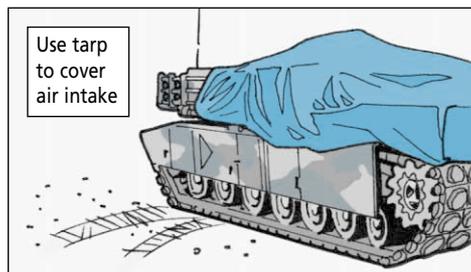
I'M KEEPING  
WATER OUT OF  
THE AIR FILTERS  
UNTIL PRIVATE  
JONES GETS BACK  
WITH A TARP!

Your combat vehicle's air filters are going to have a hard time filtering if they get wet and freeze up. The engine can't get the air it needs and pretty soon you've got a burned-out engine.

So keep those air filter elements as dry as you can when Mother Nature throws a little sloop your way.

Start with the air cleaner intake. When your vehicle is sitting, cover the intake with canvas or plastic to keep out rain, sleet and snow. Make sure you remove the cover before starting, though.

During operation, keep a close eye on the air cleaner indicator or air filter clogged light so you'll know when the element is plugged. Get a plugged filter cleaned, dried out, or replaced—whichever is needed—as soon as possible.



# REPAIR KIT RETURNS



Mechanics, when you send a Stewart-Warner heater with a bad burner to DS for repair, chances are they'll put in a new burner instead of repairing the old one.

That's because the burner repair kit, NSN 2540-00-255-0777, was left out of TM 9-2540-205-24&P.

Let DS know the repair kit is still available and that it works with Stewart-Warner models 10560C, 10560G, 10560M and 10560M24B1.

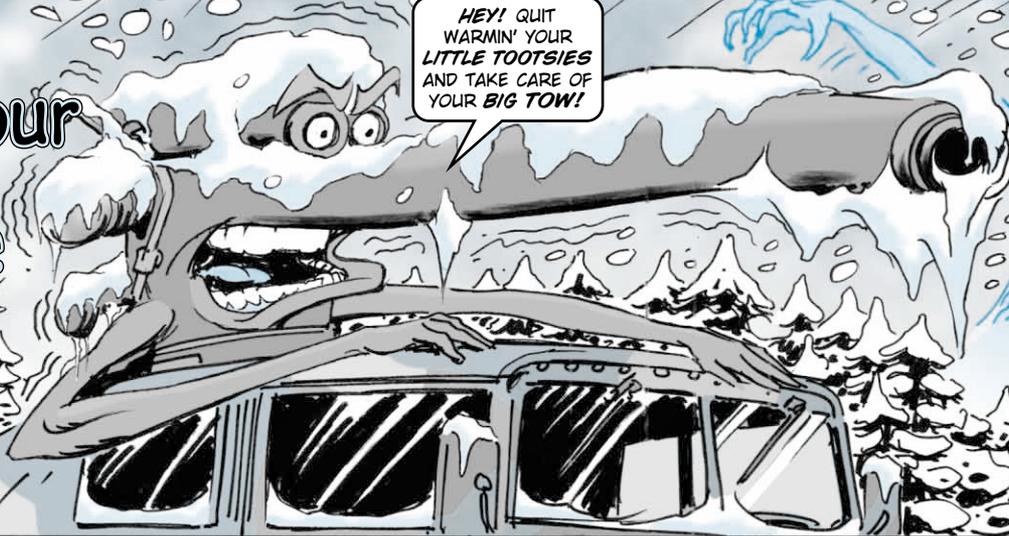


Item	PN/NSN	Qty
Nut, hex castellated	705587*	3
Wick	9390-01-070-5959**	1
Washer	5310-01-126-0466	2
Washer	705136	2
Washer, shouldered	5310-01-059-0988	1
Vaporizer, fuel	2910-01-124-9284**	1
Washer	5310-01-126-0467	1
Washer, flat	5310-01-137-6801	1
Shield, fuel vaporizer	2540-01-057-7443	1
Screw, machine	5305-01-136-8734	1
Screw	5305-01-066-3431	3

\*Order on a DD Form 1348-6 using part number and CAGE 38385 from RIC AKZ.

\*\*Listed as an unavailable or terminal item. Available only by ordering the burner repair kit.

# Don't Let Your TOWs Freeze



HEY! QUIT WARMIN' YOUR LITTLE TOOTSIES AND TAKE CARE OF YOUR BIG TOW!



A FROZEN TOW IS A NO-GO ON THE BATTLE-FIELD.

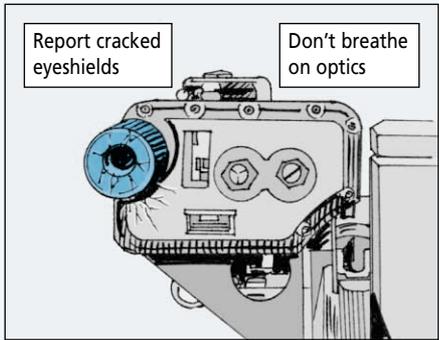
KEEP ON YOUR TOWS IN THE COLD.

Keep ice and snow off clamping surfaces on the traversing unit, sights, and the missile. Ice and snow prevent a good electrical connection. Clear the surfaces with your hands. Use a plastic scraper if necessary.



Clear off ice and snow

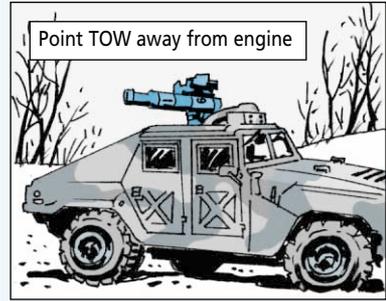
Rubber eyeshields for the sights freeze and eventually crack. That leaves delicate optics vulnerable to ice and snow and makes it difficult for you to sight. Is your night sight eyeshield, NSN 5855-01-292-5639, or op sight eyeshield, NSN 1440-01-050-4911, cracked? Get it replaced as soon as possible.



Report cracked eyeshields

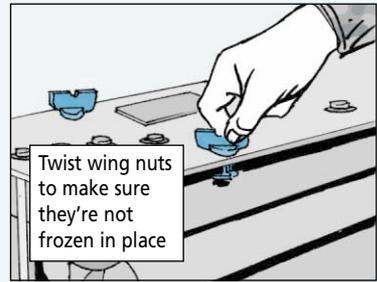
Don't breathe on optics

When extremely cold air hits the heat rising from the vehicle engine, the night sight's vision is distorted. The solution is to park so that the engine is not on the same side as the target.



Point TOW away from engine

Wing nuts on the battery of the MGS freeze solid and pop off when the battery is installed. Without at least 4 wing nuts, the TOW is NMC. Prevent seized nuts by twisting each one before loading the battery.



Twist wing nuts to make sure they're not frozen in place



IT'S A GOOD IDEA TO KEEP EXTRA WING NUTS, NSN 5325-01-148-8601, AND RETAINER RINGS, NSN 5325-00-298-6564, ON HAND IN ALL WEATHER.



DON'T BREATHE ON OPTICS IN COLD WEATHER. THAT FOGS AND ICES THEM.

Avenger Missile System...

# TRIO OF CHECKS STOPS TONS OF TROUBLE

WE'RE THREE CHECKS WHO CAN MAKE YOUR LIFE EASIER.

JUST GIVE US A CHANCE!

YEAH, CHECK US OUT!

I'M ALL EARS!



THESE THREE CHECKS CAN INDEED SAVE YOU LOTS OF TROUBLE DOWN THE LINE, AVENGER REPAIRMEN. SO CHECK THEM OUT.

## Argon Bottles

Each of the Avenger's four argon bottles has a pressure test date that's good for 5 years. Once those 5 years have passed, you're not supposed to use the bottle until it's tested again. Using a bottle that may be leaking and have low pressure causes cryogenics problems.

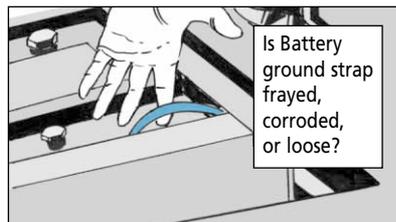
So right now check the dates on all your unit's argon bottles. If any of their pressure tests are expiring in the next 6 months, get them tested now by support.



## Batteries

Batteries are critical to the Avenger's performance. If the batteries aren't at full strength, the Avenger can give you firing faults. Make sure the crew does the battery PMCS spelled out in the Avenger operator's TM.

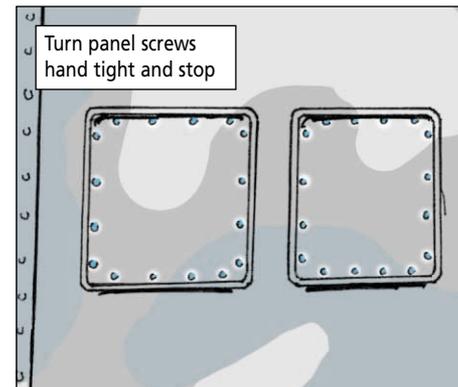
But all that battery PM won't do much good if the ground strap for the battery is in bad shape. A bad ground weakens battery performance. Check that the ground strap is tightly connected and not frayed or corroded. Clean off corrosion with a wire brush. Replace a frayed ground strap.



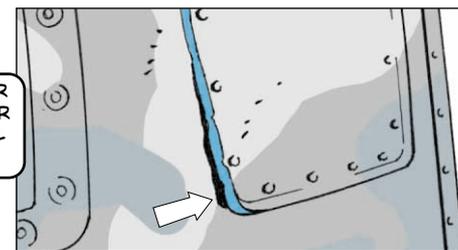
## Access Panels

If you force the screws for the access panels as tight as possible, you'll pop out the inserts for the screws. As your support can testify, it's a time-consuming job to replace those inserts. Hand tight is tight enough when you install the panel screws.

Pay attention to the access panel seals, too. If the seals are missing or have gaps, exhaust and moisture can get into the turret. Exhaust shortens the operator's life and moisture causes electrical problems.



CHECK FOR MISSING OR BAD PANEL SEALS



# HOT PM FOR COLD WEATHER

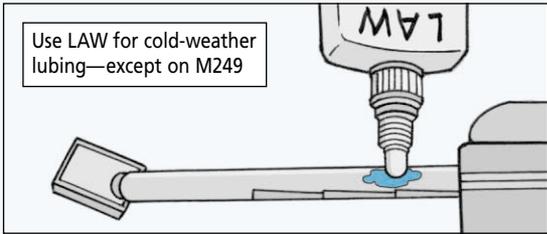
YOU'RE NOT FREEZING OUR MOVING PARTS WITH YOUR COLD, OLD MAN!

COLD WEATHER PM IS KEEPING US MOVING!

...AND WE'RE MOVING YOU OUT OF HERE. GOT THAT, OLD-TIMER!?

THE COLD WILL FREEZE YOUR RIFLE OR MACHINE GUN IN ITS TRACKS IF YOU IGNORE COLD WEATHER PM. HERE'S **HOT ADVICE** TO HELP YOUR WEAPON FIGHT THE COLD...

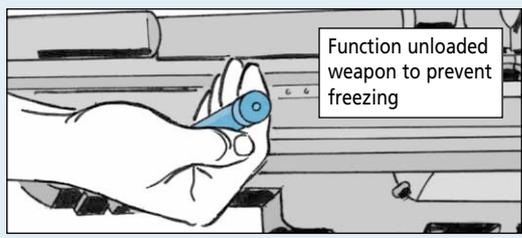
Use rifle bore cleaner, NSN 6850-00-224-6663, to remove carbon, and use LAW, NSN 9150-00-292-9689, to lube your weapons when temperatures drop below 10°F. LAW helps moving parts on most weapons slide better in cold than CLP or LSA. The exception is the M249 machine gun. It needs CLP in all weather.



Wait until a weapon warms to room temperature before cleaning it. A cold weapon will sweat with condensation. If you clean and lube the weapon before it quits sweating, the sweat freezes when you take it back outside.

Prevent condensation from forming inside weapons by keeping them covered when you move from a cold place to a warm one. That lets the weapon warm gradually.

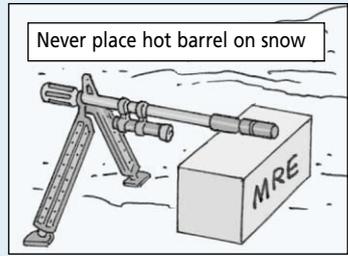
Hand function the weapon every 30 minutes to keep parts from freezing solid. If parts stick, move them slowly and easily until they move smoothly again. Forcing things breaks parts.



Keep ammo dry. If necessary, wipe ammo and the insides of magazines before firing. That will prevent moisture from freezing and jamming your weapon.



Never lay a hot weapon or barrel on the snow. Set it on an MRE box or spare barrel bag. That sudden cold can warp the barrel.



Store weapons in a covered, wind-protected area when you're not using them. If that's not possible, cover them with a blanket or poncho. That at least shuts out ice and snow from the barrel, sights, and working parts.

# Spring Check Checks-Firing Problems



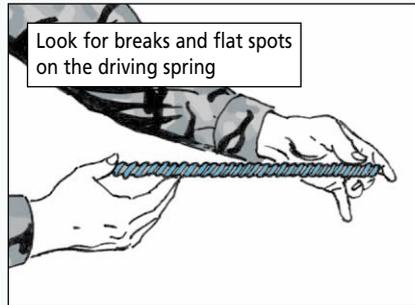
Dear Editor,

We've found in our unit that a common cause of misfires for our M240 machine guns is worn-out driving springs. Once a spring strand breaks, the M240 fires one shot and then quits. But even with a bad spring, the M240 passes a function test so you don't find out you've got problems until you get to the field.

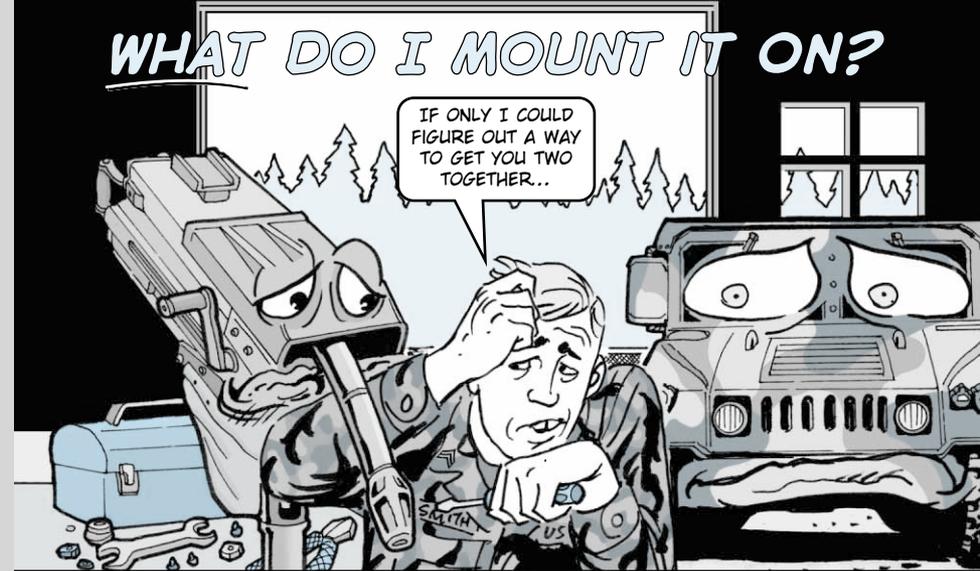
Those problems are avoided if gunners eyeball the driving spring when they clean their M240s. Just look over the spring for cracks or breaks, especially in the top and bottom 5 coils. That's where breaks usually occur. Also look for flat spots on the outside of the spring. They're a sign that the operating rod is wearing out and the spring is rubbing on the inside of the bolt carrier.

If you find problems, tell your armorer. He will find the inspection criteria for the springs in TM 9-1005-313-23&P.

CPT Mike Riedmuller  
Co F, 2/3 ACR  
Ft Carson, CO



# WHAT DO I MOUNT IT ON?



Dear Half-Mast,

What exactly do we use to mount our MK 19 machine guns on our vehicles? The TMs for the MK 19 don't spell that out.  
SGT D.B.

Dear Sergeant D.B.,

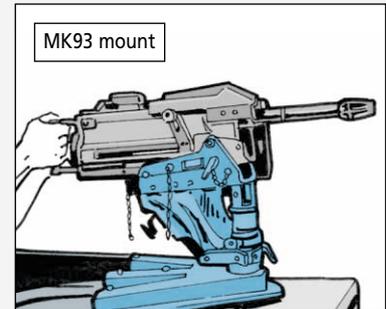
Actually, you have two choices. The MK 19 can be mounted on the MK64 MOD 9, NSN 1010-01-412-3159, and on the MK93 MOD 1, NSN 1005-01-383-2757. The MK64 is also used with the M2 and M60 machine guns.

Check your vehicle's -20 TM to see which ring should be used with the mount.

Remember, mounts and the M66 ring have their own TM, TM 9-1005-245-13&P. The MK64 mount is covered by TM 9-1010-231-13&P. They're the best places to go for mount and ring info.

If you have mount and ring questions, contact TACOM's Barb Painter at (309) 782-4403/DSN 793-4403 or e-mail [painterbr@ria.army.mil](mailto:painterbr@ria.army.mil)

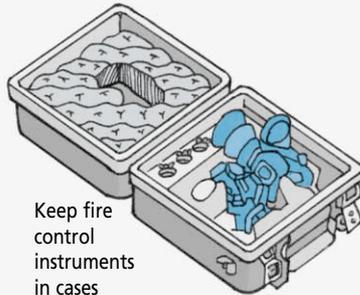
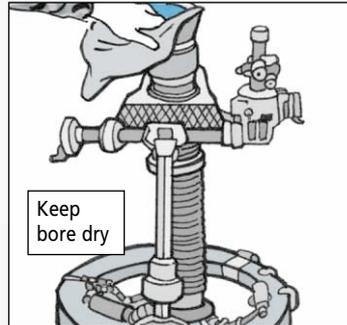
*Half-Mast*



# Defrost COLD Problems with PM



- ✦ Lube with LAW instead of GPL when the temperature drops below 10°F. LAW does not get as stiff as GPL in cold weather.
- ✦ Wipe the inside of the bore dry before you go into the cold. That helps prevent ice from forming.
- ✦ Cover rounds until they're ready to be fired. That stops ice from coating them.
- ✦ Keep fire control instruments in their cases. The cases protect the instruments' delicate optics against the the cold.
- ✦ Never bring fire control instruments directly from the cold into a warm place. The sudden change in temperature cracks optics and lets condensation form inside the instruments. Leave the instruments in a sheltered—but unheated—place where they can gradually warm before you bring them inside.
- ✦ When you bring your mortar inside, wait at least an hour before cleaning and lubing it. That lets the mortar stop sweating from condensation and lets you wipe out all moisture.



# STOP FREEZING LIKE THIS

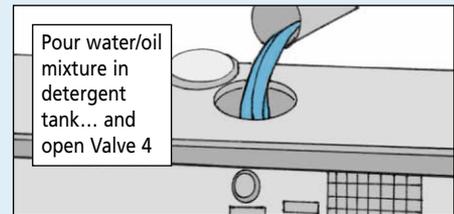
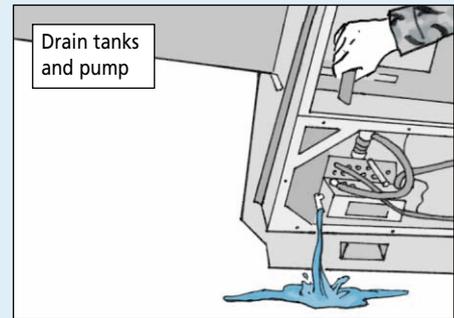
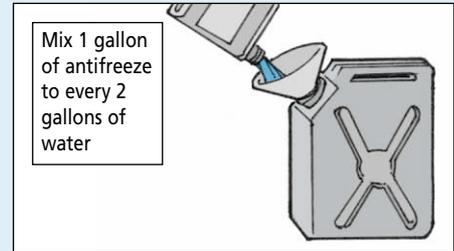


Both the M17 and M12 decons often sit for long periods without getting any use. Sitting in cold weather can produce unpleasant surprises, like water freezing in the tanks and pumps and causing serious damage. But a little PM can freeze out freezing problems.

Freeze protection is easier with the M17 because you can just run antifreeze through it. Mix 1 gallon of antifreeze, NSN 6810-01-181-7121, to every 2 gallons of water and fill the M17's tank with the mixture. The procedure begins on Page 2-55 in TM 3-4230-228-10.

It's a different story with the M12. You can't use antifreeze in it because it will mix with bleach and produce a toxic gas that can create enough pressure in the tank to rupture seals and valves.

The solution is general purpose lubricating oil (PL-S), NSN 9150-00-231-6689. First, park the M12 on level ground and drain all water from the main tank, prime detergent tank and pump. Then mix 3 pints of oil with 3 gallons of water. Pour the mixture into the detergent tank and open Valve 4. Run the pump 30 seconds, then drain the pump. Close Valve 4, but leave the pump drain valve open. Now the pump won't freeze.



# How to ID Masks

LET'S SEE, HARRISON... I KNOW I PUT YOUR MASK IN HERE *SOMEWHERE*...

COULD YOU GIVE ME AN HOUR?

I'M SUPPOSED TO LEAVE IN 15 MINUTES FOR THE EXERCISE. I DON'T HAVE AN HOUR!



IF YOU NBC NOCS ARE HAVING TROUBLE KEEPING TRACK OF THE MANY MASKS IN YOUR UNIT, HERE IS ONE WAY TO KEEP YOUR TRACKING ON TRACK...

Use metal dog tags, NSN 8465-00-242-4804, and dog tag covers, NSN 8465-00-999-7905. Attach them to the carrier D-ring with binder rings, NSN 7510-00-286-5787. Put a strip of embossing tape, NSN 7510-00-995-4895, on each side of the tag with the ID number and mask type and size. You'll need an embossing gun, NSN 7490-00-835-0443, to punch numbers on the tape. Or you can stamp the number directly on the dog tag.

Attach dog tag to D-ring



# STUCK FINGER REMINDER

IT'S ALWAYS A *SHAME* WHEN IT ENDS THIS WAY...

...HE WAS TOO *YOUNG* TO DIE!!



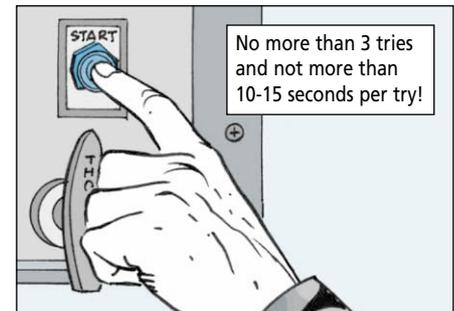
HERE LIES STARTER MOTOR  
BURNED OUT BY AN ITCHY FINGER  
PUSHED IN TOO LONG  
HE DIED TOO SOON.

**W**ord around the campfire is that way too many starters end up at support for service and repair, especially during cold weather.

Well, cold weather is here. That means some itchy fingers stay stuck on an engine's starter switch. All it takes is one finger stuck on the switch too long to burn out a good starter motor.

When you try to start your vehicle's engine, never keep the starter engaged for more than 10-15 seconds. Then **stop!** Give the starter at least one minute to cool off before trying again.

If your truck's engine won't start in three tries, call it quits. Call in your mechanic to find out what's wrong.



No more than 3 tries and not more than 10-15 seconds per try!

# HYDRAULIC CYLINDER REMINDER



Cold weather plays havoc with cylinder rods on construction equipment.

Before the day's run, eyeball the cylinder rods for ice build-up. Ice on the rods will scrape or cut seals when the rod is moved. Damaged seals lead to fluid leaks, which lead to NMC equipment. If you find any ice, get rid of it.

Another rod saver, no matter what the weather, is to exercise the cylinders weekly. This fights rust by spreading a thin coat of oil on the rod. Rust, like ice build-up, will scrape and cut the rod's seal.

If the equipment sits longer than a month, coat the polished cylinder rod with a light coat of GAA.



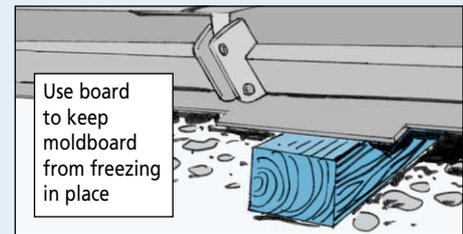
Conditions at the worksite can fool you.

For instance, mud is wet and soft during the day. But at night it can freeze as hard as concrete. A vehicle left sitting in mud at the end of the day will be frozen in its tracks the next morning.

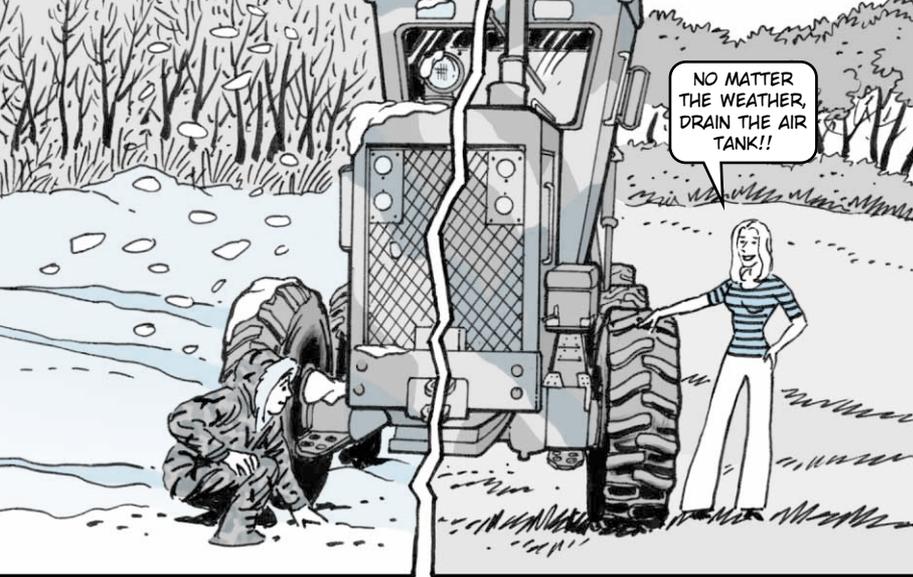
And, it doesn't matter if you're in the DEUCE, D5B or D7G tractors, or the M9 ACE—you can't rock the vehicle loose. You'll end up with broken track, snapped drive sprocket teeth and a vehicle that's still stuck.

Here's how to prevent that problem before the sun goes down:

- ★ Park your vehicle on high ground if possible. Water drains downhill, so the mud won't be quite as deep.
- ★ Avoid parking in deep ruts worn by other vehicles. Some are deep enough to bottom out your vehicle's hull. Leave it there and you won't be moving until spring.
- ★ Use a shovel to scoop out mud that has collected on and between roadwheels and drive sprockets. If there's no mud, it can't freeze.
- ★ Put a board between the ground and any moldboard. That way the mud can't freeze the moldboard in place.



# ICE IS A BRAKE BUSTER



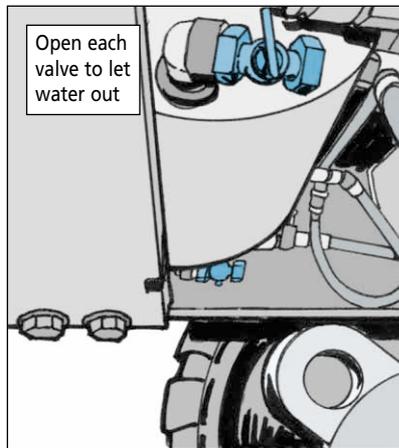
**M**other Nature is kind of like a yo-yo. That is, the temperature goes up and down. One day it's warm, the next day it's cold.

A change in temperature means trouble is brewing if you don't drain your vehicle's air tanks, especially in warm weather. That's because moisture corrodes air lines, relief valves, safety valves and even the tank itself.

But frozen water (ice) in your vehicle's brake system is double trouble!

Water expands when it turns to ice. The pressure will burst most anything. You lose your brakes, control of your vehicle, maybe your life.

The solution is simple—after the day's run, no matter what the weather, drain the vehicle's air tanks.



## SIR ERNEST SHACKLETON AND THE TRUE STORY OF THE ENDURANCE EXPEDITION



### London Times

#### MEN WANTED FOR HAZARDOUS JOURNEY

Small wages. Bitter cold. Long months of complete darkness. Constant danger. Safe return doubtful. Honor and recognition in case of success.

Sir Ernest Shackleton.

**T**HIS AD WAS PLACED IN THE LONDON TIMES NEWSPAPER IN 1914. TWENTY-SEVEN MEN ANSWERED THE CALL AND SAILED WITH SIR ERNEST SHACKLETON IN HIS SHIP, THE ENDURANCE, TO THE ANTARCTIC. THEY WOULD NEVER REACH THE ANTARCTIC CONTINENT, BUT WOULD SPEND ALMOST TWO YEARS TRAPPED ON A SINKING SHIP, AN ICE FLOW, AND A ROCK ISLAND.

ALTHOUGH THEY WITHSTOOD THE MOST INCREDIBLE HARDSHIP AND PRIVATION, **NOT ONE MEMBER OF THE CREW WAS LOST.** ALL 28 MEN SURVIVED TO SEE THEIR HOME IN ENGLAND AGAIN. HOW WAS THAT POSSIBLE? WE'RE GLAD YOU ASKED...



SIR ERNEST, DO YOU THINK THAT AD WAS SUCH A GOOD IDEA?

BRITISH IMPERIAL EXPLORERS CLUB



"SAFE RETURN DOUBTFUL!"

THAT WOULD LIKELY SCARE MEN OFF THAN ATTRACT THEM.

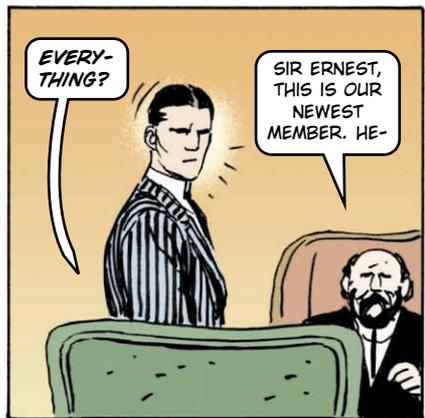


THIS WILL BE NO FOX HUNT. TO SURVIVE, THEY MUST BE THE TOUGHEST AND THE BRAVEST OF MEN. THEY WILL MAKE UP THE LAST GREAT POLAR EXPEDITION.



IS THE ENDURANCE PACKED AND READY TO GO?

I'VE PACKED ALL THAT MY CREW AND I NEED FOR ANTARCTICA.



EVERYTHING?

SIR ERNEST, THIS IS OUR NEWEST MEMBER. HE-



PARDON ME! WHEN I SAY ALL IS PACKED, I MEAN ALL!



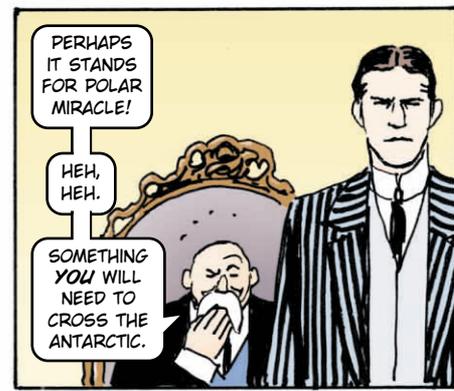
I DID NOT MEAN TO OFFEND YOU, SIR.

AND DID YOU PACK PLENTY OF PM?

PM? WHAT NONSENSE IS THAT?



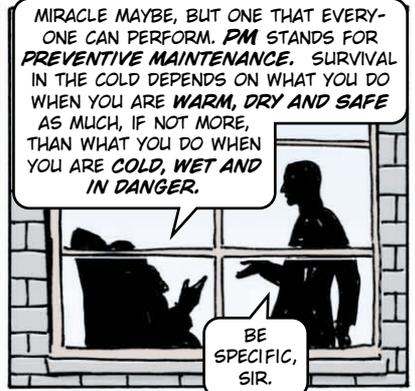
I KNOW OF NO SUCH THING AS PM.



PERHAPS IT STANDS FOR POLAR MIRACLE!

HEH, HEH.

SOMETHING YOU WILL NEED TO CROSS THE ANTARCTIC.



MIRACLE MAYBE, BUT ONE THAT EVERYONE CAN PERFORM. PM STANDS FOR PREVENTIVE MAINTENANCE. SURVIVAL IN THE COLD DEPENDS ON WHAT YOU DO WHEN YOU ARE WARM, DRY AND SAFE AS MUCH, IF NOT MORE, THAN WHAT YOU DO WHEN YOU ARE COLD, WET AND IN DANGER.

BE SPECIFIC, SIR.



SPECIFICALLY, THEN...ARE YOU TAKING STOVES FOR COOKING AND HEATING?

OF COURSE.

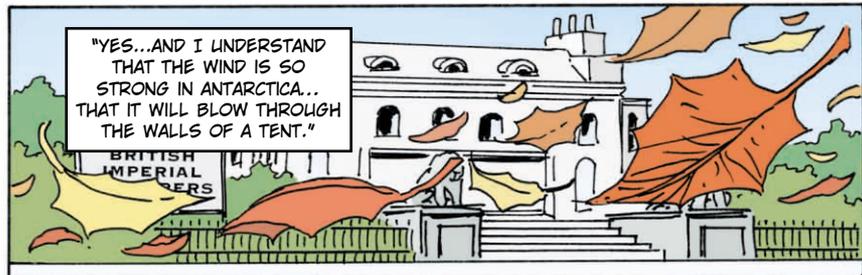
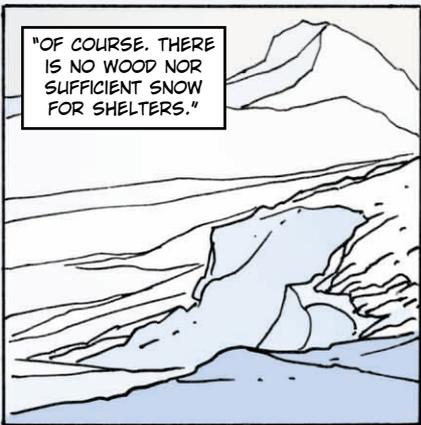
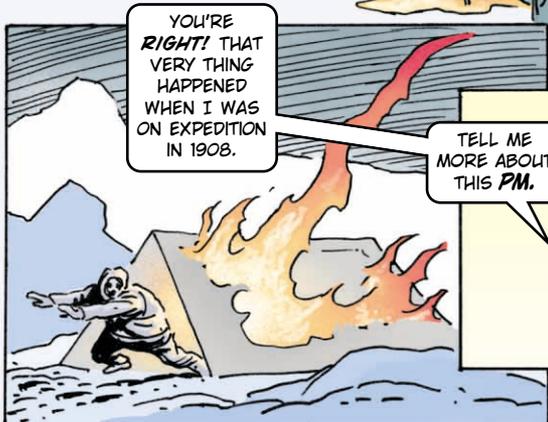


AND WHAT WILL YOU USE FOR FUEL?

SEAL BLUBBER. A SQUARE FOOT WILL BURN FOR SEVERAL HOURS.



"UNLESS YOU HAVE DONE PM ON YOUR STOVES BEFORE YOU LEAVE—LIKE COATING THEM AND REINFORCING THEIR STACKS— THAT OILY SOOT WILL IGNITE AND BURN YOUR MEN AND MORE THAN LIKELY DESTROY YOUR STOVE."





KEEPING WARM IS NOT MERELY A MATTER OF WEARING HEAVY CLOTHING.

HEAVY CLOTHES CAN MAKE YOU **SWEAT** AND FREEZE. YOUR CLOTHES MUST **REPEL** THE WIND, BUT ALLOW SWEAT TO ESCAPE.

**LAYERS** OF CLOTHES ALLOW AIR BETWEEN THEM AND THE SKIN.

THEN **PM** IS PLANNING FOR THE **RIGHT** EQUIPMENT, AS WELL AS **PREPARING** YOUR EQUIPMENT.



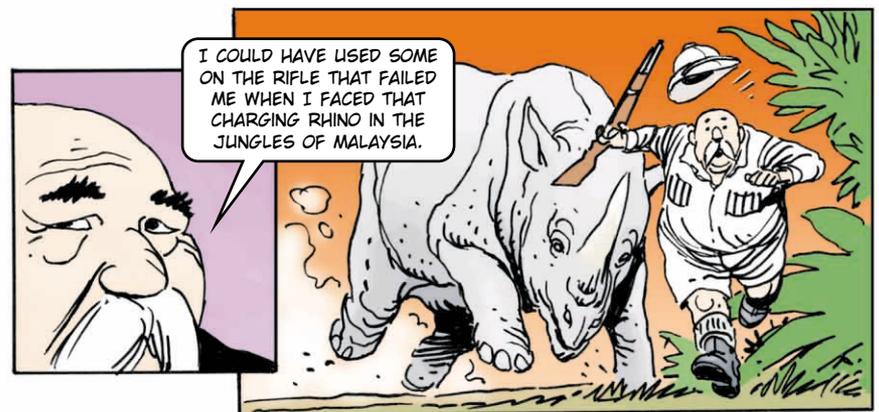
THE WORD **PREVENTIVE** MEANS JUST WHAT IT SAYS—DOING SOMETHING **NOW** TO PREVENT TRAGEDY **LATER**.



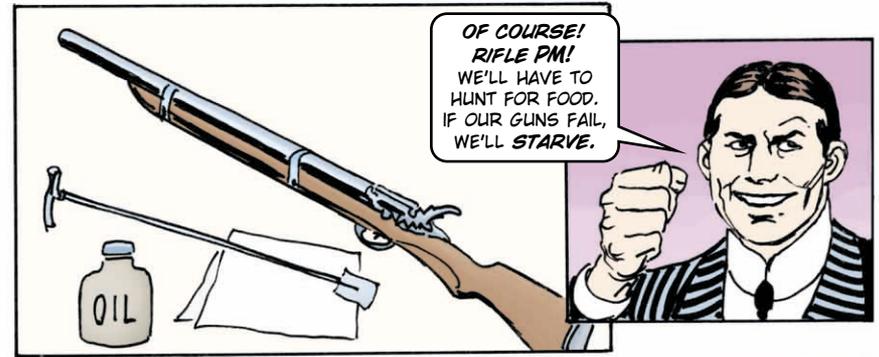
IN MOST CASES, WE ARE TALKING ABOUT EQUIPMENT MAINTENANCE, BUT IN COLD WEATHER GOOD PLANNING IS **PM**, TOO.



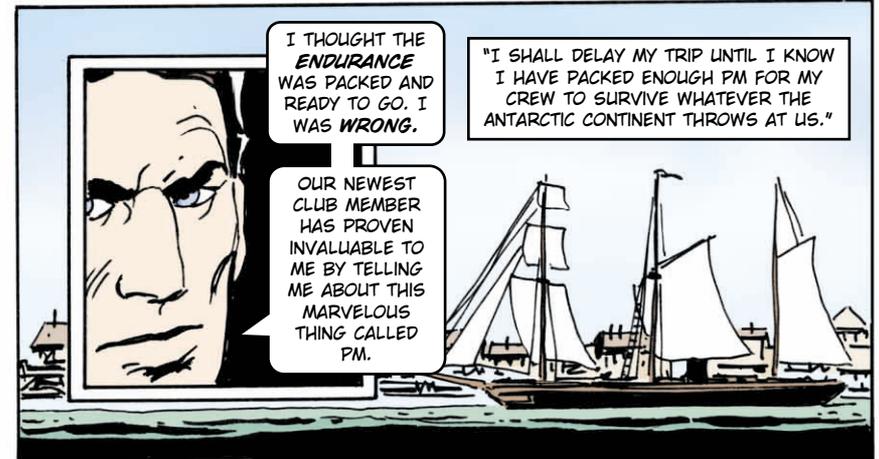
BY JOVE, I LIKE THE SOUND OF THIS **PM**!



I COULD HAVE USED SOME ON THE RIFLE THAT FAILED ME WHEN I FACED THAT CHARGING RHINO IN THE JUNGLES OF MALAYSIA.



OF COURSE! **RIFLE PM!** WE'LL HAVE TO HUNT FOR FOOD. IF OUR GUNS FAIL, WE'LL **STARVE**.



I THOUGHT THE **ENDURANCE** WAS PACKED AND READY TO GO. I WAS **WRONG**.

OUR NEWEST CLUB MEMBER HAS PROVEN INVALUABLE TO ME BY TELLING ME ABOUT THIS MARVELOUS THING CALLED **PM**.

"I SHALL DELAY MY TRIP UNTIL I KNOW I HAVE PACKED ENOUGH **PM** FOR MY CREW TO SURVIVE WHATEVER THE ANTARCTIC CONTINENT THROWS AT US."



WELL DONE, SIR ERNEST. YOURS IS AN EXPEDITION I WOULD ENJOY.

THEN *JOIN* US. WE COULD USE A MAN OF YOUR WISDOM.

THANK YOU, BUT NO. I HAVE MY OWN MISSION, AND MANY PEOPLE ARE DEPENDING ON ME.



VERY WELL, SIR. I HOPE TO HEAR OF YOUR EXPLOITS WHEN I RETURN. BUT, NOW...

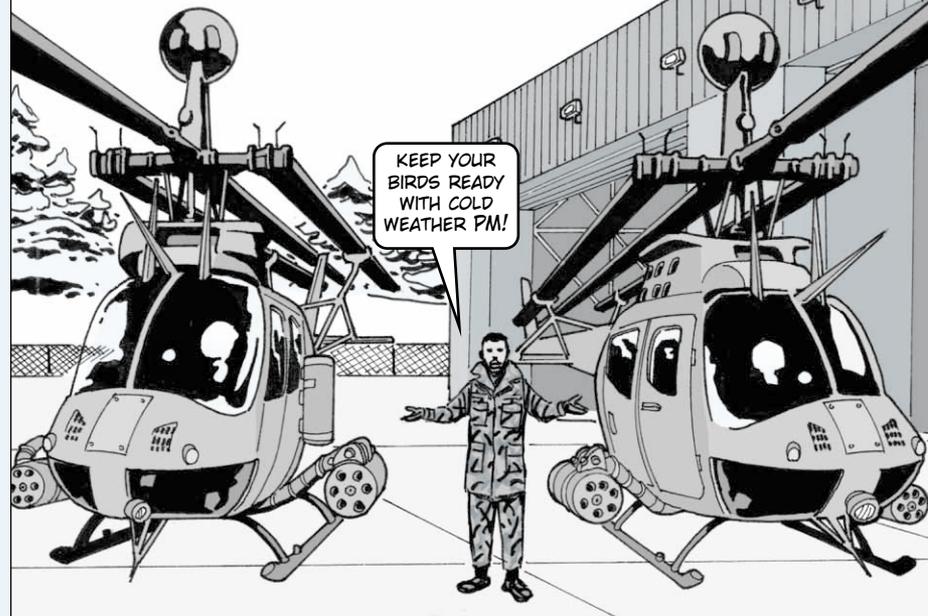
...I'M OFF TO DO **PREVENTIVE MAINTENANCE.**

WHEN IT COMES TO COLD WEATHER **PM**, I DON'T LEAVE HOME WITHOUT IT.

OCT 02

All Aircraft...

## KEEP BIRDS FLYING IN BONE-CHILLING COLD



KEEP YOUR BIRDS READY WITH COLD WEATHER **PM!**

An aircraft needs attention when the temperature takes a dive and Old Man Winter hurls snow, wind and ice at you. But top-notch aircraft mechanics know that preventative maintenance is hard during knee-knocking cold weather.

When winter starts putting its grip on you, move your aircraft inside to perform maintenance. If you can't move inside and you're faced with some extended time outside, use a maintenance shelter or rig a temporary shelter out of canvas or a salvaged cargo parachute canopy. Warm your shelter with a ground heater.

A warm and ventilated work area will let you get the PM done without the nuisance of bulky clothing and heavy gloves.

If you can't rig a shelter, dress for the cold. Work in short bursts and take breaks to warm up.

HERE ARE OTHER POINTERS TO CONCENTRATE ON DURING **COLD WEATHER.**



35

PS MORE

PS 599

## Cold Fuel

Water in fuel can form ice that blocks fuel lines. So keep fuel tanks topped off. The gap between the top of the tank and the fuel is full of cold moist air. When that moisture condenses, water drips into your fuel.



When you refuel a bird outside in sub-zero temperatures, always check the fuel level before moving it inside. When an aircraft with a full fuel tank is moved into the hangar, the fuel level will rise as the fuel warms and expands. Opening the filler cap could give you a fuel spill to clean up.

Static electricity can ruin a cold day too, so be extremely cautious during refueling. The lower the temperature, the drier the air, the more static electricity becomes a fire hazard.

Static can result from aircraft moving through the air or by the movement of frost or snow across the aircraft surface. Fuel flowing through the filler neck can also generate a spark that could ignite the fuel.

So make sure you find a good place to ground the aircraft. Also make sure the aircraft and tanker are electrically bonded together, and the nozzle is electrically bonded to the bird before you remove the cap. When you're freezing while refueling, you might be tempted to neglect a ground or bond. **Don't!** You must follow grounding procedures without shortcuts.



If you're not using a closed circuit fueling nozzle, put the regular nozzle in all the way. That keeps the danger of static down and reduces the chance for a spill.

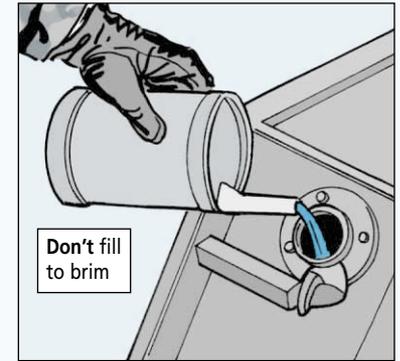


## Cold Oil and Grease

Fuel is affected by cold weather but so is oil and grease. As the mercury plummets, fuel is harder to ignite, oil thickens, and grease gels. So you must use the right fuel and lube for cold conditions. Follow your TMs' recommendations for the right fuel, oil, and grease to use in winter.

When you service oil systems on a stone-cold aircraft, never fill oil reservoirs to the brim. Otherwise, when the oil heats up, you can count on cleaning up oil overflows.

Oil leaks are a chronic problem in winter weather. So check connections, joints, gaskets and seals regularly, especially during pre-flight inspections.



## Cold Seals

Old Man Winter is unrelenting and seals and gaskets get the brunt of his blast.

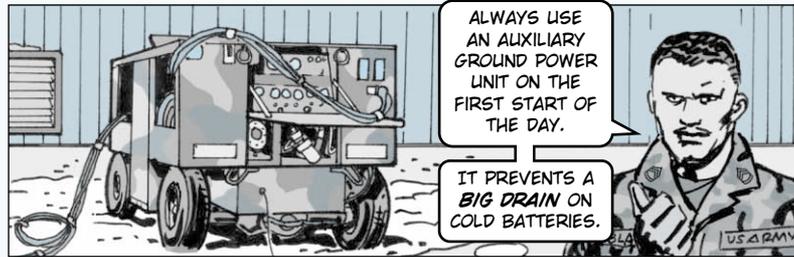
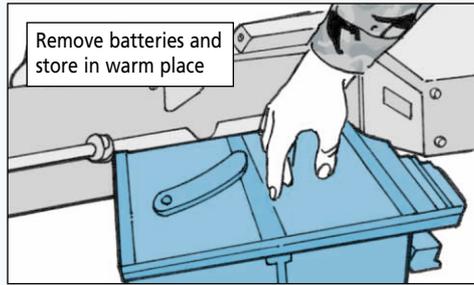
When they contract due to cold, they open the door for leaks. Moisture can seep in around seals and freeze. The ice formed will cut seals. Get familiar with your bird's vulnerable seal and gasket trouble spots. Clean all exposed pistons of servos daily to prevent ice and dirt build-up. That will reduce the wear and tear on seals and gaskets. Make sure all leaks are taken care of.



## Cold Batteries

Your nickel-cadmium batteries will do their job without much extra effort on your part. But if your bird sits in a deepfreeze for days on end, cold starts will shorten battery life.

When possible, bring your batteries in from the cold if the forecaster predicts several days of subfreezing temperatures. If it's not possible, turn on the landing gear lights, searchlight or cabin lights, for 30 seconds before an engine start. That "load" will warm up the battery a bit.



Lead-acid batteries should also be kept warm. Cold lead-acid batteries lose their charge much faster than nickel-cadmiums. If you bring your batteries inside, never store nickel-cadmium and lead-acid in the same area. Fumes from the lead-acid battery can cause the nickel-cadmium to discharge.



## Cold Tires

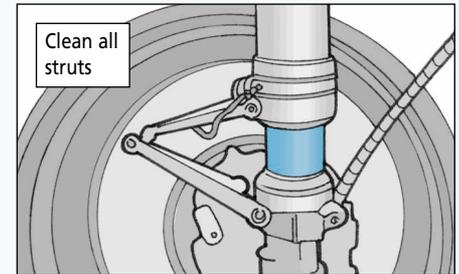
Cold reduces tire air pressure, so check your helicopter's tire pressure often.

Tires frozen to the ground can be freed with liquid deicer. Move the aircraft immediately because deicer will form slush and re-freeze.

Check your landing gear often. Use a clean rag dampened with hydraulic fluid to remove ice, dirt and grit from the struts and pistons.

Service pressurized systems according to the instructions in each aircraft maintenance manual. Remember that any moisture will freeze into ice crystals and damage seals.

Do not bend rubber hoses or rubber-covered wires while they're cold soaked. Rubber gets brittle and stiff and could crack.



## Cold Weather Guides

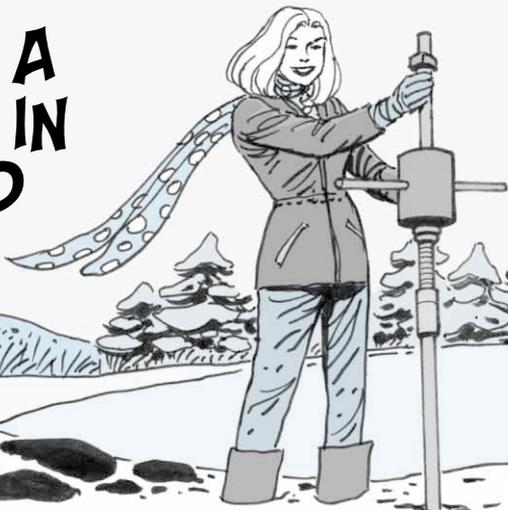
For more information on winter maintenance operations, check out FM 31-70, *Basic Cold Weather Manual* (Apr 68) and FM 31-71, *Northern Operations* (Jun 71).

When the cold hits, make sure you hit your -23 maintenance manuals and chapter 10 of your general aircraft TM 1-1500-204-23-1 for good cold weather PM to protect your birds, so you can fly high.

If your bird has specific covers for the rotor head and engine plugs, use them. If covers are unavailable in heavy snow, remove the snow accumulation periodically during snowfall.

Extreme caution should be exercised around cold metal. Working on small parts often requires removing your gloves. Stop work frequently to put your gloves back on to warm up your hands. Use the buddy system to keep frostbite in check.

# GETTING A GROUND IN THE COLD



THANKS FOR KEEPING MY SHELTER WELL-GROUNDED!

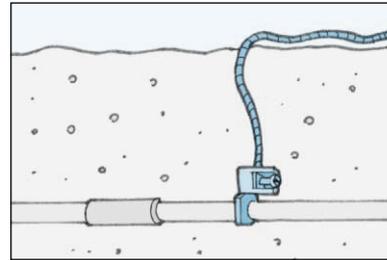


COLD MEANS MORE SOIL RESISTANCE AND GREATER GROUNDING IMPEDANCE.

TO US THAT TRANSLATES, "GROUNDING AIN'T GOING TO BE EASY, BUT IT'S GOT TO BE DONE."

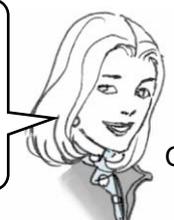
HERE ARE A FEW TIPS THAT MAY HELP...

1. Try to ground to a buried metal object like an underground pipe. That will save you a lot of digging or driving in frozen ground. However, the metal object has to be buried at least 2½ feet below the surface; cannot contain, or transfer, gasoline or other flammable liquids; must be all non-coated metal; and you must test its conductivity before you use it.



IF YOU **DO** HOOK UP TO A BURIED METAL OBJECT, MAKE SURE YOU CONNECT THE GROUNDING ELECTRODE CONDUCTOR TO THE OBJECT WITH A SOLID CONNECTION. A WRAP-AROUND OR TIE-IT-ON **WON'T DO!**

Terminal lug NSN 5940-00-271-9504



OCT 02

2. If no buried object can be found, use your ground rods. Drive them in as far as you can. If you use the 8-ft, 3-section rod, NSN 5975-00-878-3791, you can use slide hammer, NSN 5120-01-013-1676, to drive it in. If you're using the 6-ft, non-sectional rod, you'll have to use a sledge hammer to do the job.

Rods 5975-01-143-7340

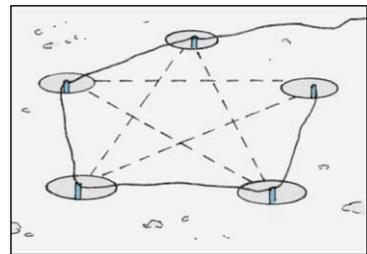
Couplings 5975-00-794-2523

No. 6 AWG wire 6145-00-395-8799

Drive/head stud 5975-00-924-9927

Clamp 5999-00-186-3912

If you cannot get the rods deep enough—below the frost line and to the water table—install a cluster of shorter rods. Depending on the number of rods you have, you should install them around the perimeter of your shelter or generator in a triangle pattern. If you cannot install around the perimeter, use a star-pattern. The distance between rods should be 2-4 rod lengths.



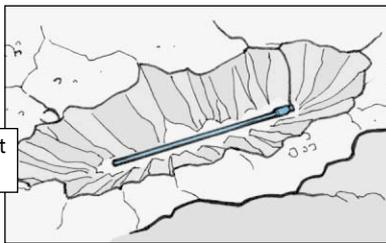
PS 599

41

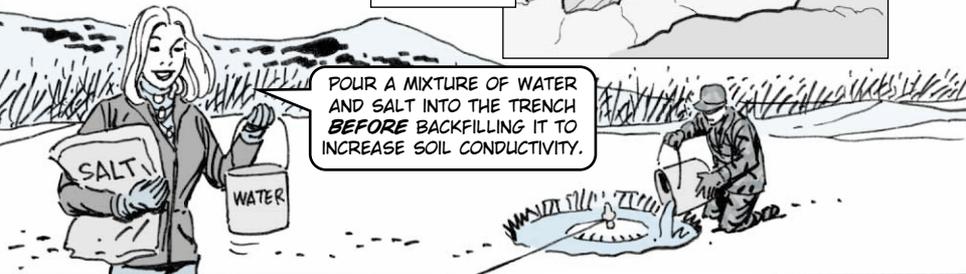




3. Another option is to bury the rods horizontally. Dig a trench at least 2½ feet deep. Install the ground rod horizontally or put at least 10 feet of copper 2 AWG bare wire in the trench.



Trench at least 2½ feet deep?



POUR A MIXTURE OF WATER AND SALT INTO THE TRENCH BEFORE BACKFILLING IT TO INCREASE SOIL CONDUCTIVITY.

4. It is very important in cold weather to bond equipment and shelters located within arms length of each other to eliminate any hazardous voltage that may develop between them. If the equipment is not bonded, that voltage can use you as the conductor if you touch both pieces of equipment at the same time.



SHELTER BONDING SHOULD BE DONE BY EITHER RUNNING A BONDING STRAP OF AT LEAST 6 AWG BETWEEN THE TWO SHELTERS' GROUNDING TERMINALS OR BETWEEN THE TWO GROUND RODS PROVIDED FOR EACH SHELTER.

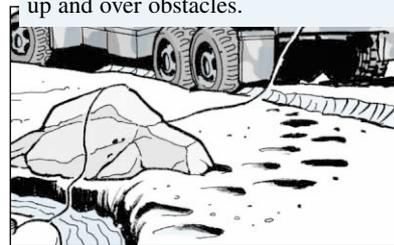


5. REGARDLESS OF THE WEATHER, THERE ARE SOME GROUNDING FUNDAMENTALS THAT YOU SHOULD ALWAYS FOLLOW...

—The grounding electrode conductor should be as large as possible, at least 6 AWG. The conductor should be copper.

—Minimize any twists, loops or sharp bends and remove all knots from the conductor.

—Run the conductor as straight and as short as possible in a downward direction. Do not run the conductor up and over obstacles.



—Make sure the bonding surfaces are free of paint, corrosion, grease or dirt.

—Never twist or tie a ground wire around a ground rod. Use the bolt or clamp. If there is no bolt, then 24 tightly wound turns of stripped telephone wire or other bare wire should hold the strap in place. This is a temporary measure only. Get a clamp when you can.



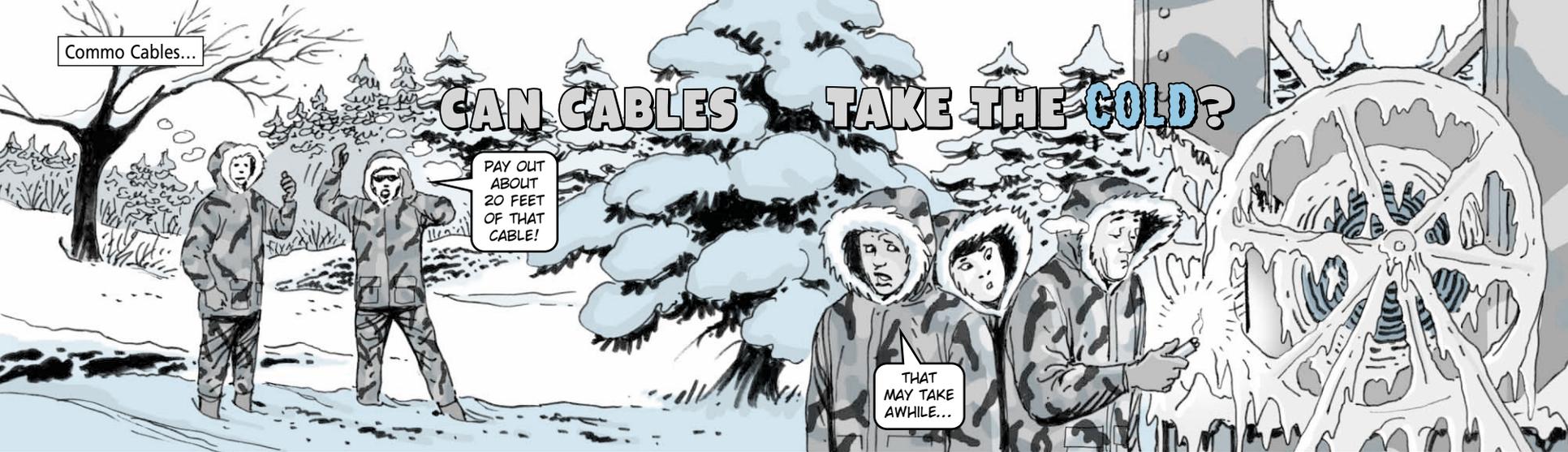
MAKE SURE THE CONNECTION POINT IS NOT CORRODED AND THE CONNECTOR IS NOT LOOSE.

—Think safety when installing ground rods. Wear goggles and gloves.



ORDER A COPY OF THE EARTH GROUNDING AND BONDING PAMPHLET PUBLISHED BY CECOM. CALL DSN 992-0084 OR (732) 532-0084.

# CAN CABLES TAKE THE COLD?



EXTREME COLD IS BRUTAL ON FIELD AND TELEPHONE CABLE.

INSULATION TURNS STIFF AND BRITTLE. IT CRACKS AND BREAKS OPEN IF CABLE'S HANDLED TOO ROUGHLY.

ONCE THAT HAPPENS, MOISTURE SEEPS INTO THE WIRE CONDUCTORS AND CAUSES A SHORT.



Not only is cold cable more likely to crack, it's also stiff and harder to handle. A reel of cable may even freeze into its coiled shape.



The remedy for cold cable is a warm shelter and careful handling. Together they protect cable from damage and make it easier to control.

Take tightly coiled cable, unwind it into bigger coils, and store it where it's warm before taking it out in the cold. That'll reduce the risk of a pinch or break.

The same principle goes for cold, stiff cable, too. Before coiling it, warm it up, if possible.



And don't forget to handle cold cable carefully. Slow and easy is the way when you pay out, reel in or flex cable. That helps avoid cracking the insulation.

If you have to splice or repair cable, use TL-600 cold weather tape, NSN 5970-00-685-9059, which comes in a 30-ft roll. This tape holds fast in cold weather and can be used without being warmed up. Most other friction and rubber tapes don't hold as well in extreme cold.

Metal connectors and receptacles shrink in the cold, making cable connections stubborn. Here again, take care when you hook up or unhook cables. Rough stuff invites damage.



# WARD OFF WINTER WOES

WHEN TEMPERATURES PLUNGE, BATTERIES NEED EXTRA CARE.



Keep batteries stored until you're ready to move out. Then warm up only as many as you'll need.

Lithium batteries won't need warming up unless they've been in temperatures below -20°F.



Protect dry cell batteries by keeping them out of the cold and wind. Cover them with your clothing. Put them in a vehicle or commo shelter when possible. Sheltering batteries behind a wind break is better than leaving them out in the open. Putting them next to your body is best of all.

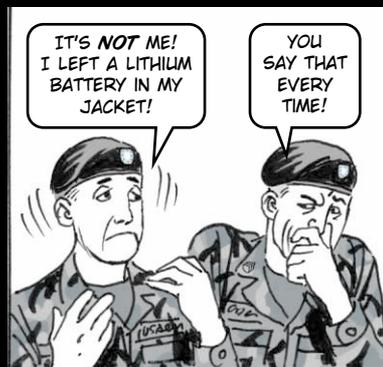


Never stow batteries next to a heater or stove. That's too much warmth for most batteries and they could vent or rupture.



Keep spare batteries handy so you can make a switch when the ones in your gear start to fade. When you remove batteries from your gear, put them in an inside shirt pocket to warm up. After a while, they'll regain their punch.

Never store a lithium battery in your clothing after the Complete Discharge Device has been activated. The battery could vent harmful gas.



If you won't be using your gear right away, don't install the batteries. Keep them warm as long as you can.

If you warm batteries in a heated place, watch for sweating. Wipe off any moisture or it will freeze when you go back into the cold.



Finally, if your gear has plastic pins in the battery compartment, take care when installing the battery. Cold pins become brittle. They'll break if handled too roughly.

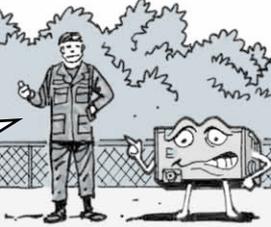


# TAKING THEM OUT OF STORAGE

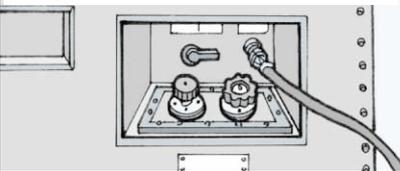
WHEN IT'S COLDER THAN A WELL-DIGGER'S NOSE, IT'S **NOT** THE TIME TO FIND OUT THAT YOUR H120 OR H120-1 SPACE HEATER IS ON THE FRITZ.

THESE SPACE HEATERS, NSN 4520-01-367-2739 AND NSN 4520-01-439-1682, HAVE A REPUTATION FOR COMING OUT OF LONG-TERM STORAGE WITH PROBLEMS.

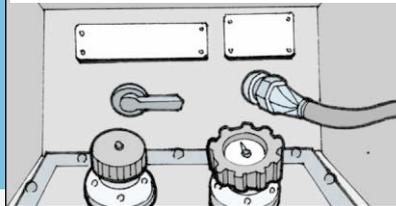
HERE ARE **10 THINGS** YOU NEED TO BE ON TOP OF WHEN YOU BRING A HEATER OUT OF STORAGE.



**1.** Take a good look at all tubes and fittings. Look for stripped threads or poor alignment. Make the fuel lines a special priority. Fuel leaks are more than just a maintenance problem!



**2.** Put an eye on the fuel supply and return lines. Sometimes the storage goblins reverse them. Use your TM to make sure the lines are right.

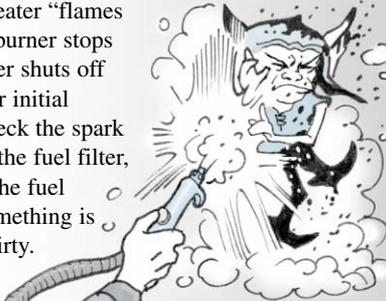


**3.** Put the fuel valve setting in the right place. Chances are, you'll be drawing from the internal fuel tank so a switch set in the external mode will have the heater sucking only air.

**4.** Look for broken CB2 circuit breakers. Those storage goblins love to break switches.



**5.** If the heater "flames out"—the burner stops or the heater shuts off during your initial runup—check the spark gap, clean the fuel filter, and clean the fuel nozzle. Something is probably dirty.



**6.** If the problem is no fuel pressure, eye the fuel coupling for installation of pins. Make sure all is well with the fuel pump, too. Especially, look for loose or stripped fittings on the suction side of the pump and make sure you don't have a broken fuel coupler.

**7.** If the LED indicator does not come on or the heater does not cycle right, could be you have a bad remote thermostat.



**8.** If the heater fan rattles or doesn't rotate, chances are good you have a loose blower fan.



**9.** If the burner doesn't work,...



...make sure the ignition transformer does.



**10.** Finally, if it is really cold, watch out for fuel line freeze-up and keep water out of the fuel and the fuel filter.



YOUR BEST FRIEND IS NOT YOUR MOMMA WHEN IT'S 20 BELOW—IT'S YOUR **HEATER!** MAKE SURE YOUR BEST FRIEND IS CAPABLE OF DOING ITS JOB.



Heaters...

# APPROVED TENT HEATER

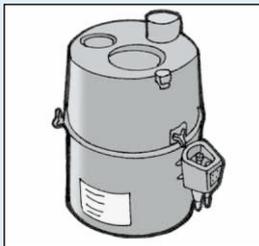


**NEVER HEAT YOUR TENT WITH A COMMERCIAL HEATER. UNVENTED COMMERCIAL KEROSENE HEATERS MAY EMIT DANGEROUS GASES THAT COULD MAKE YOU SICK... OR KILL YOU.**

**NO COMMERCIAL HEATERS MEET ARMY REQUIREMENTS FOR FIELD ENVIRONMENTS.**

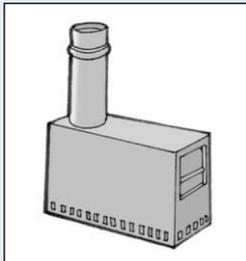
**WARM YOUR TENT SAFELY AND EFFICIENTLY WITH THESE HEATERS...**

## H-45 space heater NSN 4520-01-329-3451



The H-45 replaces the old potbelly M-1941. Designed to heat the General Purpose and TEMPER tents, it burns liquid and solid fuels.

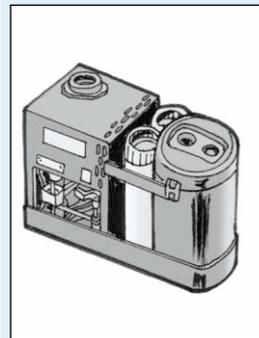
## Arctic space heater NSN 4520-01-444-2375



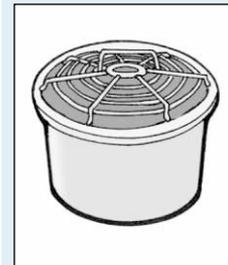
The Arctic heater replaces the gasoline burning M-1950 Yukon heater. It's a lightweight, portable heater for 5-man and 10-man arctic tents. It also burns liquid and solid fuels.

## Small space heater NSN 4520-01-478-9207

This heater is ideal for use in smaller tents like the 4-man soldier/crew tent. It burns liquid fuel and it has a built-in tank, so you won't need a fuel can or stand.

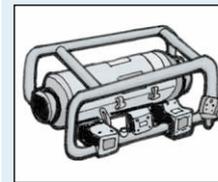


## Thermoelectric fan NSN 4520-01-457-2790



This fan is a compact, self-powered unit that fits on top of any military tent heater. The fan uses some of the heat to turn the fan blades, which circulate heated air, improve comfort and save fuel.

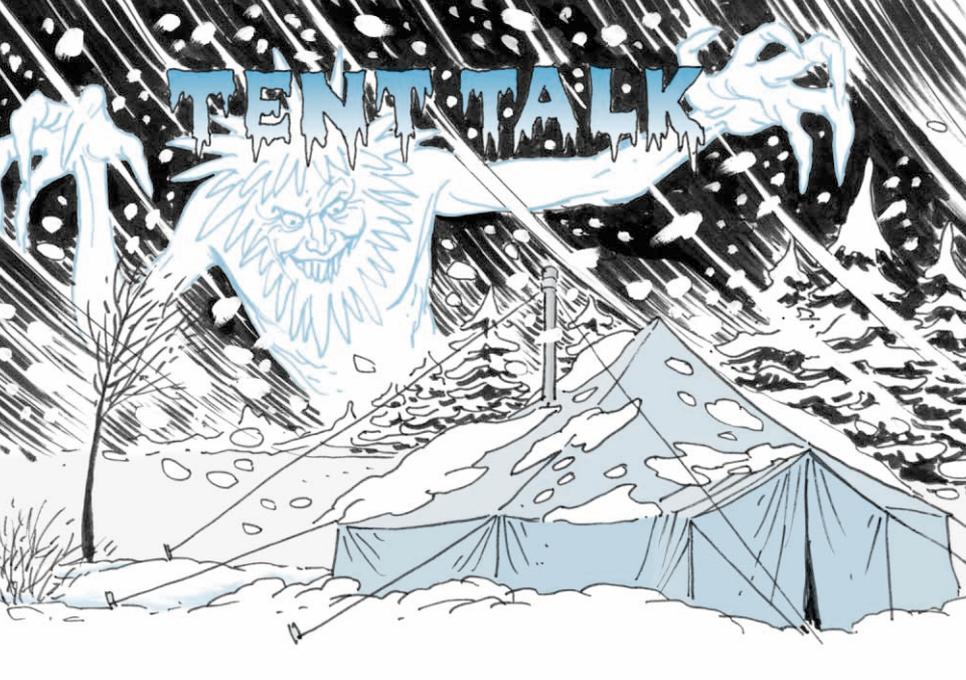
## Convective space heater NSN 4520-01-431-8927



This heater provides forced hot air for tents and shelters. This electric heater generates its own power and recharges its battery.

**YOUR AUTHORITY FOR ORDERING THESE HEATERS IS CTA 50-909.**





# TENT TALK

SOMETIMES THE ONLY THING THAT STANDS BETWEEN YOU AND A HARD WINTER'S NIGHT IS YOUR TENT.

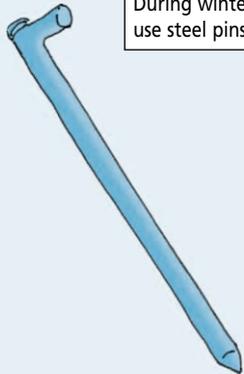
PROTECT IT AND IT'LL PROTECT YOU.



## Tent Pins

Use 12-in steel pins, NSN 8340-00-823-7451, instead of the usual aluminum pins. If the ground's frozen hard and you can't pound the steel pins in, here's a solution: Chop small holes in the ground for them. Then fill the holes with slush or water. It'll freeze and anchor the pins.

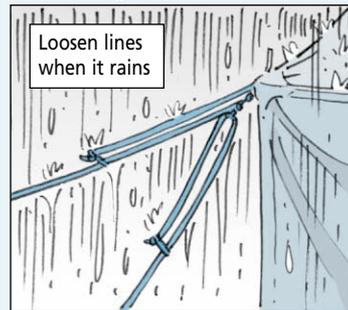
Remove pins from frozen ground by chopping the ground around them until they loosen up. Never pound them sideways to loosen them. You'll just bend them and make them unusable.



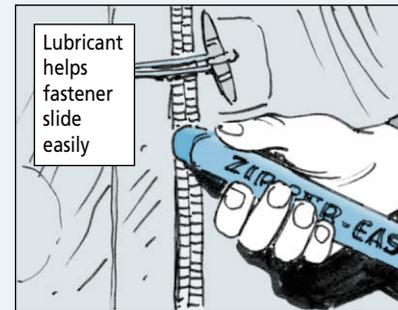
During winter, use steel pins

## Ropes and Fasteners

Draw tent ropes tight to stand up to high winds. But when the weather's wet, they need some slack to allow for shrinkage.



Don't get stuck with a slide fastener that won't slide. Slide fastener lubricant, NSN 9150-00-999-7548, unsticks them.



## Canvas

On frame-type tents, sometimes it's hard to stretch cold canvas completely over the frame. Never force it. Lay it over the frame and secure it. When heat from inside the tent warms the canvas, finish tying it down.

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



## Heaters

Make sure you're familiar with the operation and maintenance of your tent heater before you go into the field. Used incorrectly, heaters can cause fires and leak dangerous fumes.

## Snow

Snow on the roof can bring a tent down on top of you. When fiberglass poles are cold, they can bend and break under the weight of snow. So, shake the snow off the canvas before it gets too heavy. Better yet, clean the snow off with a snow rake, NSN 5120-01-464-6340. It has an aluminum telescopic pole that extends your reach to 18 feet. The headshed is working to add the rake to all tent TMs.

## Field Manuals

Finally, read FM 31-70, *Basic Cold Weather Manual*, for tips on tent placement and cold-weather information. See FM 10-16, *General Fabric Repair*, for the facts on tent repair.

# DON'T LET WASHING LEAVE



In bone-chilling weather, you don't want to find out your extended cold weather clothing (ECWCS) can't do its job because you didn't do your job taking care of it. That would be a chilling experience indeed. Here's how to keep the chill out:

**Wash ECWCS only in warm water.** Washing in hot water hurts the fabric's water repellency and fades its color. Wash ECWCS in warm water on PERMANENT PRESS or NORMAL COTTON STURDY. Use any standard liquid or powdered detergent, but **no** bleach. Rinse **thoroughly** in warm water. Any detergent left on the fabric hurts repellency.

Tumble dry on PERMANENT PRESS. Tumble drying helps restore water repellency. But don't let the ECWCS get burning hot. That can damage it. Take it out of the dryer as soon as it's dry.



# ECWCS WASHED UP



**Patch small holes while they're small.** Take a patch kit to the field and repair holes or rips as soon as possible. Follow the instructions on the kit. If a hole goes unrepaired for long, it gets too big to repair and you've got to toss the EWCS. Get the patch kits at your local military clothing sales store. You can't patch ECWCS more than 3 times or patch more than a total of 15 inches in length. After that, it should be turned in.



If you notice moisture's stopped beading up on the outside of ECWCS, use water-repellent additive, NSN 8030-01-408-9446, next time you wash it. Follow the additive instructions on the label.

# BOOTS, DO YOUR STUFF!



YOU DID YOUR STUFF, NOW IT'S OUR TURN!

WE'LL KEEP YOUR FEET WARM IN THIS COLD!

If your boots don't do their stuff when it comes to keeping your feet warm, your dogs will soon be whimpering in the cold. Here are some ways to help your boots and **keep** your feet warm:

## Patch Holes Quick

A hole lets water get at the boot's insulation. Wet insulation can't stop cold and soon you have cold feet. Patch holes as soon as you find them with cold-weather boot maintenance kit, NSN 8465-00-753-6335. Put the adhesive on both the boot and patch.



That's only a temporary fix for the field, though. As soon as you get back from the field, turn the boots in for repair or replacement.

An open air pressure relief valve lets in almost as much moisture as a puncture. Keep the valve closed unless you're flying in an aircraft. Then be sure to close the valve as soon as you land.



## Think Dry

Putting on damp socks is about as bad as going barefoot. When you go to the field, take extra socks and change them often.

Never place your boots next to a heater at the end of the day. True, extreme heat will dry out the boots, but it'll also leave them stuck to the floor.

When you're in the field, try hanging up your boots high from the center of the tent. Heat rises and dries your boots without melting them.



## How to Clean

Use only a mild detergent and water to clean your boots. Wash the insides at least once a month. Take the laces out and clean between the tongue and eyelets. Dirt or grit there wears a hole in the boots eventually.

For a really stubborn stain, use a spray-on general purpose detergent, NSN 7930-00-357-7386. What you don't want to use on your boots is paint or shoe polish. They break down the rubber coating and soon you'll need a new pair.

MILD  
DETERGENT  
ONLY FOR  
CLEANING  
ME.

NO PAINT  
OR POLISH,  
PLEASE.



# Sleep Better With Sleeping Bag PM

WHY IS IT SO-O-O COLD?!



WHADDYA EXPECT? YOU DIDN'T PAY ANY ATTENTION TO ME!

OF COURSE I'M GOING TO GIVE YOU THE COLD SHOULDER NOW...

...AND THE COLD BACK AND THE COLD LEGS AND THE COLD KNEES...

What is better than a good night's sleep after a hard day's work? What is worse than being unable to sleep because your sleeping bag lets you freeze? Stay warm and sleep well by remembering sleeping bag PM.

## Cleaning

Wash all parts of the modular sleep system on the washing machine's DELICATE cycle using cold water. Other cycles can tear the bag. Use cold water liquid detergent like Era Plus or Liquid Tide that does not contain bleach. Powder detergent leaves a residue that's difficult to remove. Bleach discolors the bag. Rinse in clean, cold water. Never dry clean.



Dry in a tumble dryer with low heat (less than 130°F) and take it out as soon as it's dry. Too much heat melts the fabric and the bag is ruined.



Never run your sleeping bag through the wringer of a wringer washing machine. That flattens the zipper.

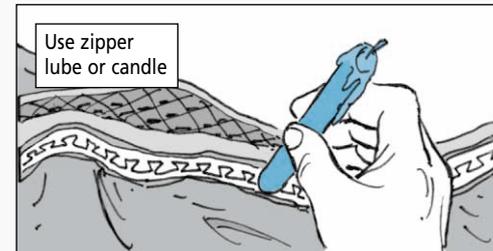
If the bag's waterproofing starts to leak, apply water repellent, NSN 8030-00-116-9255. Apply it following instructions on the can.

## Nip Zipper Problems

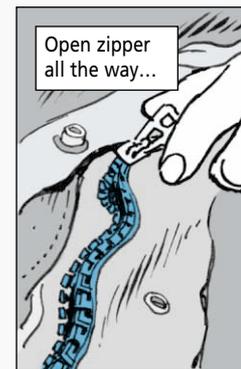
A sleeping bag that can't zip is as useful as a rifle that can't fire. And zippers get busted a lot. There are a few ways to keep zippers zipping:

✦ **Brush out the bag.** That keeps grit from clogging zipper teeth and causing the zipper to jam.

✦ **Use zipper lube, NSN 9150-00-999-7548.** On a new zipper or a zipper that sticks, zip it shut and rub a few drops of lube on the teeth. Run the zipper up and down until it moves smoothly. If you don't have zipper lube, use bar soap or a candle instead.

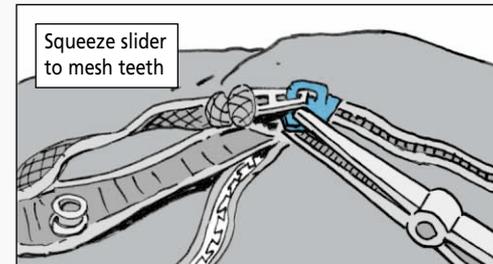


✦ **Pull slowly and evenly when zipping up the bag.** Jerking the zipper pulls it off track. Hold onto the zipper tab, not the strap to save wear and tear on the zipper.



If the zipper does come unzipped, pull it all the way to the bottom of the bag. Then slowly and carefully zip it back up. Usually that's enough to get the zipper to reattach. You may have to do that several times, though.

If the zipper unzips often, use needlenose pliers to gently squeeze the flat portion of the slider. Jerking on the zipper causes the slider to open up a bit over time and then the teeth won't mesh.



## GLOVES FOR MAINTENANCE



Ice-cold metal can freeze to your skin instantly. That's not too pleasant. But cold-weather mittens are too bulky for doing most kinds of maintenance. So what's a soldier to do in cold weather?

Use anti-contact gloves. These cotton gloves have leather palms and will keep your fingers from sticking to metal. Here are NSNs for the gloves:

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

Never wear the anti-contact gloves alone longer than you have to. They're meant to protect your hands from freezing to metal, not from freezing in general.

PS 599

## Mitten Liners

IF THE LINERS IN YOUR ARCTIC MITTEN SET, NSN 8415-00-782-6715, WEAR OUT, THERE'S NO NEED TO BUY NEW MITTENS.

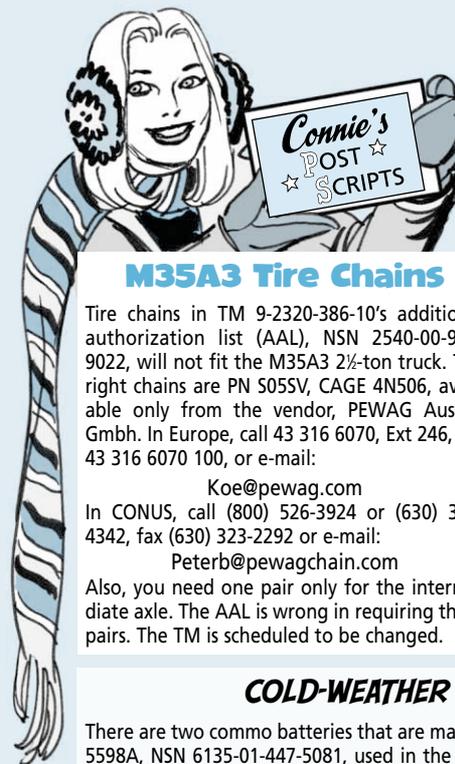
JUST REPLACE THE LINERS WITH THESE NSNs:

NSN	Size
8415-01-323-	
2174	Small
2175	Medium
2176	Large

GET A NEW MITTEN HARNESS WITH NSN 8415-01-323-2177.

60

OCT 02



## M35A3 Tire Chains

Tire chains in TM 9-2320-386-10's additional authorization list (AAL), NSN 2540-00-933-9022, will not fit the M35A3 2½-ton truck. The right chains are PN S05SV, CAGE 4N506, available only from the vendor, PEWAG Austria GmbH. In Europe, call 43 316 6070, Ext 246, fax 43 316 6070 100, or e-mail:

Koe@pewag.com

In CONUS, call (800) 526-3924 or (630) 323-4342, fax (630) 323-2292 or e-mail:

Peterb@pewagchain.com

Also, you need one pair only for the intermediate axle. The AAL is wrong in requiring three pairs. The TM is scheduled to be changed.

## COLD-WEATHER COMMO BATTERIES

There are two commo batteries that are made for really, really cold weather. They are the BA-5598A, NSN 6135-01-447-5081, used in the AN/PRC-77, and the BA-5567A, NSN 6135-01-447-5082, used in night vision goggles. The BA-5598A comes in a package of four. The BA-5567A comes in a package of 12.

## M939A2 ARCTIC BELT

NSN 3030-01-287-3155 gets an arctic fan belt for cold weather. It stands up to "Old Man Winter." Take off the arctic belt in the spring and use the regular belt, NSN 3030-01-271-3754. Keep spare belts laid flat in a cool, dry place. Never hang 'em on a nail.

## ABRAMS FIRE VIDEO REVISITED

Page 10 of PS 596 listed the wrong e-mail address for ordering the training film, *The Abrams Tank Fire Prevention*. The correct e-mail for the Joint Visual Information Services Distribution Activity is vibuddy@hq.afis.osd.mil.

## Mask Canister Serviceability

Page 57 in PS 595 (Jun 02) steered you wrong when it said to check SB 3-30-2, *Canister and Filter Elements (Serviceability Lists)*, to see which M40/M42 mask canisters are good. Instead, check the updates to the SB, which can be found at the SBC-COM link on the Army Electronic Product Support (AEPS) website at

<http://aeps.ria.army.mil>.

The site requires a password, which you can apply for on-line. If you have questions on canister or filter serviceability, contact SBCCOM's Glen Broman at (309) 782-4550/DSN 793-4550.

## M109 SHIELD DEFOGGER

Keep the panoramic telescope ballistics shield on your M109-series SP howitzer fog-free on cold, wet nights with anti-fogging kit, NSN 6850-00-127-7193. The kit includes a can of anti-fog compound and an anti-fogging cloth.

DISTRIBUTION: To be distributed in accordance with the initial distribution number (IDN) 340312, requirements for TB 43-PS-Series.

Would You Stake Your Life <sup>right now</sup> on the Condition of Your Equipment?

Issue 599

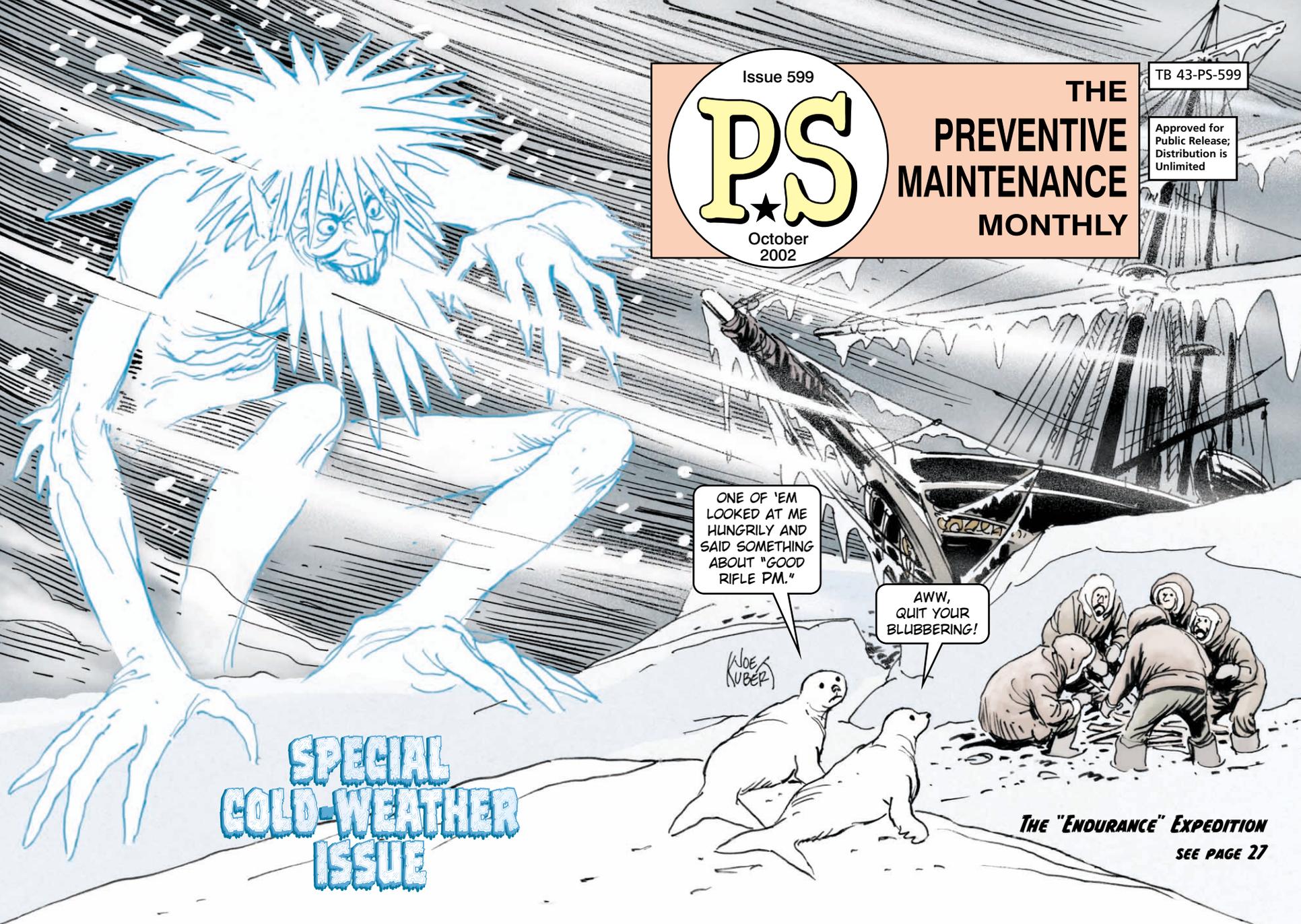
PS

October  
2002

THE  
PREVENTIVE  
MAINTENANCE  
MONTHLY

TB 43-PS-599

Approved for  
Public Release;  
Distribution is  
Unlimited



ONE OF 'EM  
LOOKED AT ME  
HUNGRILY AND  
SAID SOMETHING  
ABOUT "GOOD  
RIFLE P.M."

(NOE  
NUBER)

AWW,  
QUIT YOUR  
BLUBBERING!

SPECIAL  
COLD-WEATHER  
ISSUE

*The "ENDURANCE" EXPEDITION*

SEE PAGE 27