

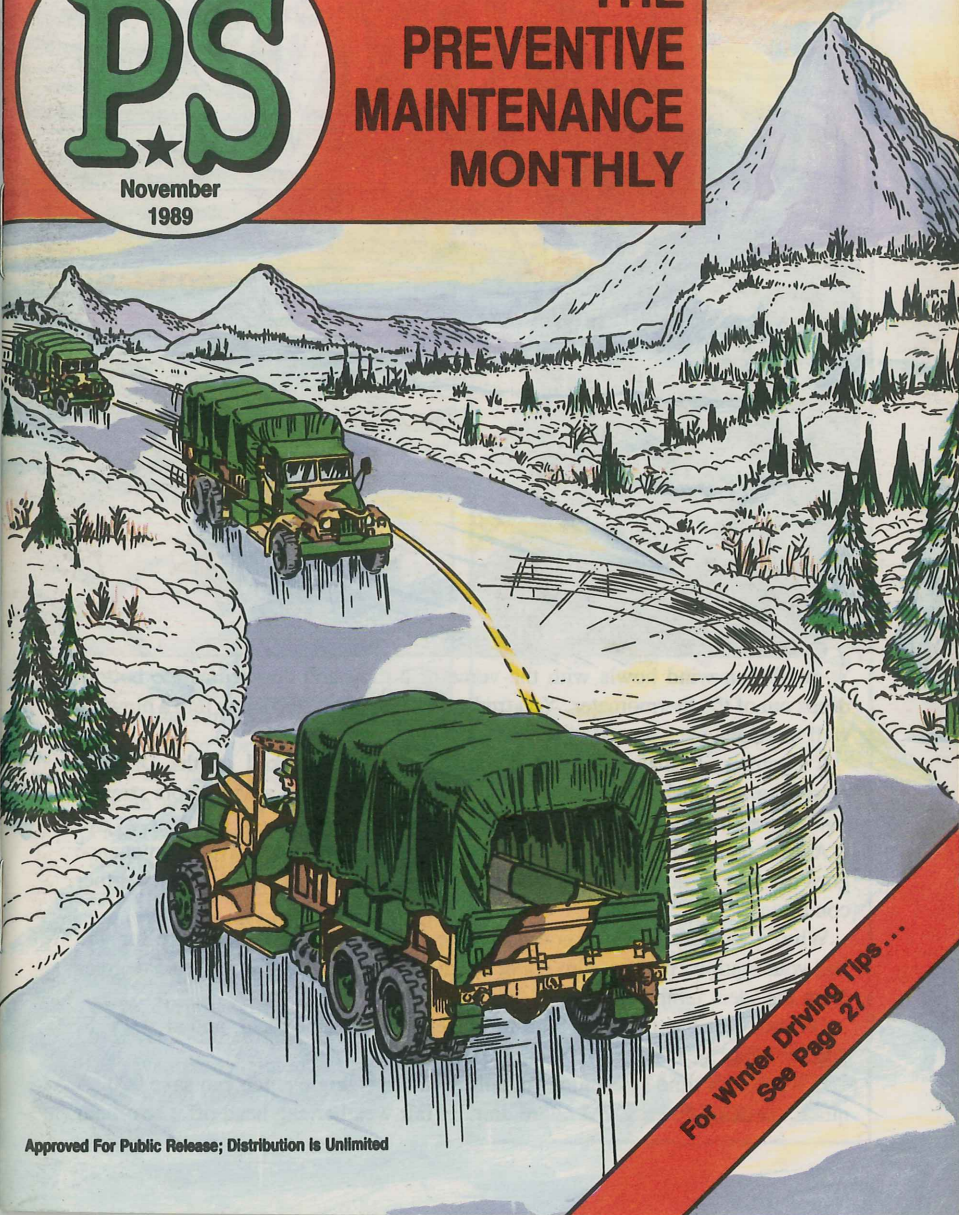
Issue 444

PS

November
1989

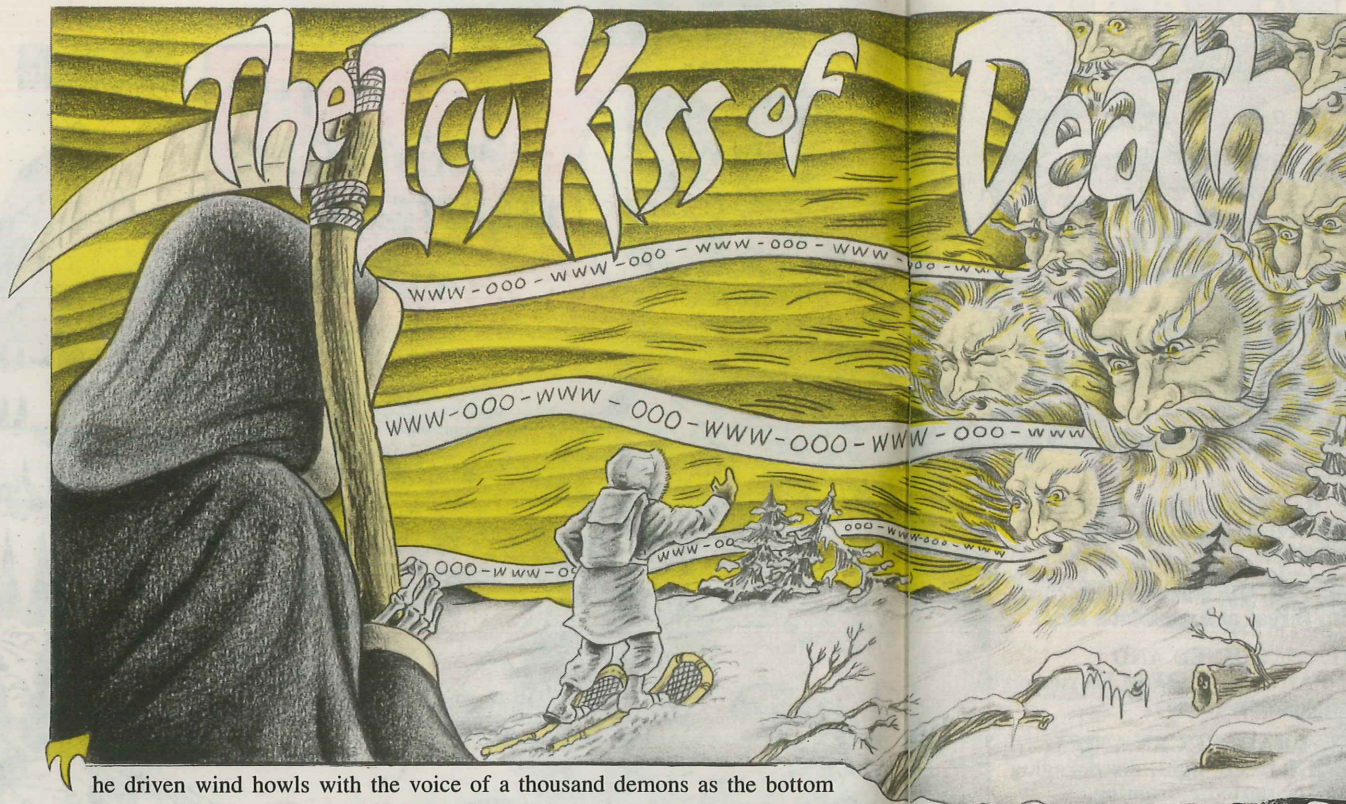
TB 43-PS-444

THE PREVENTIVE MAINTENANCE MONTHLY



Approved For Public Release; Distribution Is Unlimited

For Winter Driving Tips ...
See Page 27



he driven wind howls with the voice of a thousand demons as the bottom drops out of the thermometer. You trudge through boot-deep snow into a blowing wall of white.

It's winter. It makes no difference if you're bivouacked on the Danube, patrolling an Alaskan radar site or scouting a crossing on a Minnesota stream; you're walking arm-in-arm with death.

As the thermometer goes down, the importance of preventive maintenance goes up. PM is more important in winter's extreme cold than any other weather condition.

Why? Let's say +75° F is the average ideal operating temperature for you and your equipment. If you're going into a desert at +120° F, you're 45 degrees from the ideal temp.

On the other hand, at 0° F you're 75 degrees from the ideal, and at -25° F, you and your gear have a 100 degree loss to overcome.

If a stitch in time saves nine, in cold weather a single stitch can save 900. A quick check or an easy PM chore done in fair weather can head off a two-hour

repair that can stretch into a day's work when you're working with cold, brittle lines and numb fingers.

Plan and prepare your equipment's PM. The key is knowing the problems and staying on top of the little things.

Have your equipment ready for the moment when your life and your outfit's success may depend on a sheet of canvas, the dependability of a tent stove, the power in your radio's battery or a vehicle that must move.

Preventive maintenance could be your warm ticket home.

PS

THE
PREVENTIVE
MAINTENANCE
MONTHLY

TB 43-PS-444. 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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By Order of the Secretary of the Army:

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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.

IN COLD WEATHER THERE IS HIDDEN DANGER TO EQUIPMENT AND SOLDIERS!



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 from the defroster.
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 PM Checklist

- ✓ Be acquainted with the Cold Weather Operation portion of your operator's TM.
- ✓ Lubricate according to the temperature range on your equipment's LO.
- ✓ Arm your outfit with the necessary special winterization equipment that's authorized for the average temperature range for your area. Area climatic conditions are determined by the average temperature range of the season's coldest month.
- ✓ 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.
- ✓ Keep vital spots or portions of your equipment under cover, or out of the weather altogether.
- ✓ Always remember...you're working under unusual conditions, so give your equipment that type of attention and service.
- ✓ Try no short-cuts, alterations or repairs that are beyond your MOS know-how.
- ✓ Never force a cold, stiff or frozen piece of equipment.
- ✓ Protect your fuel and lubricants from winter's contaminating elements.
- ✓ When in doubt whether winterization treatments apply, check with someone who knows.

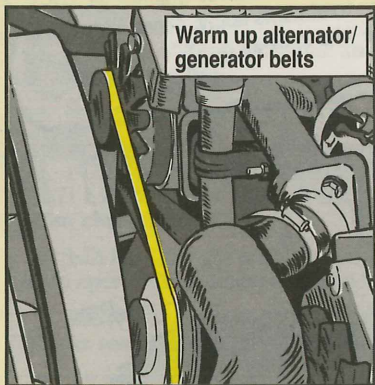


Extreme Cold

There are several degrees of cold. There's "plain, old ordinary" cold (down to zero), "really" cold (to 10 below) and then there's "extreme" cold—where the thermometer can drop from -10 to -65 degrees like a one-way yo-yo.

If you're in an "extreme" cold weather area, here are a few things you can expect:

- * CUCV and HMMWV alternator/generator belts snap in cold temperatures. Keep the belts from breaking by warming them with a 400,000 BTU duct-type heater before starting the engine. Do not rev the engine while it warms up. Keep extra belts on hand.

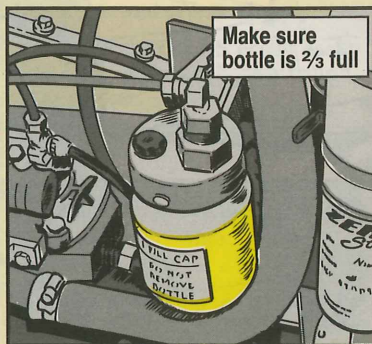


- * The boom on a 5-ton wrecker "stiffens up" when the hydraulic fluid gets thick. Change the OE to OEA (sub-zero lube) for cold weather operations. Get a 1-qt can with NSN 9150-00-402-4478 or a 5-gal can with NSN 9150-00-402-2372.

EXTREME COLD TAKES EXTREME PM MEASURES!



- * Water left from condensation causes brake systems to freeze solid. An alcohol evaporator keeps moisture from freezing. Eyeball the evaporator bottle daily to make sure it's at least two-thirds full of methyl alcohol. Get a gallon can with NSN 6810-00-597-3608, a 5-gal can with NSN 6810-00-275-6010 or a 55-gal drum with NSN 6810-00-224-8353.

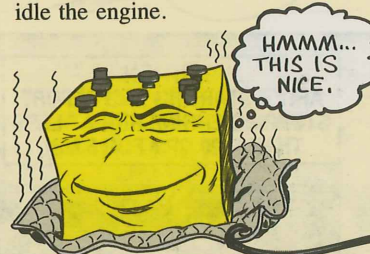


Weather Tips

LET'S WARM UP THE BELTS BEFORE WE GET STARTED.



- * Battery heating pads are the best bet for keeping a battery warm. If your vehicle has to sit outside overnight, idle the engine.



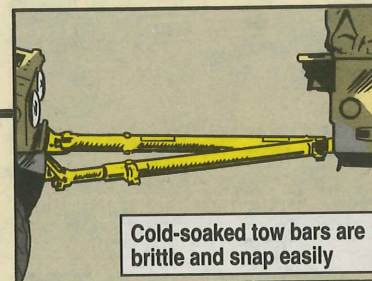
- * Never apply the parking brake. It will freeze. Instead, chock the wheels of your truck or trailer.

- * The tires on your equipment freeze to the ground if you don't move your equipment often. Use dry tree limbs, brush, or cardboard under tires when you park. If the tires get stuck, be sure to use a blunt tool to chip them out—don't gouge your tires.

- * Sudden changes in temperature crack windshields. Help prevent busted windshields by warming the cab with the personnel heater. After the cab's warm, turn the heater defroster on LOW—never throw it on full blast to warm and defog the windshield.



- * Cold-soaked tow bars, pins, hooks and pintles snap on you. Tubular tow bars and steel cables work a little better, but watch out for sudden bumps and jerks.



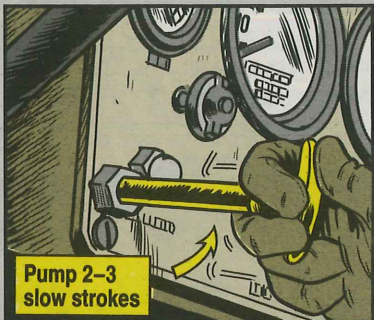
- * M973 SUSV tracks must be adjusted outside where you're operating. If they're adjusted where it's warm, the track will tighten up and break when it hits the cold.

One thing for sure, zero temperature make 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 than your -10 TM says. Longer periods can burn up the starter.

Wait as long as your -10 TM says before cranking again—usually a full 3 minutes.

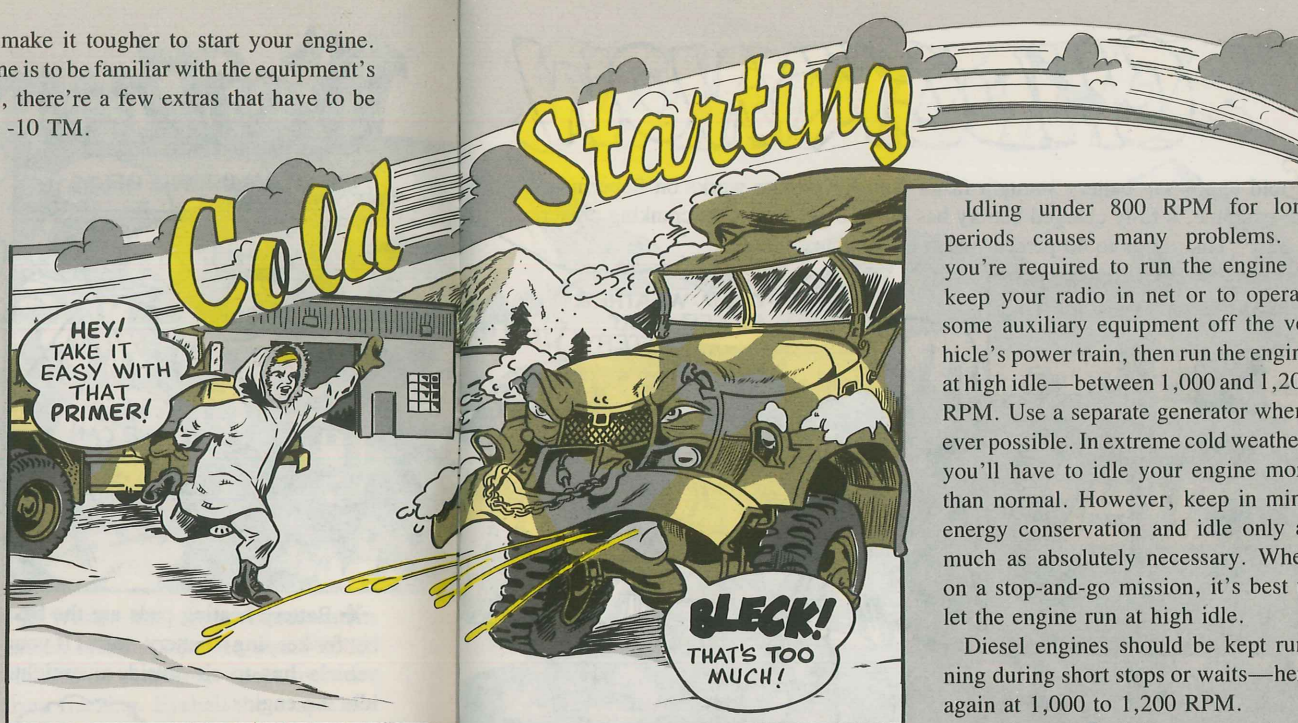
Many operators over-prime. This leads to hydrostatic lock and crankcase oil dilution. Before turning the engine over—prime 2 or 3 slow strokes—no more. Then turn over the engine and prime slowly and sparingly until the engine'll run on the choke and throttle settings alone.



Pump 2-3 slow strokes

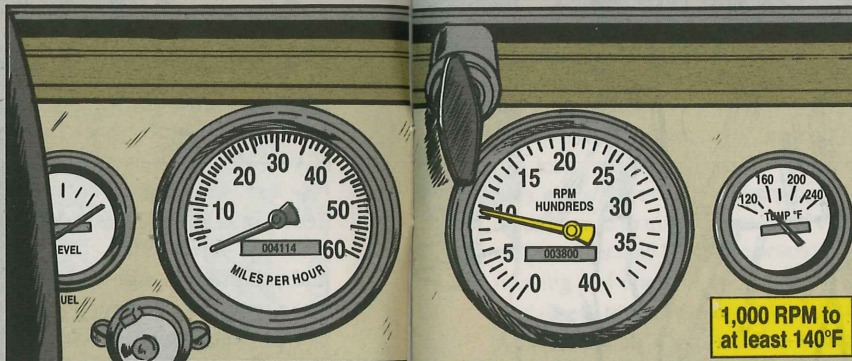
COLD WEATHER STARTING

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.



CAUTION
AFTER STARTING AND BEFORE STOPPING ENGINE RUN AT LESS THAN 1000 RPM FOR 5 MIN.

Easy on the 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).



1,000 RPM to at least 140°F

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.

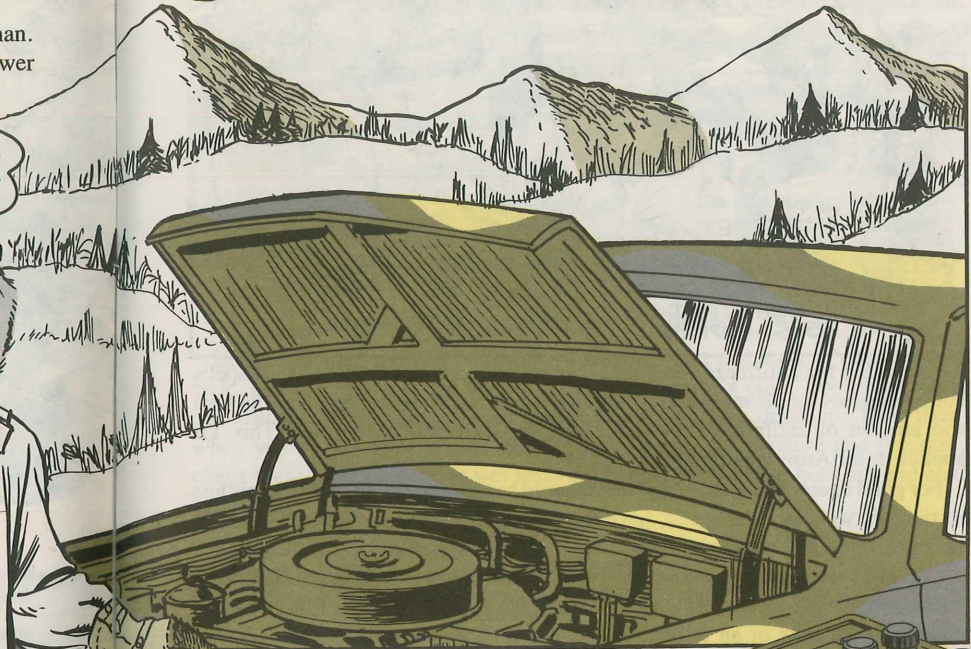
CHECK NOW

Cold temps sap battery strength faster than Kryptonite works on Superman. For example, a fully charged battery has only 65 percent of its cranking power at 32°F. That drops to 40 percent when the mercury hits 0°F.

CRANKING POWER	ENGINE RESISTANCE
100%	80°
65%	32°
49%	0°
30%	-20°



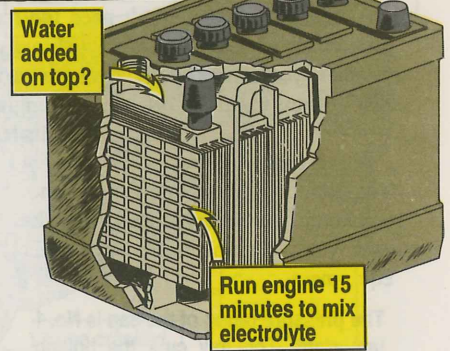
START LATER



How you check 'em is important. You can't tell the true condition of a battery if you test only the water. That's just what you do if you add water and test. The water stays at the top of the cells.

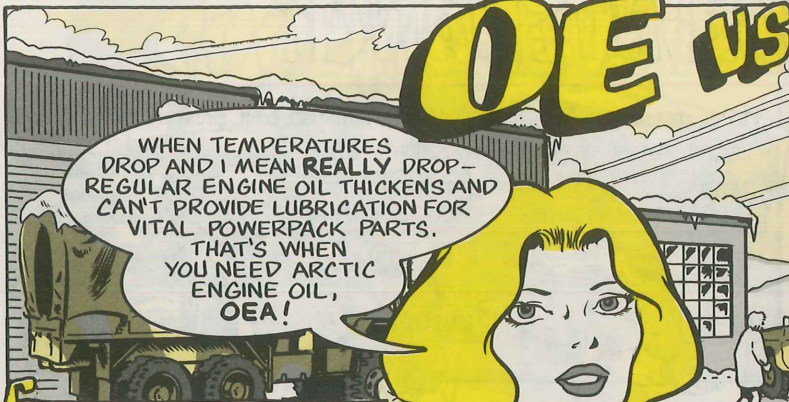
If you add water, start the engine and let it run for at least 15 minutes. This gives the vehicle's charging system a chance to mix the water and electrolyte. This also keeps the water from freezing and cracking the battery.

It's best to test the battery's electrolyte right after you shut off the engine. All the how-to's you need to test and keep your batteries in full charge are explained in Chapter 3 of TM 9-6140-200-14.



OE VS

OEA



WHEN TEMPERATURES DROP AND I MEAN REALLY DROP—REGULAR ENGINE OIL THICKENS AND CAN'T PROVIDE LUBRICATION FOR VITAL POWERPACK PARTS. THAT'S WHEN YOU NEED ARCTIC ENGINE OIL, OEA!

Some mechanics claim that OE holds up better than OEA, that starting isn't too much more trouble with OE, and then they rattle off the number of powerpacks that the "umpty-ninth" has to replace "because of OEA."

To begin at the beginning, why OEA in the first place? Well, the engineers have it figured that at least 90 percent or more of the engine damage done by starting in extreme cold weather will happen in the first 10 seconds of operation.

OEA is specifically designed to sleep there all night at 65-below and then snap to and perform that critical lube chore in those terrible 10 seconds. (At -65°F, OEA is fluid. OE is solid at -20°F.)

No powerpack ever burned up or seized or threw a rod because of OEA. It may have been because of low OEA, or because of contaminated OEA, or because of operational abuse with OEA in it—but not because of the lubricating powers of OEA alone.

Why? Well, as the man said, it's the situation and the terrain. Follow me!



Contamination-Dilution

The same weather conditions that tell you to go to OEA in the first place also set the stage for some fantastic handicaps for **any crankcase lube**—only more so for OEA because it's designed to be thin and flow under those goshawful temperatures.

Bulb-breaker temperatures cause engine parts to contract and you get more blow-by and fuel trickling past the piston. At the same time, you have to grind and grind before she fires up—and this gives some ham-handed yahoos an urge to over-prime—all of which gives you more raw fuel sneaking down to sabotage whatever you've got in the crankcase.

And, as if that's not enough, extreme



SO OEA REALLY IS BETTER?

THAT'S WHAT CONNIE'S BEEN TELLING US!

differences between crankcase temperatures and cold outside temperatures set the stage for moisture condensation—especially at shutdown—that adds to the dilution of your lube and robs its slicking powers.

Believe Me, Sam!

When a powerpack burns up or seizes or throws a rod into the next county, the damage is instantaneous, dramatic, and is usually blamed on lubrication—or lack of it. So whatever was in the crankcase gets the blame. On the other hand, the gut-tearing, raw-rubbed damage that grates your engine's entrails during a cold start with a thicker lube will be sneaky and quiet—and might not show up until later when it's torn down after a shorter-than-usual work life.

What to Do

Follow your LO. It's the law, and not only is that safer, it's a little more sure, too.

Pull that dipstick—every hour, or more often if your experience with your goat tells you to. It's easier to pull a dipstick than it is to change a pack with gloves on and snow blowing in your face. And carry enough oil with you so's you can do something about it when she reads low.

USE YOUR NOSE...

Keep a sharp sniffer out for fuel contamination in your crankcase by smelling the dipstick. Drain and refill if you even suspect it.



USE YOUR EYES AND FINGERS...

Moisture (condensation) dilution of crankcase lube is hard to detect unless it's really bad. Suspect it all the time in extra cold weather. A sure check, if you have time and suspect it's bad, is to draw a sample and let it stand in a clear glass container—the water and oil will show you a separation.



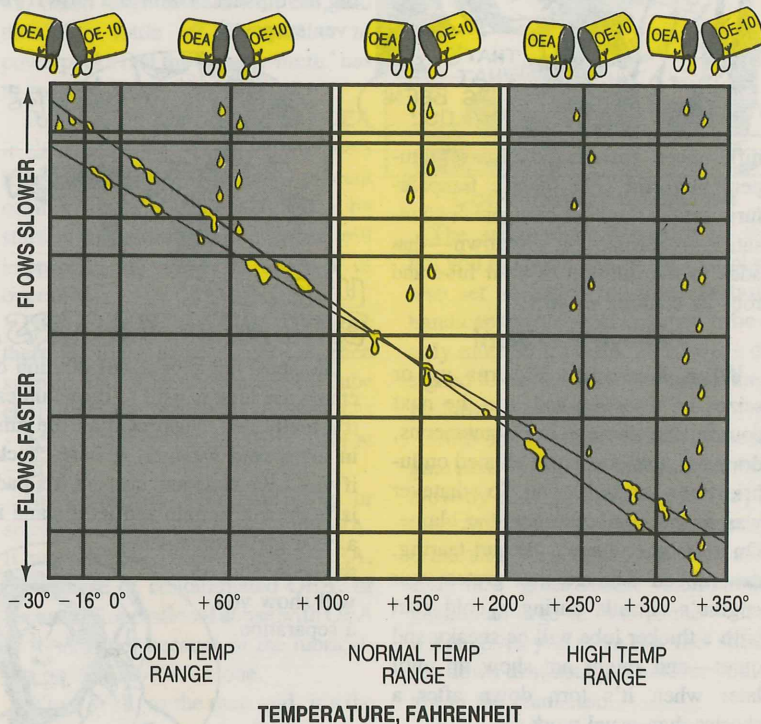
USE YOUR HEAD...

Remember that with a lot of idling or low-gear dragging, the hours an engine is run can be more important than miles.

WHO'D BELIEVE IT!

In plain language, it shows how the two of 'em flow under the same conditions. You'll see that OEA flows much easier than OE-10 at cold starting temperatures... and yet at normal engine operating temperature it's almost the same as OE-10. And who would have believed it? At overheating temperatures, OE-10 actually thins out faster than OEA does! 'Nuff said?

Here's a chart that some laboratory folks whomped up on the viscosity of OEA and OE-10.



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.

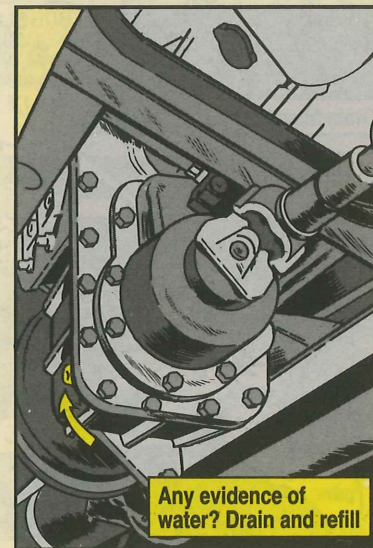
After every daily oil-level check, sniff the dipstick for fuel. And use your eye and fingers to detect sludge. Moisture contamination is hard to detect unless it's really bad. If you suspect it, draw a sample and let it stand in a glass jar. Water will show by separating from the oil.

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.

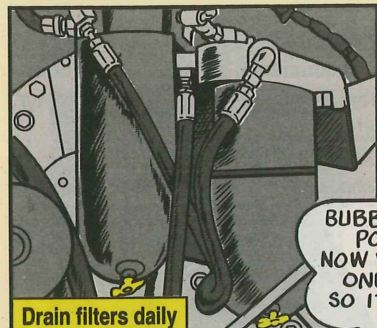


Put a Halt on Fuel Freeze-Up

Ice crystals form in your vehicle's fuel system from condensation as temperatures go down—down—down. Water freezes in the bottom of the fuel tank and the lowest parts of the fuel line. Then your vehicle's engine won't start.

Here are a few tips to keep the fuel system from... br-r-r-r-r... freezing:

- ★ Drain the fuel and refill with arctic grade fuel.
- ★ Keep the fuel tank filled up to the "full" mark to stop condensation.
- ★ Drain fuel filters every day.



★ Add icing inhibitors to the fuel. There are two kinds—one for diesel and one for gasoline. Eyeball Pages B-1 and B-3 of FM 9-207.

Diesel	
(Ethylene Glycol Monomethyl Ether)	
5-gal can	- NSN 6850-00-753-5061
55-gal drum	- NSN 6850-00-060-5312
Gasoline	
Methanol (MOGAS)	
1-gal can	- NSN 6810-00-597-3608
5-gal can	- NSN 6810-00-275-6010

Mix 1 pint of additive with 40 gallons of fuel before refueling like it says on Page 2-7 of the FM. Also, read 'n heed: You'll damage the engine if you add more additive than the TM calls for.

BUBBLE, BUBBLE, TOIL AND TROUBLE,
POUR IT IN ON THE DOUBLE,
NOW WE ADD WITH GREAT EASE,
ONE PINT OF INHIBITOR...
SO IT WON'T FREEZE !!



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, others 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.

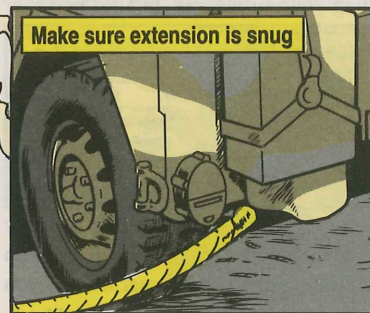
But don't!

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

Beware of Deadly Gas

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

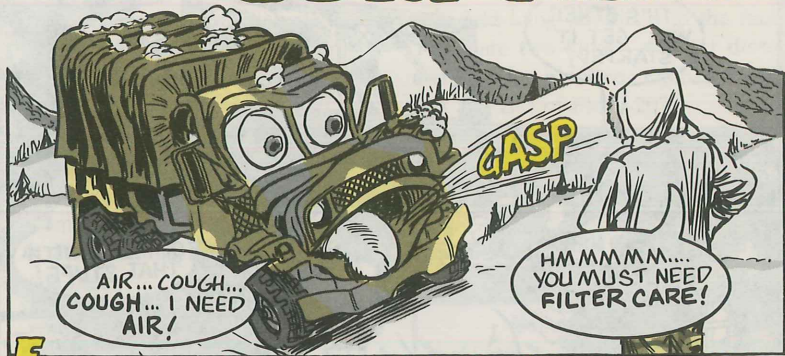
A snug fit over the tailpipe is a must—to prevent a leak. Here are flexible tubes to fit some common-size tailpipes:



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.

Cold Filter



Engine won't start? Poor power? Missing? Coughing? Stalling?

Most times it's a simple problem with a simple solution. And it's often a problem that doesn't have to happen in the first place.

You, the operator, can save yourself from this trouble.

Think filters—fuel filter and air filter (or air cleaner—same thing). A plugged filter is like a cork in a bottle. Fuel and air can't get thru filters that're plugged with dirt or ice. Yes, ice... frozen water!

You can quickly find out if a plugged fuel filter is causing the trouble. Try to drain the filter. If nothing comes out, the filter's probably frozen... plugged by ice... water that should've been drained out before. In that case, your mechanic will have to take the filter apart, clean it and maybe even put in a new filter element.

If you get dirt or water from the filter, keep draining until you get it all. If your equipment's got more fuel filters, drain them, too. Get that junk

out! It holds up the flow of fuel thru the filter. It can even plug a filter solid.



Easy, right? Even better is draining fuel filters before every operation—like your -10 TM PMCS tells you to do. You can head off a lot of starting and power trouble.

But fuel's not enough. Your engine needs air—lots of it. You know dirt can plug your air cleaner, but did you ever



think of ice or snow shutting off your engine's air supply? You can wind up with a plugged air cleaner even if you just got a spanking-clean element.

Facts

Moist air sucked into your cleaner can freeze on the element. Snow can do the same thing. Either way, it's the same as a dirt-plugged element. Air can't get thru!

So eyeball that air cleaner indicator. If the colored flag is locked up in view, your air cleaner's plugged. Get it fixed—element cleaned, dried out or replaced.



Keep snow cleared away from the air cleaner intake.

In damp weather—when there's a chance of freezing—it's a good idea to have a clean, dry element on hand for a quick switch in case air cleaner icing is a problem.

M939-Series Trucks...

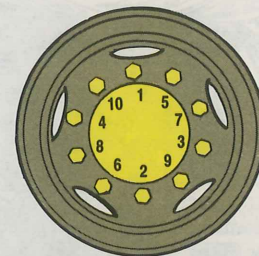
Lug Nut Torque Change

Snap! That's what happens to the wheel studs on this 5-ton's duals when you follow the torque specs in Para 8-3 of TM 9-2320-272-20-2. It lists more torque than the wheel studs can handle.

Torque the inner wheel lug nuts to 400-425 lb-ft instead of 450-500 lb-ft. Outer nuts need only 325-355 lb-ft to keep them tight. Be sure to tighten the nuts in the order shown in the TM.

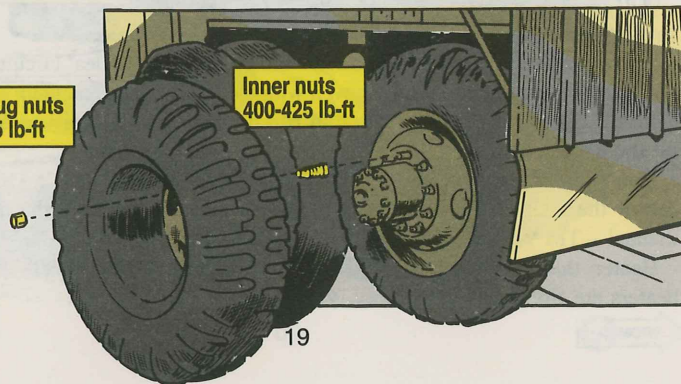
Make a note in your TM until it's updated.

Tighten sequence



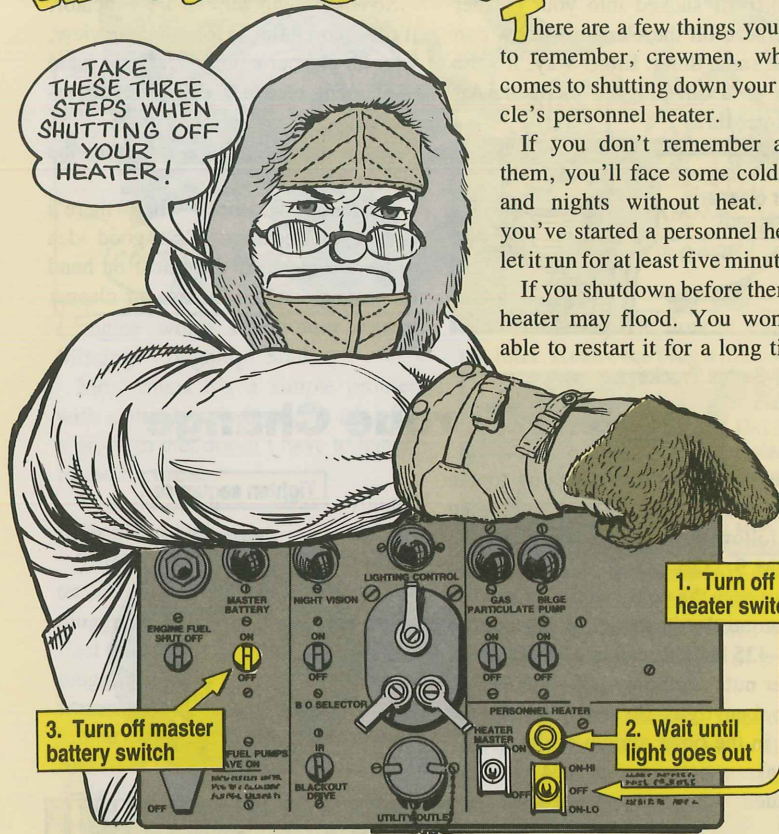
Outer lug nuts
325-355 lb-ft

Inner nuts
400-425 lb-ft



HEATER SHUTDOWN TIPS

TAKE THESE THREE STEPS WHEN SHUTTING OFF YOUR HEATER!



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. Others 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.

Keep 'em Dry



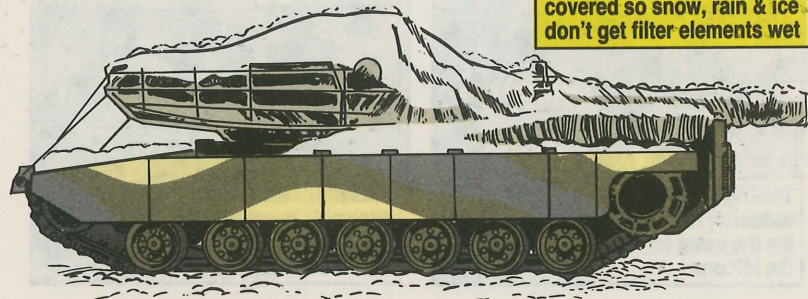
Your combat and tactical vehicles require large amounts of clean air to keep their engines running right. Providing clean air is the job of your vehicle's air filter system.

But, the filter elements won't be of much use in doing that job if they're wet or frozen.

Which means you've got to keep the elements as dry as you can during freezing rain and snow, and check them often in cold weather.

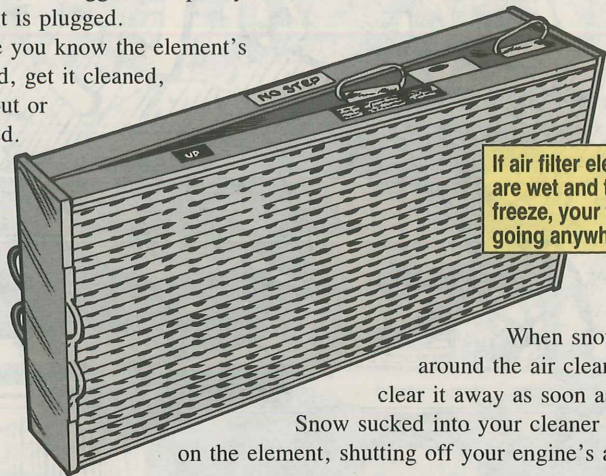
The air cleaner intake must be protected so that rain, sleet or snow doesn't get into it. When your vehicle is not in operation, cover the intake some way, either with canvas or plastic, so the filter elements stay as dry as possible. Be sure to remove the cover before operating.

Keep combat vehicles covered so snow, rain & ice don't get filter elements wet



Then, before and during operation, keep an eye on the air cleaner indicator or "air filter clogged" lamp so you'll know when the element is plugged.

Once you know the element's plugged, get it cleaned, dried out or replaced.



If air filter elements are wet and then freeze, your tank's not going anywhere fast

When snow piles up around the air cleaner intake, clear it away as soon as you can.

Snow sucked into your cleaner can freeze on the element, shutting off your engine's air supply.



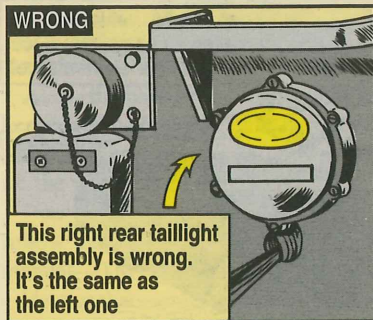
M113-Series FOV...

Tales of the Right Taillight

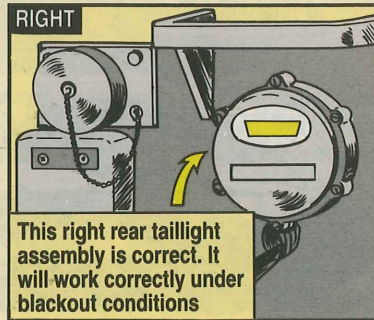
Item 1 of Fig 80 in TM 9-2350-261-20P has the wrong NSN and part number for the M113-series FOV right side stop and taillight assembly.

NSN 6220-00-669-5623 gets you the left side assembly and that's not what you need. That assembly, when used under blackout conditions, will shine just as bright as it does under normal conditions.

What you need is NSN 6220-00-337-6471, part number 8378786. Make sure your carriers have the right taillight assemblies before your next exercise. Otherwise, your vehicles will be dead giveaways in the dark.



This right rear taillight assembly is wrong. It's the same as the left one



This right rear taillight assembly is correct. It will work correctly under blackout conditions

M113-Series FOV...

WARMING UP TO BLOW-BY

Low-RPM idling in M113-series carriers is sometimes unavoidable, but the engine blow-by it creates can be a real problem.

So much of a problem that the airbox drain and crankcase breather collector can may need cleaning more often than weekly.



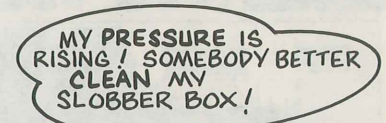
Check cleanliness often

Too much crud collected in the "slobber box" makes for too much pressure in the crankcase. Your engine may burn too much oil, and performance may suffer, too.



Crud in the slobber box causes pressure in crankcase

So, if you must idle at low RPM, like when you're in the field, keep an eye on the collector can.



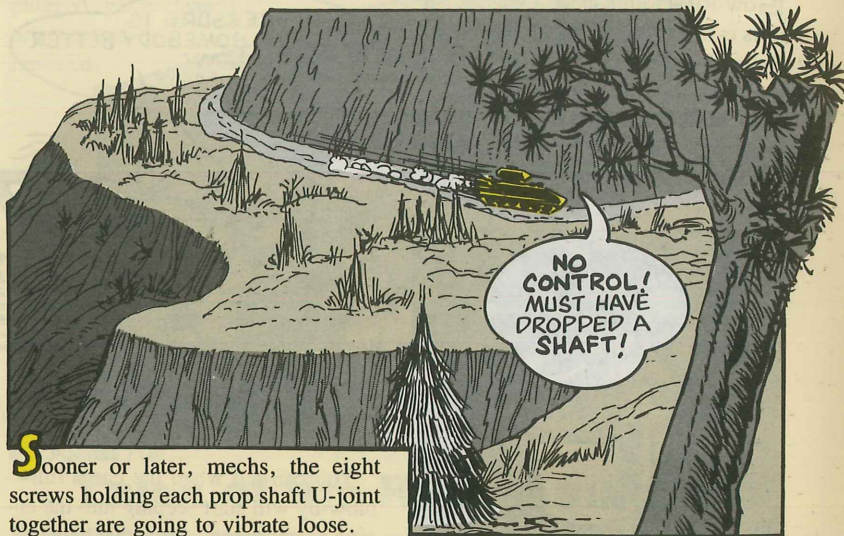
You can tell when the can's full—blow-by will start seeping into the engine compartment. Once that happens, remove the can and clean it and the plastic element inside.



In the field, just use a rag to wipe off the crud. If you're near your maintenance outfit, clean the can and element with drycleaning solvent.

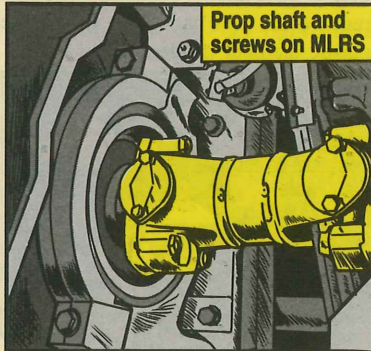
When possible, run your carrier at a higher idle so most of the blow-by is burned inside the engine.

KEEPING TIGHT CONTROL



Sooner or later, mechs, the eight screws holding each prop shaft U-joint together are going to vibrate loose.

Prop shaft and screws on MLRS



When that happens, the shafts can break loose, leaving your favorite Bradley or MLRS driver with little control over his vehicle—and you with lots of busted parts to replace.

Check those screws with a torque wrench every six months during your semiannual service, or whenever your crew tells you they've spotted loose screws.

Torque the screws to 86-94 lb-ft. Tighten once, loosen and then tighten again.

Prop shaft and screws on M2/M3 Bradley



Remember—if you use the 4-in adapter called for in the TM to get at the screws, you'll need to convert the torque value. If you don't, you'll get more or less torque on the screw than what you read on the wrench.

If your set-up looks like this, using the 19-in torque wrench called for in the TM, you need to torque to 71–78 lb-ft.

If your set-up looks like this, torque to 86–94 lb-ft.

If your set-up looks like this, torque to 108–118 lb-ft.

In all three situations, you'll be putting 86-94 lb-ft on the screws. Use of any other torque wrench adapter means you'll need to calculate the torque. See Pages 2-29 and 2-30 of TM 9-2350-252-20-1-1. Measure the length of the wrench from the center of the handle to the center of the drive tip, or you'll get a wrong reading. See Pages 2-29 and 2-30 of TM 9-2350-252-20-1-1 for M2/M3 Bradleys; Pages 2-28 and 2-29 of TM 9-2350-284-20-1-1 for M2A2/M3A3 Bradleys; and Pages 2-33 through 2-35 of TM 9-1450-646-20-1 for MLRS.

Bradley, MLRS TM's...

New Cross-Reference

Unit and DS/GS level maintenance TM's for the M2A2 and M3A2 Bradley and MLRS carrier have a nifty cross-reference code built into them so you mechanics can go easily from maintenance task to parts list.

The maintenance task title at the top of each separate task in the -20 and -34-series TM's shows the Logistic Support Analysis Control Number/Group Code (LCN/GC), which crosses to the LCN/GC in the -24P parts manuals.

All you have to do to locate the parts needed for a particular task is to cross the

LCN/GC from the maintenance task to the same LCN/GC in the parts manuals' table of contents. That will show the figure and page for the parts you need.

REPLACE COMMANDER'S/GUNNER'S SLOPE INDICATOR (ETAT)					
INITIAL SETUP					
TM 9-2350-284-24P-2					
TABLE OF CONTENTS (cont)					
ETAT TURRET SLOPE INDICATOR INSTL 114-1					114

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP: ETAT FIG. 114 TURRET SLOPE INDICATOR INSTL 12294596	



This is a selected list of recent pubs of interest to organizational maintenance personnel. This list was made from a computer print-out provided by the Adjutant General.

TM 5-3820-256-10 Mar Well drilling system, model LP-12
 TM 5-3820-256-24-2 May Well drilling system, model LP-12
 TM 5-3820-256-24-3 May Well drilling system, model LP-12
 TM 5-3820-256-24-4 May Well drilling system, model LP-12
 TM 5-3820-256-24-5 May Well drilling system, model LP-12
 TM 5-3835-222-BD Jun BDAR for POL equipment

TM 5-3895-359-24P Apr Rotary tiller mixer, Reworks model HDS-3
 TM 5-4120-394-BD Jun BDAR for environmental control unit
 TM 5-4320-314-10 Fuel transfer pumping unit 24V DC EMD
 TM 5-5420-202-24P Jul AVLB for M60A1
 TM 5-5430-227-12&P Jun 3,000-Gal self-supporting fabric water tank
 TM 9-1005-306-10 Jun M24 sniper weapon
 TM 9-1090-208-23P Aug M139 gun helicopter armament subsystem; M230 rocket management subsystem
 TM 9-1095-208-23&P Jun Multiple delivery mine system (Volcano)
 TM 9-1410-387-24P Jul Pershing missile system

TM 9-1425-470-L May TOW weapon
 TM 9-1425-585-L-1 Aug Chaparral missile system
 TM 9-1425-601-12 Apr Touch-up painting (Patriot missile system)
 TM 9-1427-475-23P Jun AH-64A helicopter Hellfire missile equipment pilot missile control panel, CPG missile control panel, remote Hellfire electronics
 TM 9-1450-646-BD Jul BDAR for MLRS carrier
 TM 9-4925-233-23P Aug Loader, box magazine, ammunition
 TM 9-4933-259-14&P Apr M26A1/M27A1 muzzle boresight
 TM 11-5805-256-23P Jul TA-43/PT telephone set
 TM 11-5820-955-20P Aug MK-2384/VRC installation kit

Maintenance & Safety-Of-Use Messages

AMCCOM Maintenance Advisory MSG-120MM M256 Cannon, AMSMC-MAW 171200Z Jul 89.

FT MONROE SOU-MSG-15-89—Advisory, Operational, M64/M64A1 sight units used w/mortars, ATOS 081000Z Aug 89.

CECOM SOU-MSG—Update to SOU MSG 89-03-01 on BA-5567/U lithium-sulfur dioxide batteries, AMSEL-SF-REE 241800Z Aug 89.

CECOM SOU-MSG—Follow-up to SOU MSG 89-08-04 on electrical binding post, AMSEL-SF-SEP 251800Z Aug 89.

CECOM SOU-MSG—Follow-up to SOU MSG 89-08-03 on AN/ASC-15B radiation hazard, AMSEL-SF-SEC 211800Z Aug 89.

MICOM SOU-MSG-89-08—Refilling of ATAS and AVENGER argon gas reservoir, AMSMI-LC-AM 181530Z Aug 89.

TACOM SOU-MSG-89-54—Operational, M2A2/M3A2 Bradley, AMSTA-M 261100Z Jul 89.

TACOM SOU-MSG-89-60—Advisory, Technical/Maintenance, M871 semitrailer, AMSTA-M 012000Z Aug 89.

TACOM SOU-MSG-89-56—Advisory, Technical/Maintenance, M1009 CUCV tires, AMSTA-M 110930Z Aug 89.

TACOM SOU-MSG-89-31—Advisory, Technical/Maintenance, CUCV, AMSTA-M 231500Z Aug 89.

TACOM SOU-MSG-89-64—Advisory, Technical, Mixer rotary tiller, AMSTA-M 291500Z Aug 89.

TROSCOM Maintenance Advisory MSG 89-38—Supply condition of small flyers coveralls, AMSTR-MES 161330Z Aug 89.

TROSCOM Maintenance Advisory MSG 89-39—Control lines on

the MC1-1C parachute canopy, AMSTR-MES 181430Z Aug 89.

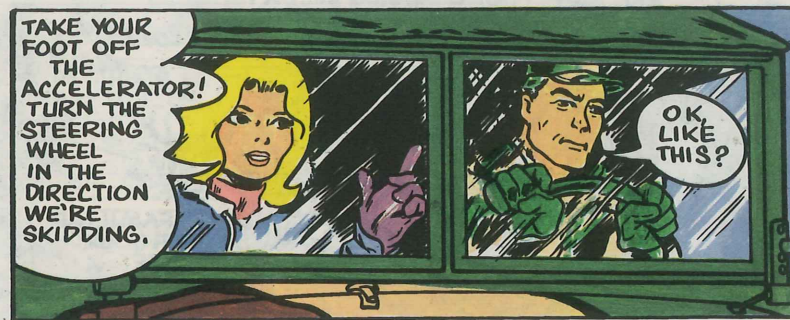
TROSCOM Maintenance Advisory MSG 89-29—Nonexpandable and one-sided and two-sided expandable tactical shelters, AMSTR-MES 222100Z Aug 89.

TROSCOM Maintenance Advisory MSG 89-35—Air duct for MUST power plant, AMSTR-MES 222100Z Aug 89.

TROSCOM SOU-MSG-19-89—Operational, Radial arm saw, model number 88-036, used on trailer mtd equip shop, AMSTR-MES 211430Z Aug 89.

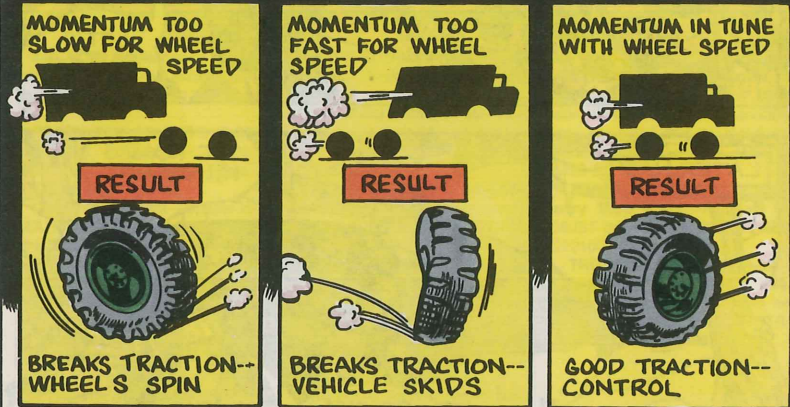
Your Direct Support or Logistic Assistance Office (LAO) can provide you with more information.





YOU MUST BE IN **CONTROL** OF TRACTION AND MOMENTUM **ALWAYS!**

IT WORKS LIKE SO...



EASY SPEED CHANGES AND **EASY** BRAKING KEEP MOMENTUM FROM CANCELING TRACTION... AND YOU **DON'T** SKID!



Adjust your Driving to the WEATHER and ROAD CONDITIONS



IF YOU'RE DRIVING ON ICE AND SNOW...
CAUTION IS THE WAY TO GO.
GIVE BRAKES JUST A TAP,
TO PREVENT A MISHAP
SO TAPS FOR YOU THEY DON'T BLOW!

SLOW DOWN BEFORE
A DOWNGRADE.
ENGINE DRAG
HELPS!
EASE OFF
THE
ACCELERATOR.

LOOK AHEAD, BE
READY TO STOP.
EASE UP TO A
HALT UP TO 30
FEET
SHORT.

BE FAMILIAR
WITH YOUR
ROUTE.

SLOW DOWN BEFORE
ENTERING CURVES.
THEN SMOOTHLY
ACCELERATE OUT OF
IT TO HOLD TRACTION.

BRIDGES AND
OVERPASSES
FREEZE FIRST. COLD AIR PASSES
UNDER THEM AND FREEZES
WATER. ACCELERATE
SMOOTHLY AND ROLL
THRU TO KEEP TRACTION.

WE HAVE THE WORLD'S BEST EQUIPMENT... *Take care of it*

IF YOU WANT TO DISPLAY THIS CENTERPIECE ON YOUR BULLETIN BOARD, OPEN STAPLES, LIFT IT OUT AND PIN IT UP.



EASE TO A HALT. GIVE YOURSELF 20 TO 30 FEET FOR UNEXPECTED TROUBLE.

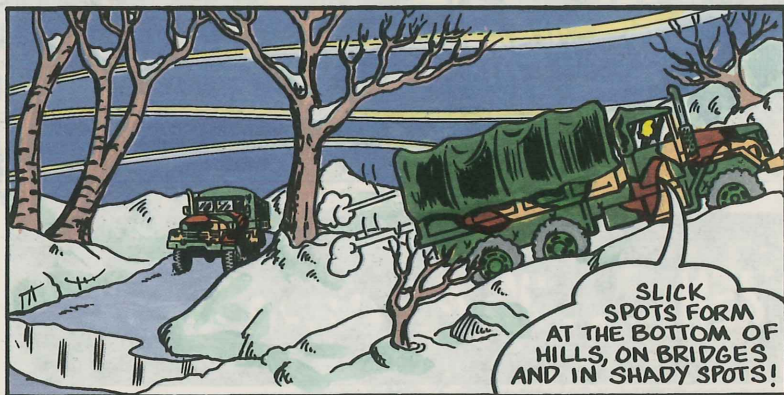
IN CLIMBING A HILL, THE MORE MOMENTUM (AMOUNT OF MOTION) YOU HAVE, THE LESS TRACTION (GRIP) YOU NEED!

TO AVOID STOPPING HALFWAY UP THE HILL, LET THE OTHER TRUCK MAKE IT FIRST!

ON THE ROAD

BE CAREFUL, BUT HIT THE HILL AS FAST AS YOU CAN SAFELY GO. MOMENTUM WILL CARRY YOU OVER!

SHIFTING GEARS CAN BREAK YOUR GRIP ON THE ROAD. MAKE EACH SHIFT AS SMOOTH AS POSSIBLE, PARTICULARLY THE DOWNSHIFT.



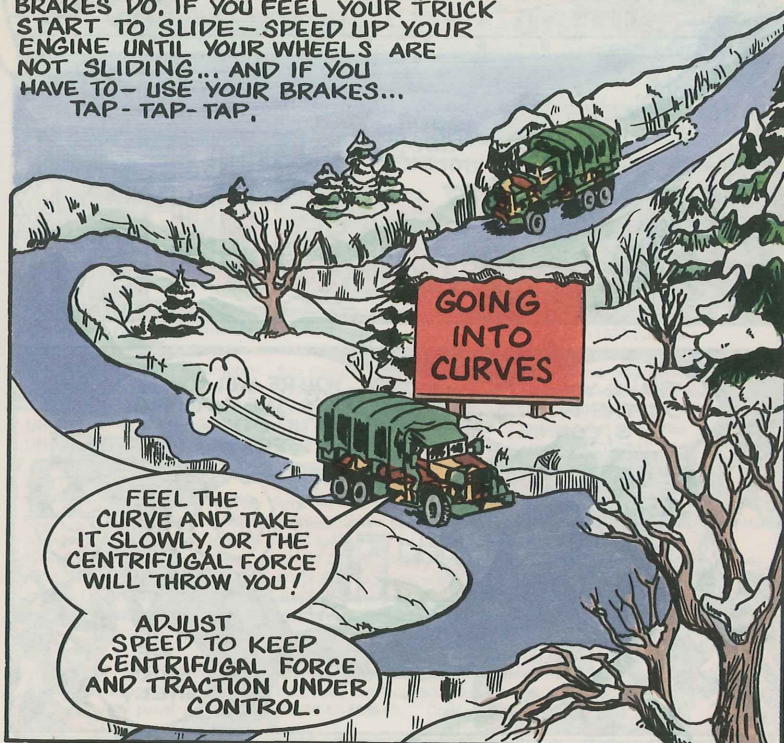
SLICK SPOTS FORM AT THE BOTTOM OF HILLS, ON BRIDGES AND IN SHADY SPOTS!



CLIMB HILLS IN ONE SMOOTH UNINTERRUPTED FLOW OF POWER.

CUT SPEED BEFORE STARTING DOWN.

WHEN YOU'RE ON A DRY ROAD, YOU CAN SHIFT DOWN AS LOW AS YOU NEED, GOING DOWN INTO THAT GEAR USES YOUR ENGINE AS A BRAKE. BUT ON ICE, REMEMBER THE ENGINE APPLIES FORCE TO 'EM, JUST AS BRAKES DO. IF YOU FEEL YOUR TRUCK START TO SLIDE - SPEED UP YOUR ENGINE UNTIL YOUR WHEELS ARE NOT SLIDING... AND IF YOU HAVE TO - USE YOUR BRAKES... TAP - TAP - TAP.



GOING INTO CURVES

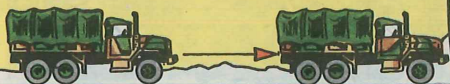
FEEL THE CURVE AND TAKE IT SLOWLY, OR THE CENTRIFUGAL FORCE WILL THROW YOU!

ADJUST SPEED TO KEEP CENTRIFUGAL FORCE AND TRACTION UNDER CONTROL.

LET THE POWERTRAIN SLOW YOU DOWN...NEVER SLAM ON THE BRAKES!! TAP-TAP-TAP SO YOU DON'T LOSE YOUR TRACTION. FRONT WHEELS LOCK WITH HEAVY BRAKING AND YOU HAVE NO STEERING!

UNDER NORMAL CONDITIONS!

TAP-TAP-TAP BRAKES HERE



UNDER ICY CONDITIONS IT TAKES 3 TO 12 TIMES AS FAR TO STOP! SO WATCH IT!

TAP-TAP-TAP BRAKES HERE

UNDER ICY CONDITIONS!



LOOK, CONNIE, WE'RE HERE!

GOOD JOB, SOLDIER!

FT. FRIGIDAIR



THANK YOU FOR THE DRIVING TIPS, CONNIE.

YOU'RE WELCOME, PASS THEM ALONG TO THE OTHER DRIVERS.

WE SURE WILL!



Attack Helicopters...

Hangar Safety

Smart crew chiefs don't take chances with lethal weapons. Any time your Cobra or Apache is wheeled into the hangar, always:

Disconnect the battery.

Install jettison safety pins.

Post a warning sign if explosive cartridges are installed.

Aircraft...

Protect Flight Controls

Flight controls get real stiff when temperatures drop below zero. That's when you can damage servos and seals. So wait until your bird's transmission temperature reaches at least 15°F before moving the flight controls.

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.

AH-64-89-11, SOF, Emergency, Immediate grounding of all AH-64A and YAH64, 031635Z Jul 89.

UH-1-89-07, SOF, Technical, All UH-1D/E/H/V, records inspection of universal control levers, P/N 204-011-128-1, 080200Z Jul 89.

UH-1-89-08, SOF, Maint Mandatory, UH-1M series revision/changes of selected component lives, 132030Z Jul 89.

AH-64-89-13, SOF, Maint Mandatory, All AH-64A, inspection for indirect view display (IVD) connector tiedown and chafing, 172130Z Jul 89.

UH-60-89-06, SOF, Technical, H-60A series, inspection of right and left hand relay panel assemblies

for suspect grounding modules, 171600Z Jul 89.

OH-6-89-03, SOF, Maint Mandatory, All H-6 series, inspection of main rotor blade and lead-lag link assemblies, 172200Z Jul 89.

CH-47-89-07, SOF, Maint Mandatory, CH-47D, loose jam units on integrated lower control actuators, 181600Z Jul 89.

CH-47-89-08, SOF, Emergency, Immediate grounding of CH-47D aircraft with combining transmission oil cooler fan P/N 145DS518-3, 291820Z Jul 89.

UH-60-89-07, SOF, Technical, H-60A series, revision to right and left hand relay panel, 031800Z Jul 89.

UH-60-89-MIM-07, Crashworthy

crew seat maintenance for ARA seats, 111630Z Jul 89.

UH-60-89-MIM-08, Correction to MIM concerning replacement bearing requirement, 112130Z Jul 89.

OH-58-89-MIM-03, OH-58A/C, error in maintenance test flight manual, 131830Z Jul 89.

AH-64-89-MIM-05, All AH-64, revision of AH-64-89-MIM-03 Msg concerning intumescent coating on titanium louvre assembly, 172145Z Jul 89.

GEN-89-MIM-07, Engine maintenance support by CCAD hotline, 251410Z Jul 89.

OH-58-89-MIM-04, OH-58A/C, removal of tail rotor gearbox TBO, 271945Z Jul 89.

AH-64-89-12, SOF, Technical, ungrounding requirements, 061840Z Jul 89.

HELMET SIGHT

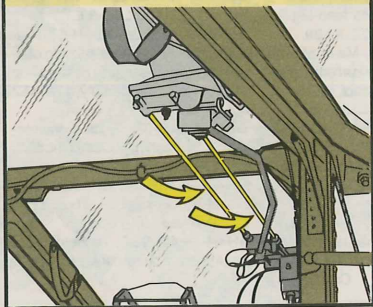


Cobra mechs, you can't put all the blame for poor shooting of the 20mm cannon on the pilot and gunner.

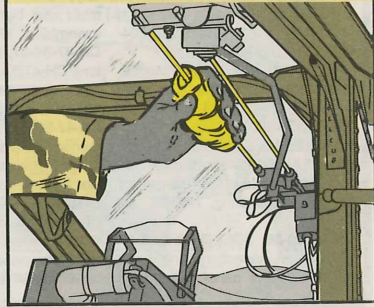
If you don't do your job well, they don't have a chance to hit the target.

Give your Cobra crewmen an edge on accuracy by keeping their Helmet Sight System (HSS) linkage assembly fine tuned.

Never lube the linkage rails. Wipe them clean of all foreign material, such as oil, grease, paint, insecticide, window cleaners and tape residue.



Clean the rails often with a lint-free cloth soaked in denatured alcohol.



SYSTEM SALVO



After you clean the rails, make sure the carriage travels freely without binding. If the carriage binds, alternately wipe the rails, move the carriage, wipe the rails . . . until you've eliminated the binding.

Remove small nicks and light damage by rubbing the rails with crocus cloth, NSN 5350-00-221-0872.

AH-1...

The Winning Edge

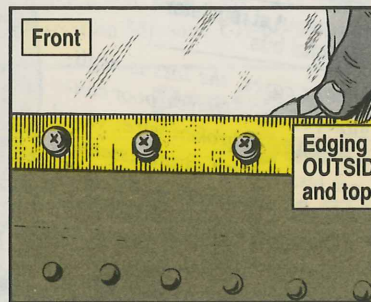
Some Cobra mechanics get turned around when they install new windshields. They put windshields in with the nylon strip edging on the inside rather than the outside of the windshield.

Never use the linkage rails as a handhold when you enter and leave the cockpit. 'Course, that goes for you flight crewmen, too. If you bend the rails, they have to be replaced.

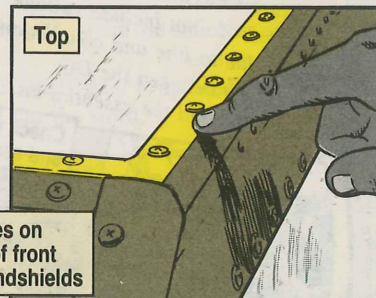
Use the handle to enter and leave the cockpit



Finally, never throw anything into the cockpit before you climb in. You could hit the linkage assembly and knock it out of whack.



Edging goes on OUTSIDE of front and top windshields



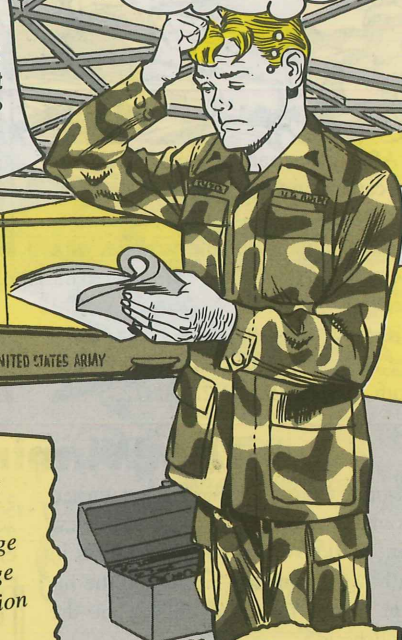
Then, when they try to attach the windshields to the canopy frame with

So bond the edging to the outside of the windshield next time you install one. Then follow the instructions in Para 2-146 of TM 55-1520-236-23-1 to get the windshield on right.

Double Check the Voltage

Dear Windy,
Our UH-1's have solid state voltage regulators with color-coded outlets for checking voltage output. So why is it necessary to check voltage at the essential bus, too, like it says in TM 55-1500-204-25/1? P.B.M.

OUR HUEY HAS A VOLTAGE REGULATOR, SO WHY CHECK VOLTAGE AT THE ESSENTIAL BUS?

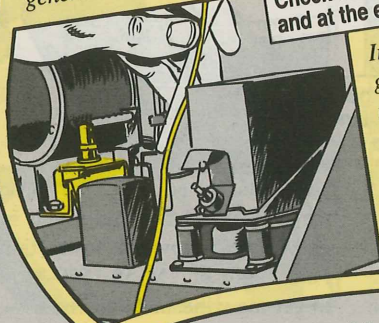


Dear P.B.M.,
It may seem like a duplication of effort to check voltage output at both places, but it's really not. Measurements made at the voltage regulator do not include voltage losses due to line and connection resistance between the DC generator and the essential bus.

Check voltage output at regulator and at the essential bus

In most cases, the loss is negligible, but if you have a poor connection or a broken wire, you'll get less voltage at the essential bus. So always check the voltage at both places using the measurement procedures in TM 55-1500-204-25/1.

Windy



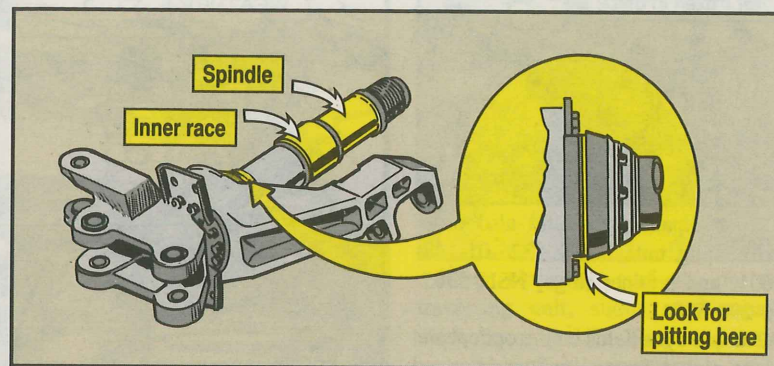
Spindle Sleeve Scouring Snafu

Toss those scouring pads you've been using to clean the sleeve bearings on your Black Hawk's main rotor spindle.

You're rubbing the outer diameter of the bearing inner race raw with those pads.

Use only cleaner, NSN 6850-01-239-0571, and water to clean the bearing surface. The cleaner NSN is not on the AMDF, so order on a DD Form 1348-6 using RIC S9G.

Then visually inspect the bearing for pitting. If you find pitting, use safety wire and a magnifying glass to determine the diameter of the pits. Replace the spindle if there are 5 or more pits of 0.030 inch diameter or greater in a 1/2 inch diameter circle, or if one or more pits is larger than 0.050 inch in diameter.



If there is any doubt about the size of the pits, be on the safe side and replace the spindle.

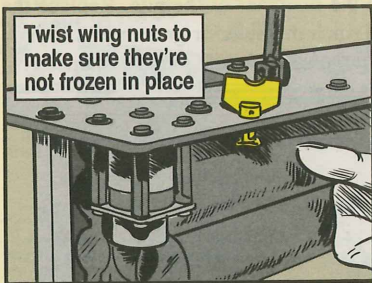
Make a note until Task 16 of TM 55-1520-237-23-7 is updated. Maintenance Information Message UH-60-89-MIM-02 has the word.

Prevent T53 Engine Overspeeds

The P1 connector in the PS 437 article about monitoring the accuracy of the N1 gas producer tachometer on T53 engines should be NSN 5935-01-255-7736. The Jetcal analyzer used with the adapter cable should be model BH112JB. If you'd rather buy than make an adapter, order NSN 4920-00-715-4661.

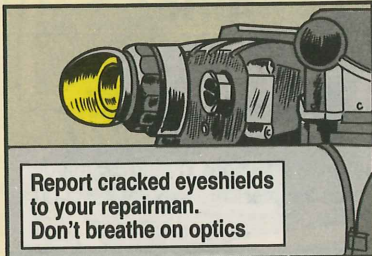
Hot Tips for Cold Weather

The wing nuts on the MGS battery freeze in place and then pop off when the battery's installed. If there're fewer than four wing nuts, your MGS is NMC. Prevent that by twisting each wing nut before you load the battery to make sure they're not frozen.

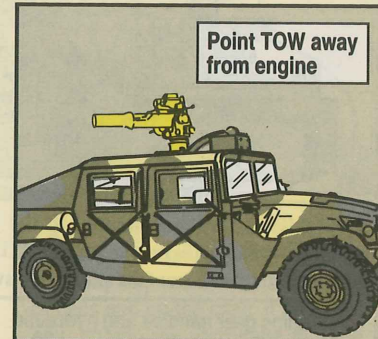


Your repairman should also order extra wing nuts, NSN 5325-01-148-8601, and retainer rings, NSN 5365-00-298-6564.

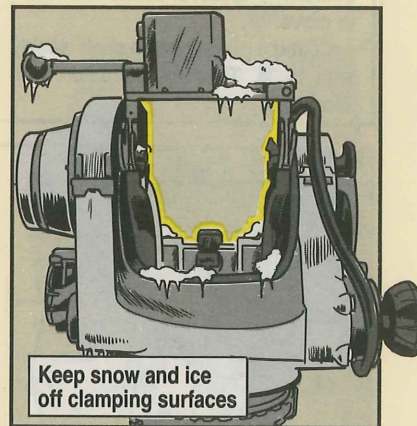
Rubber eyeshields on the optical and night sights freeze, collect ice, and eventually crack. That leaves the delicate optics vulnerable to ice and snow. Tell your repairman if eyeshields, NSN 5855-01-070-4072, are cracked. Don't breathe on optics, either, in cold weather. That will fog and ice them.



Extreme cold—less than -10°F —causes distortion for the AN/TAS-4A night sight when cold hits the heat rising from the vehicle engine on mounted TOW's. Beat distortion by positioning your vehicle so you're aiming away from the engine.

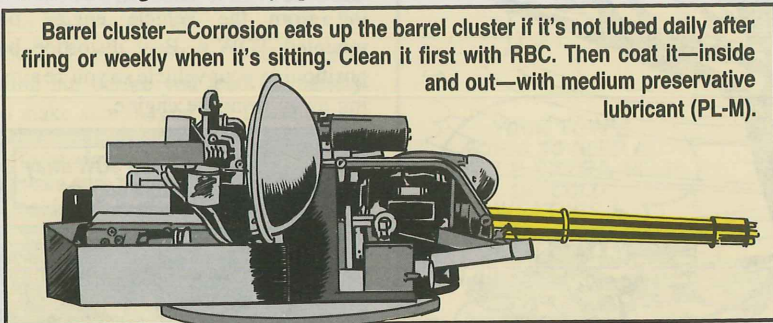


Keep clamping surfaces on the traversing unit, sights, and missile clear of snow and ice. They can prevent a good electrical connection.



Some M167A1 Vulcan components are forgotten when it's time to lube. The result is the Vulcan gets stiff and hard to set up and loses its accuracy. But just a little lubing attention—and the info in LO 9-1005-286-13—can keep your Vulcan moving smooth. Pay special attention to these lube points:

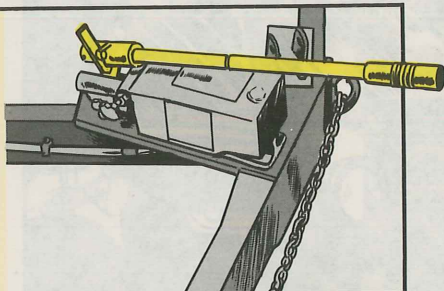
Barrel cluster—Corrosion eats up the barrel cluster if it's not lubed daily after firing or weekly when it's sitting. Clean it first with RBC. Then coat it—inside and out—with medium preservative lubricant (PL-M).



Don't force the cleaning rod in the barrels. The rod's aluminum and bends easily. The rod will move smoother if you only use cleaning swabs, not rag patches. Your armorer has plenty of swabs.

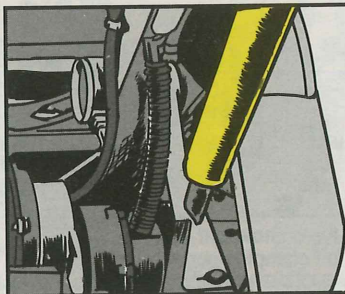
Running gear handles and hydraulic pump handle—They become muscle-strainers if they're ignored and the Vulcan's tough to set up for movement or firing. Lube the running gear handle quarterly with GIA or sooner if it's hard to move.

Coat the pump handle shaft weekly with PL-M. Take off corrosion with sandpaper.

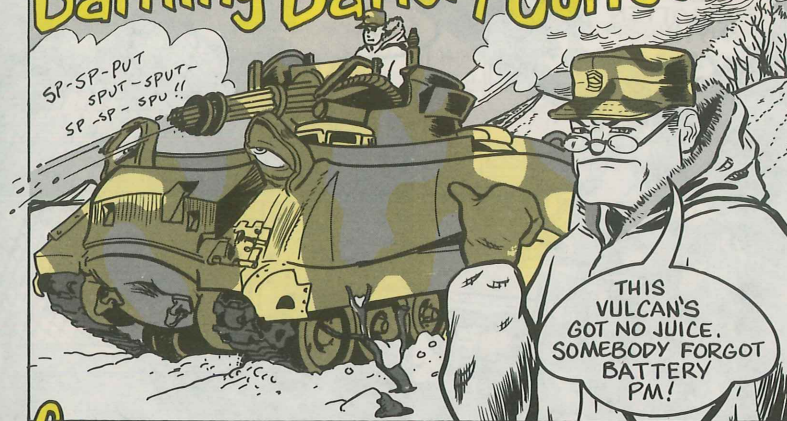


Equilibrators—Equilibrators that stick make it impossible for the Vulcan to adjust to the target. Weekly, elevate the cannon and clean the inner cylinder. Leave a light coat of GIA on the cylinder.

If any parts of your Vulcan—like the mount or the running gear—move hard, don't wait for somebody else to do the job. Lube 'em.



Battling Battery Corrosion



Corrosion and potassium carbonate powder are stopping gun system battery current cold and turning Vulcans into sputtering hulks. Repairmen can keep Vulcans charged and strong by doing these battery checks weekly:

1. Unscrew the battery connectors and eyeball the sockets for corrosion. Clean out corrosion with soap and water and a nylon brush. Keep wire brushes away from Vulcan batteries. They short out the batteries. Let the connectors dry before you reconnect them.



2. Pull the battery case cover and check for potassium carbonate powder—the white stuff—on the outside of cells and on the case. If you spot any, tighten the vent caps to keep powder out of the vents. Use a nylon brush to brush away the powder.



If that doesn't get rid of all potassium carbonate, follow the thorough cleaning procedures on Page 4-5 in TM 11-6140-203-14-4&P.

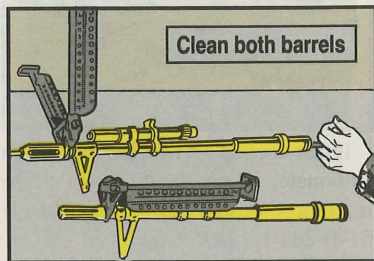
Don't Forget



Those M60 extras—spare barrel, traversing and elevating mechanism (T&E), blank firing attachment (BFA)—can prove to be extra important when you need them . . . and you will need them.

You're supposed to change the barrel every 2 minutes of rapid fire. If you fire with the same barrel, the barrel overheats. But if you replace it with a dirty barrel, your M60 quits firing.

So, when you clean one barrel, clean the other, too.

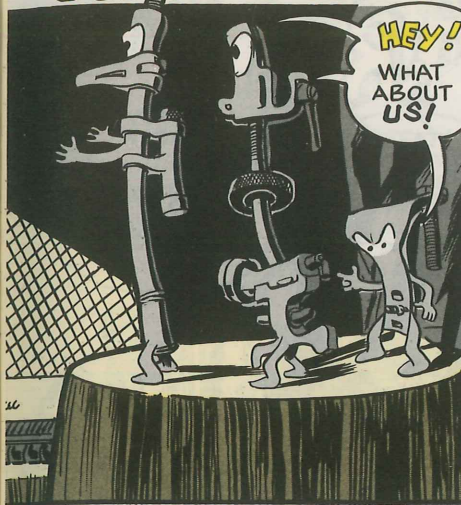


If the T&E gets gummed up or corroded, you can't adjust it for firing. If it's banged around during travel, it's knocked out of calibration. That ruins accuracy. Clean the T&E with a rag and CLP when you clean your M60. To protect it for travel, wrap the T&E in a rag and store it in the spare barrel case.

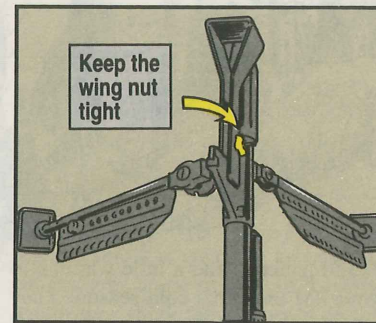


If the BFA's not cleaned, it gets fouled with carbon. Clean it with CLP after every 500 rounds or at the end of the day along with the rest of the M60.

Those Extras



Keep the BFA screwed on tight, too. A loose BFA lets gas escape. Tighten it during breaks in firing. Vibration shakes it loose.

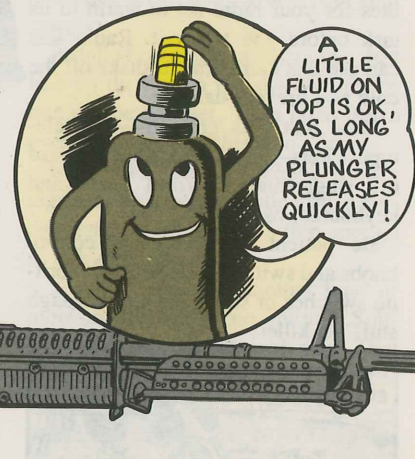


Wet's OK

Never replace the M60's buffer just because you spot a bit of hydraulic fluid around its wiper (brass) ring.

The ring (it surrounds the plunger rod) picks up fluid each time the plunger's depressed. The fluid lubes the rod.

As long as the plunger releases quickly when you depress it, the buffer's fine.



It's not fine if fluid dribbles out of the buffer when you depress the plunger or the plunger has little spring. Replace the buffer.

Wipe off the hydraulic fluid from the wiper ring and plunger with a cleaning patch before and after firing.

WARM UP

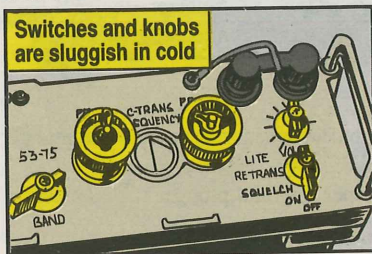


Add patience and a little warmup to your PM tools this cold season. They can save your phones, radios and commo accessories a lot of downtime.

Patience—like waiting 10 to 15 minutes for your radio set to warm to its task before you transmit. Radio sets can use that extra time to shake off the cold and prevent damage.

Gear that gets greased—like teletypewriters—needs the time to ward off sluggishness. Worm gears and keyboards, especially.

Be patient with sluggish control knobs and switches. Go easy with brittle switches or shock isolators. Rough stuff's a killer.



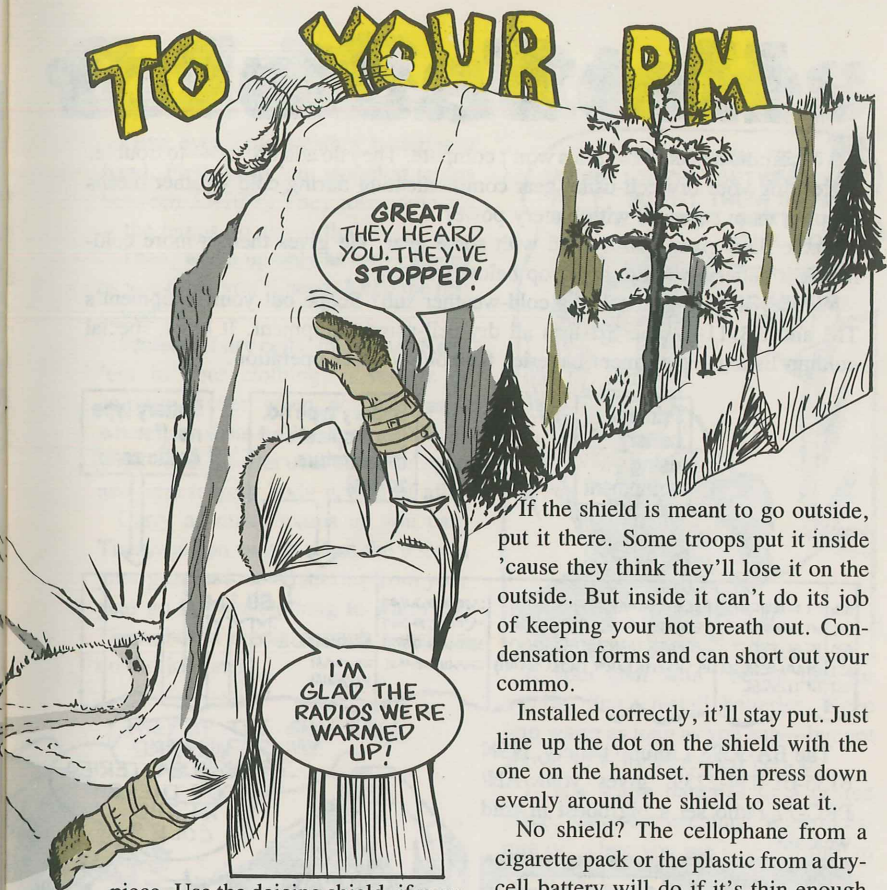
Accessory PM

Good cold-weather PM extends to your handsets, headsets and microphones.

Moisture from condensation is the big enemy. Moving inside, outside and back again makes 'em sweat. You can equalize temps somewhat by keeping accessories inside your clothing, or wrapped in something woolen.

You supply some of the moisture, tho, when you speak into the mouth-

TO YOUR PM

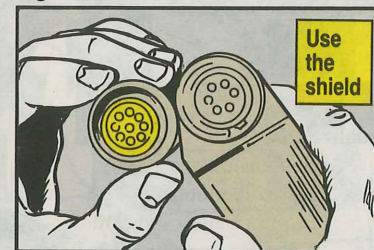


If the shield is meant to go outside, put it there. Some troops put it inside 'cause they think they'll lose it on the outside. But inside it can't do its job of keeping your hot breath out. Condensation forms and can short out your commo.

Installed correctly, it'll stay put. Just line up the dot on the shield with the one on the handset. Then press down evenly around the shield to seat it.

No shield? The cellophane from a cigarette pack or the plastic from a dry-cell battery will do if it's thin enough to talk through.

piece. Use the deicing shield, if your gear has it. That keeps condensation from getting inside the gear and shorting it out.



You can head off another kind of moisture problem by not spitting. Spitting into the connector, that is. That might make connection easier. It can also freeze your cable to the receptacle. Use a dab of silicone, NSN 6850-00-880-7616, for easy connections.

Watch metal or plastic handsets and headsets, too. If it gets too cold and you touch the material with your skin, you might stick.

Hot Facts for

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.

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.

Primary battery using equipment		Battery type no. (for tropical and temperature zones)	Battery type no. (for Arctic zone)
615	RT-84/PRC-77	RECEIVER-TRANSMITTER RADIO	5820-00-930-3725
618	RT-84/PRC-77	RECEIVER-TRANSMITTER RADIO	5820-00-930-3725
620	RT-84/PRC-77	RECEIVER-TRANSMITTER RADIO	5820-00-930-3725
621	RT-84/PRC-77	RECEIVER-TRANSMITTER RADIO	5820-00-930-3725
622	RT-84/PRC-77	RECEIVER-TRANSMITTER RADIO	5820-00-930-3725

SB 11-6

The BA-5598 Lithium battery, NSN 6135-01-034-2239, gives your AN/PRC-77 radio set a big boost in cold weather.



Cold Batteries

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

Finally, if your batteries have to mate with plastic pins to do their job,



be careful when installing 'em. Pins get brittle, and can break if handled too roughly.

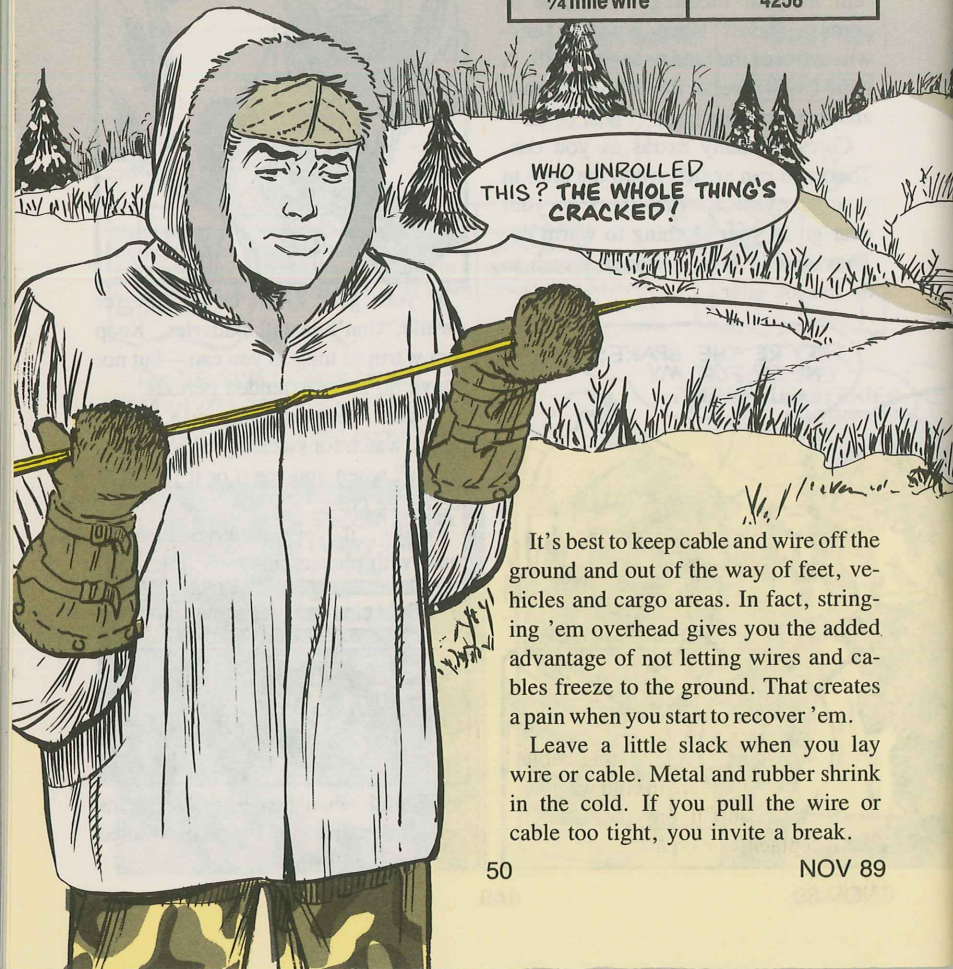
Wire and Cable Cold

When temperatures drop, keep comms on line with some cold weather PM.

During cold weather, cables and wires need more care. Watch for kinks and crimps in wire and cable. Rubber insulation cracks and breaks when it freezes. Even worse, the inside wires can break when it's cold.

In extreme cold weather, use these NSN's to order arctic insulated wire:

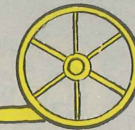
Item	NSN 6145-01-155-
RL-159 reel with 1 mile wire	4256
MX-30 reel with 1/2 mile wire	4257
DR-8 reel with 1/4 mile wire	4258



It's best to keep cable and wire off the ground and out of the way of feet, vehicles and cargo areas. In fact, stringing 'em overhead gives you the added advantage of not letting wires and cables freeze to the ground. That creates a pain when you start to recover 'em.

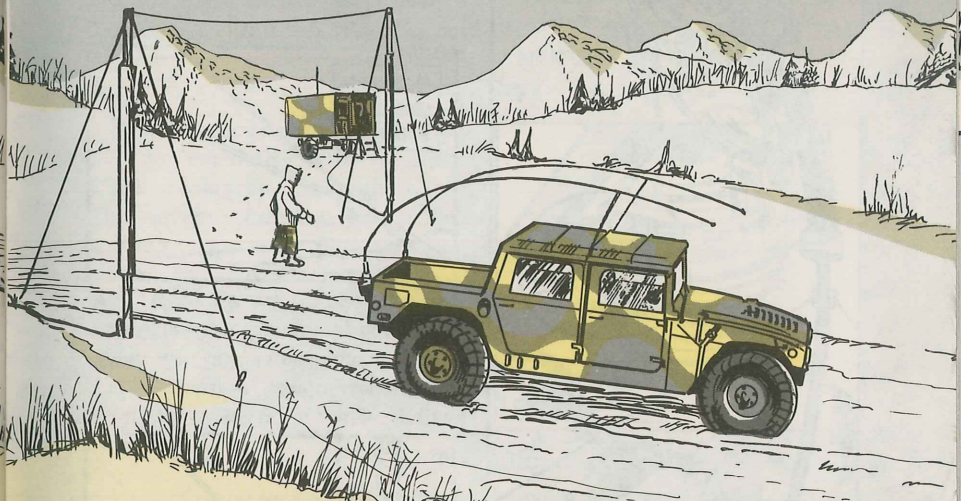
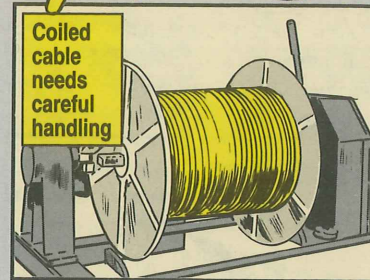
Leave a little slack when you lay wire or cable. Metal and rubber shrink in the cold. If you pull the wire or cable too tight, you invite a break.

Weather Tips



Have a little patience when reeling wire and cable. Reeled wire freezes into its coiled shape, of course. Warm it up before unreeling, if possible.

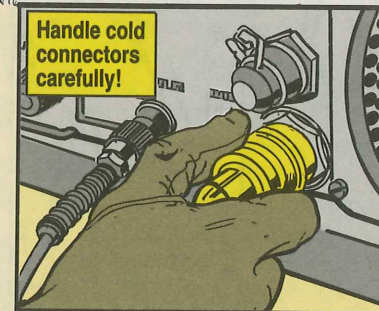
If you can store it inside a shelter, so much the better. A good idea is to take tightly-coiled cable and store it in bigger coils where it's warm before taking it into the cold. That'll reduce the chances of a pinch or break.



That's good for cold cable, too. Before coiling it, warm it up if possible.

If you have to splice or repair wire, use a tape that'll hold in the cold. TL-600 cold weather electrical tape, NSN 5970-00-240-0620, does the job. The tape comes in a 30-ft roll.

Connecting or disconnecting cables takes a little more care in cold weather, too. Rough stuff'll break something like receptacles or connectors.



GOOD PM WARMs

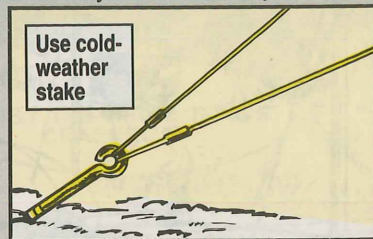
our mast-type antennas need special attention and good PM in cold weather as much as any piece of gear you use.



For instance, during good weather it's not too hard to sink a guy stake. Cold weather changes all that.

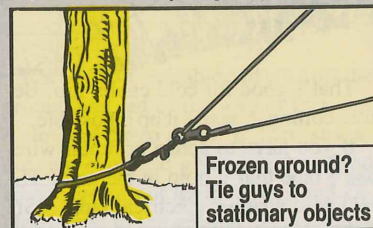
If your mast doesn't have a cold-weather stake (like the RC-292 antenna equipment's GP-101, NSN 4030-00-187-5265) a good sub is the GP-112 for your OE-254 antenna group. It goes by NSN 4030-00-291-9354.

Watch cold-weather stakes, tho. Because they're slimmer, they don't hold



as well when the ground thaws. Keep an eye on 'em during warming days.

In a pinch, you can tie your guy to a stationary object. A tree or a pole will do. Don't try to get by with fewer



guy than your TM calls for. That's asking for trouble.

Another stake you work with when installing your mast and its radio equipment is the ground. Be sure you have a good one. See the tips in TC 11-6.

COLD ANTENNAS

Grease the Joints

Those mast and whip antenna sections can freeze together for real during chilly weather. Check your pubs for the right lube, of course, but usually a dab of silicone will do.



A 2-oz tube is yours with NSN 6850-00-177-5094. A bigger 8-oz supply is NSN 6850-00-880-7616.

Be sure mating surfaces are clean before you lube. Clean all other outer surfaces as well.

Keep ice off your mast. Besides cutting down the radiating distance of your antenna, it poses a real safety hazard. Think what a chunk of ice on your noggin would do to your day.

Bowl Dry?

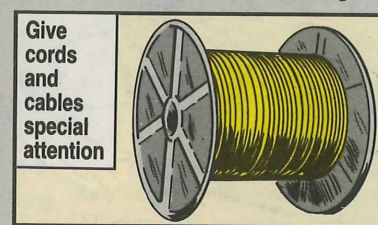
Keep ceramic bowls dry. Water collects in 'em during warm weather. Comes a cold snap, and it turns to ice. That can crack the glass. Course, the freezing temps make the glass more brittle—and breakable anyway. Handle it carefully.

Once you've wiped the bowl clean and dry, reach for your tube of silicone again. Seal the insulator before you join the 2 halves.



Cable Cautions

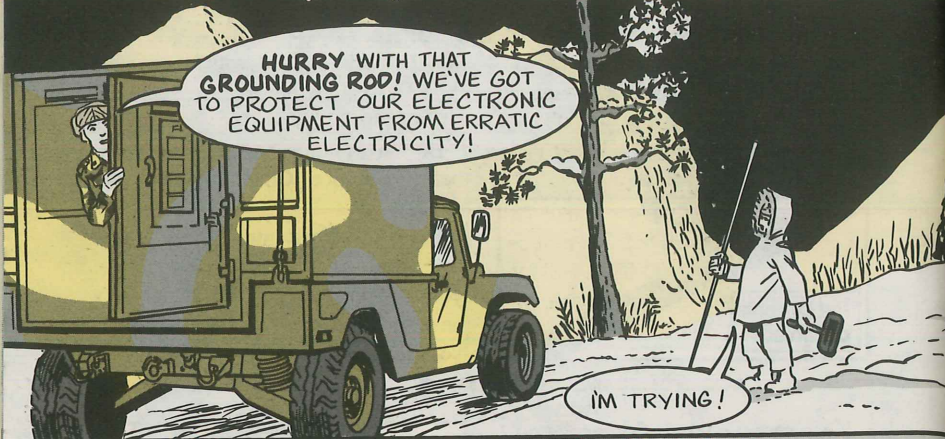
Your RF cables need special handling during cold weather, too. Insulation becomes brittle and can break. That can damage delicate inside wiring.



You keep it from knocking around too much by taping it to the antenna where possible—like with your OE-254 and RC-292.

Normal tape loses some of its staying power in sub-freezing temps. Substitute some cold weather TL-600 tape. NSN 5970-00-240-0620 brings a roll. If it's too cold even for the tape, use clamps to relieve the strain on your cable. Order 'em with NSN 5975-00-563-0229.

IT'S A SHOCKER

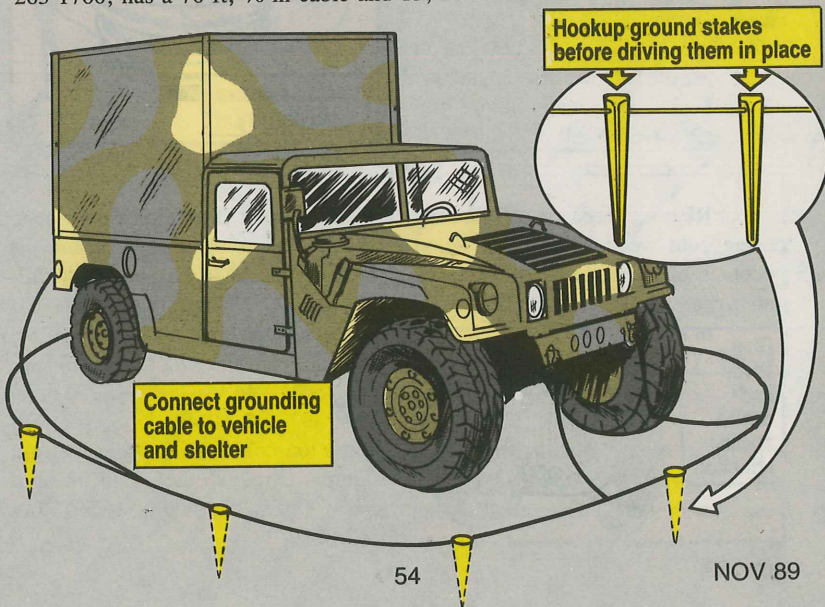


HURRY WITH THAT GROUNDING ROD! WE'VE GOT TO PROTECT OUR ELECTRONIC EQUIPMENT FROM ERRATIC ELECTRICITY!

I'M TRYING!

To knock out an errant electrical charge before it knocks out your electronic equipment or you, use the MK-2551A grounding kit. It's made to take the licking.

This new surface wire ground (SWG) system hooks up to your AN/GRC-142 RATT Rig like any other grounding rod. The difference is the kit, NSN 5820-01-263-1760, has a 70-ft, 1/8-in cable and 15, 10-in stakes.



Hookup ground stakes before driving them in place

Connect grounding cable to vehicle and shelter

KNOCKER



THINK THEY HAVE A GOOD GROUND?

LET'S FIND OUT!

HERE, TRY THE NEW SWG MK-2551A.

Here's how to install the SWG:

1. Drive the stakes into the ground in a circle around your shelter.
2. Hook up the cable to the stake before pounding the stake's head even with or just below the ground.
3. Attach one end of the cable to the shelter grounding cable.

The SWG is more effective than the MX-148/G grounding rod or the three piece rod. The SWG breaks up the errant electrical charge faster over a larger area.

This lowers the ground resistance no matter whether you're in sand, frozen

tundra, desert, on a mountaintop or in snow.

The SWG bleeds off a lightning strike's very high short-term peak current, lowering the chance of damage to your equipment.

Besides making operating electronic equipment safer, it'll be much easier to remove your grounding stakes when you move out.

SWG will replace most of the long, single-unit grounding rods through attrition.

Other Gear Uses SWG

The MK-2551A can be set up with generators, switchboards, radio sets, computers or any equipment requiring a ground system.



SURE BEATS THE 8 FOOT GROUNDING ROD!

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.

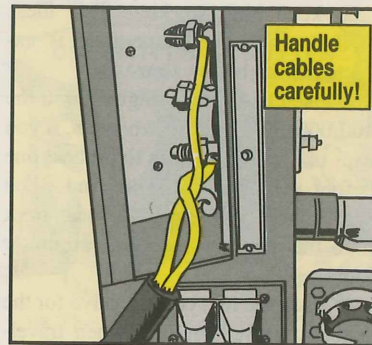
Store bulk oil and lube inside to make them easier to pour. Lube according to the LO and the temperature range you’re in.

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.

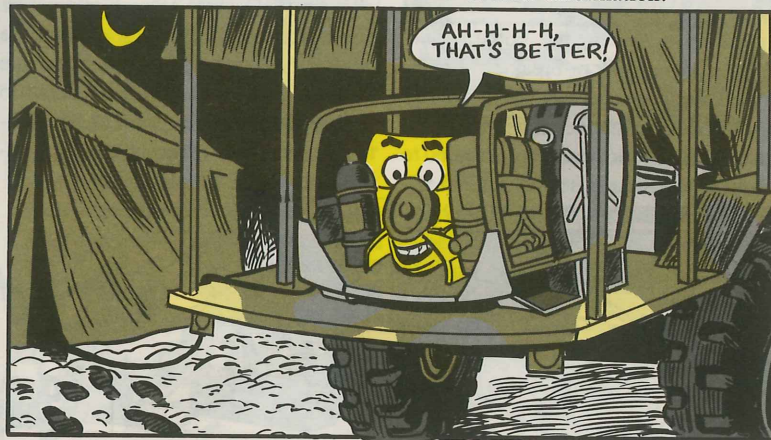
Handle cables and wiring as little as possible. Insulation becomes brittle in the cold.



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.



MORE COLD

Extreme cold weather is hard on men and equipment. Here are some tips to help keep both working. Use these ONLY when the temperature is expected to be below zero.

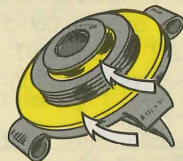
❄ Use OEA Arctic engine oil in the 400,000-BTU duct-type heaters. If you can, use another heater to preheat one before you try to start it. And when it's running, route a little heat back onto the engine to prevent carburetor icing.

❄ Pack the fuel control valve for the potbelly stove carefully when traveling. And carry a few spares.

WHEN THE MERCURY DIPS, HERE'S SOME HOT TIPS.



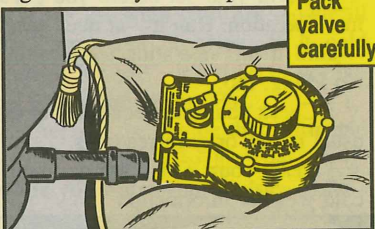
❄ The closure gasket on 5-gal fuel cans becomes hard and leaks at low temperatures. Replace it with gasket, NSN 5330-01-271-7621.



Use arctic gaskets

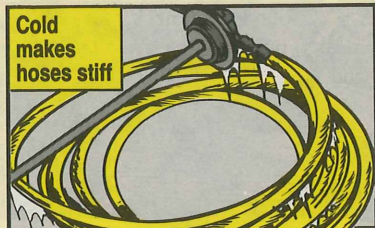
❄ Parachutes from the Defense Reutilization and Marketing Office—the old PDO—are a quick alternative to maintenance tents. Drape it over the equipment, stake the risers to the ground, and use a duct-type heater to inflate the parachute. See TM 10-1670-1 for other emergency uses for parachutes.

Salvaged chutes make maintenance tents in a pinch



Pack valve carefully

❄ Fuel hoses on the potbelly and Yukon stoves leak or break at -25°F . Warm the hoses before uncoiling, and try to make all connections in a warm area. Make arctic hoses that are good to -65°F by using hose, NSN 4720-00-542-3304 or NSN 4720-00-913-5910.



Cold makes hoses stiff

WEATHER TIPS

❄ Water in the plastic 5-gal water can will freeze. Do not fill them to the top. Do not apply direct heat or the can will melt. Also elevate cans off the ground, and use the insulating case, NSN 7240-00-125-9061.

❄ There's no cold weather garment for fuel handlers. The Extended Cold Weather Clothing System (ECWCS) better withstands fuel spills and will keep them warm.

❄ Keep your balaclava and stocking cap when you are issued the ECWCS parka. The hood is too small to fit over your helmet, and it does not have a fur ruff to stop the wind.



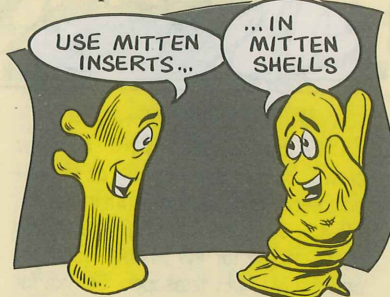
Balaclava

Stocking cap

❄ Arctic mittens alone do not protect your hands at -50°F . Wear trigger finger mitten inserts, and be sure the mittens are



the right size. Oversize mittens mean cold air pockets.

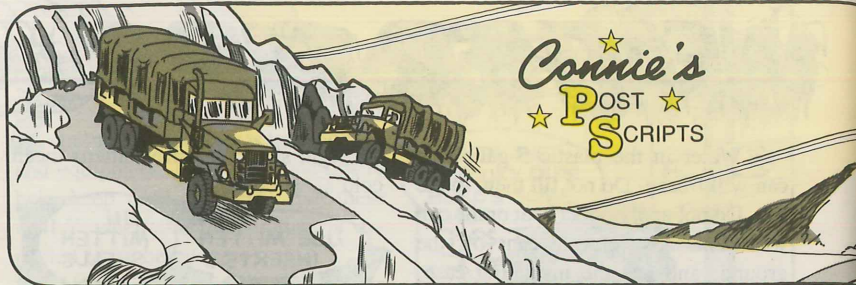


❄ The Type II Extreme Cold Sleeping Bag alone is not warm enough below -35°F . To keep comfortable, shorten the bag to suit your height by folding the extra over at the bottom. Secure it by loosely tying the straps around the bag.



Place all the insulation you can find under the bag. Line the bag with a poncho liner, drape a spare field jacket liner around your neck, wear mitten inserts, put arctic mittens on your feet and wear your balaclava.

❄ MRE's can rupture if you treat them roughly in the cold. And if they freeze, leave them frozen until you're ready to eat them.



M102 Fire Control—Again

Let's try it again, M102 howitzer crews, concerning missing or inoperable secondary fire control instruments. TB 43-0001-36-2 (Jul 87) deleted the NMC criteria for the M14A1 quadrant and the M114A1 telescope, but not for the M1A2 gunner's quadrant. You must have an operating M1A2 for your howitzer to be FMC.

M978 Fuel Separator Service Saving\$

There's no need to replace the 15 filter canisters when you pull the two-year service on the HEMTT tanker's fuel filter-separator. At about \$45 each, they cost \$675. Instead, replace only the \$8 filter elements, NSN 4330-00-983-0998. That makes the service cost \$120, which saves \$550.

M860A1 Lug Nut Torque

Torque for wheel lug nuts is wrong in TM 9-2330-357-14&P. Instead of 525-575 lb-ft, it should be 450-500 lb-ft. Make a note until the TM is updated.

Heater Control Box NSN

Stymied by cancelled requests for heater control box, NSN 2590-00-953-0110, for your M113-series carrier? Order NSN 2590-01-125-6154 instead. It replaces -0110 and is readily available.

Lock HMMWV Starter Bolt

The starter bolts on the HMMWV vibrate loose. Use sealing compound, NSN 8030-00-148-9833, on the threads to keep the bolts snug 'n' tight.

Stop AN/TRC-145 Surges

The HAWK's AN/TRC-145 radio terminal will have electrical surge problems without the surge suppression kit, NSN 5820-01-098-2376. Make sure it's been installed. A decal on the inside of the inner cover of the signal entrance panel shows if the kit's installed. The kit is part of MWO 11-5895-453-30-1 (Oct 80).

M747 Semitrailer Valve Stem Change

You operators have a tough time getting air in the inside dual tire on these big semitrailers. To make your job a little easier, get your mech to replace the valve stem with a hand-bendable valve stem, NSN 2640-01-130-8066.

Antenna Base NSN

If you need an AB-1241/PRC-104A antenna base, order it with NSN 5985-01-065-4459 on a DD Form 1348-6 from S9E. Mark in the form's Remarks column "Not on AMDF." Make a note of this stock number until it's updated in Fig 1, Item 4 on Page C-3 of TM 11-5820-919-12.

Bendix Air Dryer Kit NSN

No need to replace the dehydrate cartridge in the Bendix AD-2 air dryer on the M915/A1 and HEMTT trucks. Everything you need to clean and repair the cartridge comes in desiccant parts kit, NSN 2940-01-081-1391. Instructions come with the kit.

M939 Truck STE/ICE Test Change

Using STE/ICE test NG50 to troubleshoot the starter circuit as shown in the Note at the bottom of Page 2-66 in TM 9-2320-272-20-1 will get a wrong reading. You need to use STE/ICE test NG80.

HEMTT Inner Tube Mixup

A supply snafu put a bias ply tire inner tube in the system under NSN 2610-01-165-0567 for the HEMTT's radial tire. But a tube for a bias ply tire does not work with a radial tire. The tubes are made by Firestone, under contract number DAAE07-88-C-1409, and come without valve stems. Their boxes are marked, "Not for Use With Radial Tires". If you have one of the tubes, turn it in, pronto!

Seat Sitter Upper

Short drivers have a tough time seeing over the hood to the road ahead in some trucks. Those drivers can get a better view by sitting on a 2-in thick cushion, NSN 7210-00-205-3544. Use Appendix A of CTA 50-970 as the authority to order.

AM/VIC-1 Power Off?

Before you hook up or remove the radio system or intercom system cables, be sure the vehicle master power switch is OFF. Make sure the AM-1780 amplifier power switch is OFF, too. If the amplifier switch is ON, transients or short circuits can damage the circuits.

M939 Tires & Beadlock

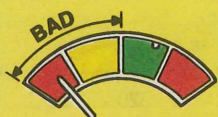
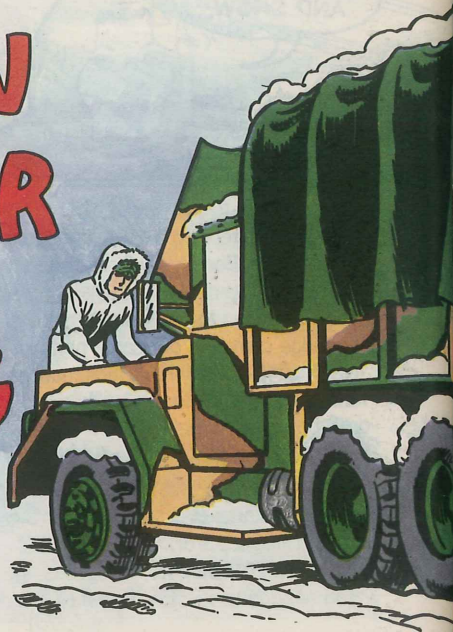
Forget the Caution on Page 8-10.4 in C1 of TM 9-2320-272-20-2. It's wrong. The beadlock on Michelin tires is compatible with a Goodyear beadlock. Just make sure the O-ring seats properly between the wheel halves to prevent air loss.

The word is in TACOM Msg AMSTAMTB 232000Z Jun 89.

Distribution: To be distributed in accordance with DA Form 12-34-C-R, for TB-43-series.

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

**YOUR
BAT/GEN
INDICATOR
IS
TELLING
YOU...**



**BATTERIES ALREADY SHOT OR
BEING UNDERCHARGED**

..Report It!



BATTERIES OVERCHARGED

..Report It!



**CHARGING SYSTEM PUTTING OUT
26-30 VOLTS**

..System OK!

...ONLY GREEN Is Good To Go!

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