

Volume 128

PS

1963 Edition

THE PREVENTIVE MAINTENANCE MONTHLY

IT SAYS, "STORE PARTS
AND ACCOMPLISH
NECESSARY REPAIRS
IN A WARM DRY
BUILDING."

**SPECIAL COLD
WEATHER ISSUE**

THE FRIGID BREATH



You hear the howl of a thousand demons riding the driven wind a thousand miles straight from the Pole—the bottom drops out of your consciousness and you're floundering up to your waist in snow—and you're walking head-to-head with Death.

It makes no difference if you're stranded on the banks of the Amazon, riding parallel along the banks, or crossing a crossing of the frozen Tiberius!

As the thermometer goes down, the passages of Preventive Maintenance gear spring to the point where PM is extreme cold is probably more critical than under any other weather conditions, anywhere in the world.

Why? Let's say that +32°F is a good, ideal, average temperature to work and operate in. Well, going into the snow at +10°F means you're off of 42 degrees beyond the ideal. But what's the other way. At -60°F, you and your gear have been thrown for a 110-degree haul!

You've heard all about "a stitch in time saves nine." But in the cold, a stitch in time can save nine hundred. A maintenance check is a quiet PM check, done right, can head off a repair job—one that normally takes an hour but can stretch to a day when you're working with cold-wind and metal, brittle tires, and numb fingers.

With your life—and your car's!

OF DEATH



success—depending on the thickness of a sheet of snow, or the dependability of a test store, or the power of a radio battery, or a vehicle that won't start—the way to be sure is to prepare, not wait for repair.

It can be done. All types of units have proved that trouble-free planning, knowing the problems, and staying on top of the little things, can add up to successful operation in the worst conditions you can imagine.

Preventive Maintenance in the cold can be your ticket back.

That icy wind whirling 'round your head isn't wind at all—it's the **FRIGID BREATH OF DEATH!**

PS PREVENTIVE MAINTENANCE MONTHLY

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KNOW YOUR

COLD



When the 62' bugs kicked his C-ration carrier a hole down to the next one, Adams is another wonder, that was back and allowed to leave it wasn't like this in the winter of '66—three real ones, one you might see made when he comes.

When he says "cold," he could be talking about plain, old ordinary cold blown to snow or really cold (as you know), but like or not he's getting around in leaving others: someone cold—when the thermometer ran deep from -10° to -60° like a one-way pass.

Now, there are some kinds of Army equipment that could save lives about

how cold the weather gets.... In terms of this sort of life and few lessons.

Most equipment can get along in plain, ordinary cold, with just a little more care than is usually paid during down-drafts weather. But when the temperature drops out of the thermometers, it's time the extra care and attention.

Equipment survival in extreme cold weather is a couple dozen miles beyond when it takes for ordinary cold. In low-temperature, only good cold weather maintenance know-how and practices will save the trick—and either you do it or you get it done; your equipment.



In plain cold weather, small items like boots, jacks, shovels and compass devices that are made from a combination of different metals work with little or no noticeable effect. But when these same items in -60° and below temperatures it's another story. Their various metals contract at different rates creating binding or splits.

Only special care and attention to proper clearance when adjusting parts of this type will keep them in working condition, but fitting won't free your compass and binding parts. The only way to keep your equipment out of trouble of this sort is to follow the basic rules... and here they are:



1. Keep your cell weathered. If it's 100°F and other important publications are likely to quit tomorrow, be sure they're easy where you get.



1. Do this now!

2. Get your equipment ready. Get it for failure or missing parts in several conditions.



3. Use your engine and maintenance only for its intended use.



4. Be sure you're not in a position that will be beyond your means for and with.

EXTREME COLD CONDITIONS

You'll run into many conditions that do not exist during your normal cold spells. Learning to recognize and accept these conditions as part of extreme cold weather living is the key to equipment survival. Here's a list of the worst conditions you must expect and live with.

Understand the relationship between dry bulb and wet bulb temperatures. If -40°F dry bulb and -40°F wet bulb, it's a real cold. To keep your equipment from freezing, you must have a wet bulb temperature of at least -30°F. This is the lowest temperature you can get if you have a wet bulb temperature of at least -40°F.

Wet bulb temperatures will not freeze if you have it quickly enough.

Wet bulb temperatures will not freeze if you expect to warm up.



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and —HPE, crawling—and the engine moving—one vehicle or rig from each position every 2 hours. For that time, that'll use more than 40 continuous minutes. But as the cold deepens—say below —47°—it's usually best not to shut off vehicles that aren't to be kept available for use, and move them at least ten minutes out of every hour.

If you can't reach that, remember that pre-warming a cold-soaked job with your M-88 starts kit, Harmon Motion heater, or even diesel exhaust will get a power train in shape to roll. It's the cold-soaking of power train parts that makes re-starting a wear road to damage—avoid it like the plague if there's any other way out.

A lot of cold weather starting troubles can be eliminated if you make sure your equipment is lubed with Arctic lubricants throughout. Arctic lubes are listed in TB ENG-347 (4 Dec 59) for Engines equipment and Ordnance equipment is covered in TM 9-207 (Sep 60).

There are many more of these ready checks that you won't find during normal cold weather. In general, . . . it's wise to be cautious with almost everything that's left out in low cold temperatures.

These are some of the major attention areas you'll want to watch during —HPT weather.



Going around in deep frozen weather usually depends upon a wheel or track vehicle. There is too little or no gasoline with an irretrievable water in it. Keeping water out of gas is not enough alone. The best you can do is keep the water to a minimum and then remove it with dehydrated alcohol. That'll keep it from freezing—reducing icing, freezing and freezing up your fuel system.



OIL

When it comes to pouring oil in your equipment, stick with your OIL. Don't get involved in those coffee-break arguments or discussions over which oil is best in extreme cold. Take the experts' word for it . . . in the U.S.A.

Never substitute an oil for one called for by your OIL. When it says to use OIL instead of OIL 10 . . . do it. But keep one thing in mind, when using OIL, your engine will consume more oil. This means you'll have to check your engine oil level on the dipstick pretty often. Check it as every step or every hour of operation. See page 57 of this issue for the story on OIL and extreme cold weather lube problems.

Again, no short cuts . . . just because an engine consumes more OIL, never overfill to cut down on drip-joint oil level checks and refills. Overfilling causes other troubles. Stick to the basic rule that says follow instructions to the letter.

While we're on the topic of oil, keep an eye looking for water (condensation) in your engine oil. Water will settle at the bottom of the crankcase, cover the oil pump screen and freeze. Have you ever moved ice cubes through an oil pump?



BRAKE FLUID

Some brake fluid must be in all hydraulic braking systems. A dry brake brake fluid (BRA) ME-11-11000 suspension (high alcohol content) when a piece of equipment is parked for a week or longer . . . so, check your BRA fluid level if you want brakes when you move out.

BATTERIES

The best thing to do with a battery in extreme cold is to sleep with it. When it's not hot and not practical to be in bed with a battery, just heat figure out some other way to keep it warm.

Keeping a battery warm is the only way to get it its maximum output, and your battery loading puts on your best regular bet. Cranking a cold-started engine needs the highest output from a battery. A fully charged battery at normal temperatures is only 60 percent efficient at -40°F and 50 percent efficient at -60°F .

If a vehicle is going to sit outside

for several days, it may be a good idea to bring your batteries into your warm area or any other warm area until you need them.





When cranking a cold battery, be careful using the cables from the free wrenches as terminals (put on the post on battery case). After cold snap and break out wire, see page 44 of this issue for special tips on battery care.

MANIFOLD HEAT CONTROL VALVE

Extreme cold weather demands that your manifold heat control valve be set right. Whether you have the automatic or manual type, it should work freely and be set in the "winter" or "cold" position. On the automatic job, the vacuum control linkage and spring must be in good working condition, and connected to the heat control valve. On the manual job, it's up to you to set it in the "winter" or "cold" position.

STARTING

If you've got to start a cold-soaked engine direct from your batteries, make sure the batteries are in peak performance.

Try for a quick start... say, no longer than 30 or 35 seconds of cranking. If it won't start, stop cranking with the batteries. Before your next try, pre-



heat the engine and engine compartment with your power plant heater.

Make starting life on your Herman Heiser easier. There can a jumper or drive cable from your drive kit or from a fresh set of batteries.



Always double-check before using a jumper or drive cable that the positive post on one battery is hooked to the positive post of the other battery.

On some equipment you have a positive ground and some a negative ground. If you hook up a jumper cable to the wrong post, you've got yourself trouble. You'll more likely burn out a resistor for AC ground and a voltage regulator.

When starting equipment that has an engine heater, always start the engine heater first. A cold and poor performing battery that won't crank a cold engine will usually start and run the gasoline fired engine heater. Then your preheated battery and the preheated engine'll make easier work for you.

Be on the lookout for hydraulic leak when starting a cold soaked engine. Don't over-primed... prime just enough to fire the engine. Check, don't flood it.



ENGINE IDLING



Engine idling is a very low RPM in fact. Low idling causes a barrel of troubles as don't do it. If you must idle, keep your engine at high idle, which is about 1800 to 2200 RPM on most engines. Idling just for maintenance can work out just the other way—it could increase your engine maintenance problems, and also put you in a sweat for enough fuel!

ANTI-FREEZE

Never add water to anti-freeze anti-freeze. This seems to be general knowledge but you can get thrown for a loop if you don't check your equipment's cooling system—carefully.

Any water left in the bottom of the radiator, engine block, battery pads and hoses will substitute the anti-freeze's prepackaged propionalated mixture. This unwanted water that wouldn't matter much in ordinary cold will cause real trouble in deep-freeze weather. Do a complete job and drain all the water before putting in your anti-freeze and be sure.



For specific details on anti-freeze, dig out your copy of TM 3-207 and go over page 14 for Ordnance equipment and TM Eng 347, page 4, for Engine equipment. Also, follow the instructions printed on the anti-freeze containers.

TIRES

Tires on your equipment need special attention in extreme cold weather and you'll even get arguments about how to go about it.

LOW PRESSURE
DOESN'T DO IT
EXCESSIVE
HEATING



Decreasing tire pressure below normal will certainly help traction in loose snow—but it increases flaring.

Increasing tire pressure above normal reduces flaring—and flaring at low temperatures can bring on permanent tire cracks. So it's a choice sometimes between better traction or the danger of cracks. Go by your TM, but remember that there are other ways to improve traction and a cracked tire is a permanent thing.

Always be on the lookout for the spots... if you get them, move out slowly until you work out the flat.

During thin and freezing rain cover your equipment every so often to keep their tires from freezing to the ground. Use dry tree limbs, brush or anything you can lay your hands on, under tires and tracks when you park. If you do end up frozen right and can't get a handle from snow, make sure you use a blunt tool to chip 'em out — don't gouge your steel.



Another TM you'll want is TM 9-1876-1, "Care and Maintenance of Pneumatic Tires." This TM covers all you'll want to know about chains, tire-

the driver, air pressure and maintenance of tires. This TM is useful in all types of cold weather.



AIR CLEANERS

Engine air cleaners have been known to have ice collect and run down on the air flow. This restriction effect will choke the engine and cause it to run rough or stop. For special air cleaner risks and problems, explain on page 12 of this issue.

SPARK PLUGS

Keep your spark plugs adjusted the way your equipment's TM calls it. This is true for all types of weather. There's an old story going around that in extreme cold weather you must gap them .001 inch less than specified in the TM. This is no longer true. Stick with the TM settings.

Here again if you have any questions or you want more depth on spark plugs, get a copy of TM 3-8038, "Spark Plugs Used as Defenses Material."

GENERATOR PULLEYS



Generator pulleys have a habit of twisting off when cold-soaked. The only way here is to preheat your generator with your B4B above it, or Heron Nelson Heater. Even after you heat it, take no chances and stand clear when stuffing the engine... you never know. In temperatures above -40°F this is no problem.

ENGINE HEAD GASKETS

Since many low temperatures really make metal shrink, the head gaskets in the L and F type engines will blow out no leak if their head bolts have not been torqued properly. The only way you can be certain your head gaskets will stay in good shape is to have the head bolts torqued to tight on the TM spec... after the engine has been heated to its normal operating temperature.



Your windshield is weaker than that in different in extreme cold weather. Never warm it too fast. If you do, it'll crack and leak, for sure.

Always warm it gradually.

First heat the cab with your personal heater. After the cab is warm, turn the heavy defroster on low and let it spray on the windshield. Some weather find it helpful to put a 4-in strip of tape across the middle bottom of the windshield. The tape acts as a heat shield and keeps the windshield from cracking when the heavy defroster is turned on.

In temperatures below -40°F , never allow the full capacity of your heavy defroster onto the windshield. Keep it lower as low as possible.

HEATERS

You'll find that the same plans and professional heater specs in several different makes and models. Since they're basically the same, their trouble spots are also about the same. Here's a run-down on trouble spots you're most likely to find:

Power plant bolts appear almost loose or broken.

Flame holds out of adjustment or broken.

Igniter shut-off acts dead while power plant heater is turned on.

Operating the power plant while the vehicle is moving.

SPECIAL EQUIPMENT

Equipment survival in extreme cold weather is usually not possible unless you have special winterization equipment. This equipment has been designed to help get you and your gear, engine, seats, shoes, tank, truck or whatever you through the tough cold periods. This special equipment could be heaters, blankets, special oils, shoe kits, primer pumps, covers, etc. The only sure way to know what you should

have is to keep an eye on Ed. Pamphlet 710-4.

It lists your equipment TM's, UV's, MWO's, SO's and LO's. These publications are your guide to the type of winterization equipment needed for your specific piece of equipment. It lists special publications on cold weather needs. Think through it and try to get every publication that you think you'll need.

Here's a few publications that are also in low cost to your shipping bag:

EM 11-75..... Back to Back Manual

EM 11-77..... Operation in the North

EM 11-80..... Operation & Maintenance of
Tractors Mounted to Fu-
els from Cold Weather

EM 11-87..... Cold Weather Carving

EM 11-1..... Winterization Equipment for
Automotive Equipment

EM 11-205..... Winterization Techniques for
Engine Equipment

EM 11-211..... Use of Antifreeze

EM 11-212..... Cold Weather Aid for Drivers
(11-104)

EM 11-213..... Winterization Kits for Units
with Engines

the AIR INTAKE



Any internal combustion engine needs its supply of air—just as much and just as close-to-sub-zero temperatures the more so in that important role.

You can keep yourself out on FM and special cold weather tires (use the right grade of fuel, properly mixed) keep the engine wind-up (use right-oil maintenance adjusted) to give a richer mix like the manual adjuster patches the engine, the filter, the waxes), but

DOWN YOU GO

Under the right heavy heavy conditions, this problem can paralyze equipment with either the dry type or the oil

type oil add up to a big fat snow on some of your equipment, if the air intake stays unpowered and the air cleaner freezes-up on you.

When those icy winds (and even ice and snow) are drawn in, or blow into the air intake, the air cleaner can get it right in the honey-comb, when that happens it's got no choice... it begins to freeze-up, slip-up, and not mean the engine starts to lose power, gasp, and maybe even cough-out entirely.

both type air cleaners.

For example, the oil-bath type air cleaner, in addition to being-up from

stopped moisture, or the loader of ice and snow, can also collect ice crystals and snow dust in its oil. This'll clog the oil, or it'll stick to where the filter lives, and that can partly restrict or completely block the air flow.

One of the best ways to prevent the

ice intake from dirty winds and weather, so engines can have their critical supply of air, is to shield the engine compartment and/or the intake area, as much as possible, from the direct blast of hard driven winds, ice and snow.

You can do it with whatever kind of flexible, sturdy, non-flammable material (think built-in your equipment).

Weatherize kit, for example, for some equipment will give you covers for grille, the head, radiator, hoses, and other engine compartment parts that can be covered in.



These covers provide good protection, and similar home-crafted covers or tarp covers, can work equally well, when you can't use a weatherization kit.

On some equipment, in addition to covering the engine compartment top-side, it may also help to cover the engine's under-side. A piece of canvas stretched from side to side and firmly anchored to the frame, can help to eliminate ice and snow buildup in the engine compartment.

Keeping equipment facing down-wind, when possible . . . the when it's operating in a stationary spot, or parked, also offers some protection.

THE AIR CLEANER

The air cleaner's job, of course, is to provide clean air for the combustible mixture in the cylinder. While mud and pistons won't be damaged by the abrasive grit, dust, and such. In many, by itself, however, where there is less of a dust problem, there may be times when you'll be authorized to make a temporary change in your engine's air intake system—like removing the air, the element, or both, from the air cleaner.

Q: Will I be able to remove the air cleaner element in case of an engine problem?



As a matter of fact, in most Arctic-like conditions, snipping the air cleaner may be the only way to keep the air intake reasonably un-clogged, as you can see in Figure 1.

With the oil-bath type air cleaner, for example, you can just dump the OES tube. Then clean the element and replace it. Operating without the oil solves the problem of ice crystals, and mitigated or steady oil build-up in the air cleaner.

With losing the element in place, while it won't be blowing as it normally does, will provide a trap of sorts—a change of direction for the air.

If after removing the air, making the engine compartment as tight as you can, and shuffling the air intake, the air cleaner still freezes up, about all you can do—if you must keep on going—is to keep operating. This doesn't kill the engine. If you can help it, when you first notice loss of power. Remove the air cleaner element, shake out the ice, replace the element, and give it another try.

Q: Will I be able to remove the air cleaner element in case of an engine problem?



In a case where you might be in a grand rush, or if you can't afford to keep stopping to clear out the element, you can just leave the thing out all together, and then replace it when your check's done—but that's a junk-bonus last resort.



This is one way to keep going in a, say, snow-out—but it's really an emergency deal, tho, and the air cleaner has to be put back together soon's the ice clogging conditions ease up. Cause even in the frozen areas, come a time when you might suddenly hit a cloud of wet, and you're something else that you — can kick up dirty conditions which would be extremely harmful to an engine.

On some equipment with dry-type air cleaners, when the air intake normally comes through the operator's area (so the air cleaner) the air intake lines have to be rearranged so the air



is taken from the engine compartment — during Arctic operations.

With this arrangement, and a dry-type engine compartment, the dry-type air cleaner gets a better chance of staying open. However, if a dry-air cleaner freezes and blocks the air intake... and you have to keep going, in an emergency you can remove the air cleaner element, wash it away, and then replace it just as soon as you can, because you may hit hard spots, muddy areas or worse of dirt mixed with snow.



LIKE A 1000'

This air-intake problem can hit you at the worst times. So, one of the best things you can do yourself in this area is... be prepared ahead of time. Check out local guidelines on what's to be done on your particular type of equipment when it gets caught in such a bind.

And, by all means, before you put an air cleaner apart... wet or dry...

to keep the air intake open, check it out with the Old Man on your maintenance's support staff. And, also, when it's OK if the equipment is opened without an air cleaner for any length of time, it should be tagged with the caution "Air Cleaner Element Removed" in an easy-to-spot location on the instrument panel.





MAN OF A COLD FRONT

"I need a warm blanket!"

"I need a warm blanket!"

"I need a warm blanket!"

"I need a warm blanket!"

Maybe you're starting up on a mild December—perhaps the mild hasn't started up on you.

Either way, your equipment better be in top shape. And all your cold-weather equipment like pressurized and pressurized heaters want to be ready for action.

With your own built-in body heater and the right clothes and food, you can take the cold from where your equipment can't.

When that thin line's fading down the thermometer stem, you can crawl into a clean, dry tank and take it for quite a spell, even in snow and ice. But after your equipment's cooled around a few hours, there may be trouble waiting to find its winter nap...even if it's protected with the right equipment.

The M40 kit's got two major units (heat and electrical power) to help get your vehicles and other equipment into action.

One is for direct starting, and includes the set of four 44 6-watt heaters, a generator operated by a six-cylinder air-cooled engine, a regular two-way stove

batteries (see their page), a fuelage may sleep man's hat), silk gas will and hand for gears to use. In extreme cold, ordinary oils and greases, plus any motor oil amount, may freeze solid.

That'll be the day when it'll pay to have an M40 cold-weather oil (above) kit in your maintenance kit, or mounted on wheels on the forward body of a truck or trailer. Mounted to go, it's ready to rescue any vehicle or equipment that's chattered with the cold.

You get the kit (like it says in M40-10 110 Pts 42). The rule there gives you one kit for each 20 vehicles if their average temperature for the coldest month of the year is +17° or lower. (Maybe it's not that cold where you are now, but a kit can get you there in a few hours.)

cable, and a pair of jumper cables. Stove and jumper cables are 20 feet long.

The stove cable is used if your vehicle has a stove compressor. The two jumper give you a direct connection to a dead vehicle's battery if there's no direct repair.

The kit's starting power output can be adjusted to 6-volt, 12-volt or 24-volt systems by leverage switches that automatically lock on the stove cable output compressor that are set in use. (The 24-volt system is standard for most vehicles in your tanks, but it's always best to check.)

The other major unit in the kit is a heater that operates off the main set of batteries and the same fuel tank used by the generator engine.

The heater, electrically driven and gasoline fired, puts out 100,000 BTU's an hour through a 20-foot flexible metal duct. It's used to warm up the crankcase, engine components, gear cases, tracks, bushes or other parts that are tied up or don't have fuel or other fluids and are just too cold to operate. The heater can be used to warm the kit's own generator engine—or to warm up another kit when you've got one.

When your equipment is properly prepared and maintained, this kit gives you the best method to keep it in action even down to -77°. And that's colder than the blizzard when the fire's out.



WARNING

Don't drink too much or over 10 weeks of work. And don't drink too much. It's not, and we're in a race to warm yourself in your winter gear. Otherwise, you'll be in a race to get yourself out.

Remember: The kit isn't maintenance-free. It's for backup equipment, not for quality heating.

Now, back to your equipment, and what the M&M kit can do. It's no miracle, but it can help if you've got a vehicle with a battery too low to push or roll too cold to start, using just the vehicle's own power. So, using your M&M kit alongside and get with it... but just a "conceivable" solution...

FIRST, GET THE KIT GOING

You can't make a vehicle move with out a battery. And to get a vehicle under way with the M&M kit, you first make sure the kit's in shape.

Which, you keep it dry under a shelter or vehicle cover. Keeping it at the right temperature is a bit of a problem. Its battery compartment is insulated, but extreme cold can clobber the battery.

So, you:



(1) Put the kit in a place that's kept at medium temperature.

OR...



(2) Put it in a cold place and take the battery to a warm place, if you have one. Otherwise you can warm it with its own power if batteries are not too cold to...

OR



(3) Put it in a warm place and hope for the best. If you take it from a shelter that's too warm the active cell, electrolyte could leak if it's a bag.

Keep the fuel tank full to avoid auto-detonation inside it. Besides you may need the fuel. The tank holds 44 gallons. The generator engine runs about 2 hours on a gallon. The heater takes about 2 gallons per hour.

Mix the fuel by the formula on the instruction plate inside the reinforced door (found) for general cold weather operation. Some instruction plates say mix one quart of oil (normal grade) with each 3 gallons of gas. TR-God 199 (18 Jul 82), Para 12d(1), says use one-half pint of OE-10 oil per gallon of gas or 1 pint of OES Lubriant. The TR



also says include 1 pint of demersol/12 kwhol for each five gallons of gas. Use 50 to 100 octane gas when you can get it (OE'll have more say grade, but when you want a fix you use the best you can get).

The TR formulas are likely to be especially important in extreme cold, so keep a close eye on the mixture. Too little oil and your engine won't get lubed. Too much and it'll get fouled up and choke on excess carbon.

And mix that formula completely before you pour it into the fuel tank.

Check the electrolyte level and specific gravity in the battery regularly. Same as with your vehicle, this kit won't go without 'em. See page 46 of this issue, about batteries.

IF YOU NEED HEAT

Let's say your vehicle batteries are OK (except for being a bit weak), the engine won't start. A search shows there's no other trouble, so check out that heat applied to the combustion and other engine components will warm it so the batteries will have it over for a normal start.



Use the heat gun to the 24-volt battery —the auto battery starting power because of the heavy initial draw. Do repeat until the battery flows as long as you're operating without the generator in action. This procedure is, the battery can be filled.



Attach the heater duct to the front axle.



Turn off the fire that runs at full rate above heater fuel pump.

Open the air inlet port on lower right corner. Adjust the warm-air flap shutter with a bit of the wood strips opening for cold weather, until heater returns.

Make sure the power is on 24-volt (switch handle up), then shove the single blade heater controls upward into socket. This should light 'er up.

That heater duct gets another look, so have a crew where you lay it or point it. Hold for awhile now parts not be wanted by keeping your mind on the intended handle-like you might get a nasty burn. It's best to wear safety gloves if they're available.



You warm the parts that need it, next.

With hood down to hold hot air like a blanket around the engine, heat applied to the combustion chest up and warm other parts. This may be enough to get the vehicle moving. In extreme cold, you may need to apply heat to components like the subframe, generator, radiator, and gear cases.

The heat is to take hold when you add the heat of electric or other components. It's best not to apply heat to any component more than 15 minutes at a time.

Once the vehicle engine's warm enough to start, operate it at a speed fast enough (1100 to 1200 RPM) to warm it up to normal operating temperature (160-180 degrees). Check to see that all gauges show normal opera-

tion. They may need a bit of warmth, and, then try moving out.



It may be that your brakes are frozen to your tires (or tracks, if it's a tracked vehicle) and frozen to the ground. Or maybe your transmission needs a bit of warmth for shifting.

A lot of that M-40's hot breath may take care of it. But don't go crawling underneath when there's a chance the vehicle may start to roll. Better keep the engine and re-vent than get crushed. Use a snowbank.



And keep that heat out of the cab-or crew compartment in any place where troops will ride. If instruments and controls need heat, get an 'em the best you can from the engine compartment and underneath.

Better be a bit chilly than get a slight case of sophistication followed by rigid march.

To stop the heater, cut off the fuel to the tank. Run 'em a couple minutes, then cut off the main heater switch.

WARM FEET IS NOT ENOUGH

When vehicle batteries are low and the vehicle's cold-soaked, heat may not



be enough of an answer. You may have to slave start it.

Slave starting with the M-40 is a lot like with another vehicle—but with a few special quirks of its own.

If you're using the slave cable as slave equipment for the first time, it's a good idea to see 'em with a new lamp like it says on pages 10-12 of 85 83, to see their positive and negative wires are hooked up right.

Once you're sure of this, plug the slave cable into the M-40's switchboard receptacle. Select the run to match the slave vehicle's directional system. For standard tracked vehicles it's 14-14-14—but check it. Connecting power on the cable and holes in the receptacle are slightly off-center so it's unlikely you've got 'em wrong.



For engine work, check to see if you've got the latest approved valves described in Change 1 CIO (see 241 to 248 and 249 for valve numbers). They should have 1 in white bands near the ends.

Be sure proper clearance is maintained between the valve and the spring. The valve should have a 1/8 in. gap from the spring seat. The spring should have a 1/8 in. gap from the valve stem.



Now connect the drive cable to the diesel engine's drive sprocket. Remember, for better power it is preferable to use a 100% grade or give.

And that's about it!



Open that cable on the left side of the bit for the road.

Open the engine access door at front face faster to warm engine and battery if needed. See steps to hold fuel tank.



Open the fuel nut at the bit on the engine.



Adjust the nut on the cable holder to open with lower block against stop pin.

Place both gear switches in (front) forward position. (They'd be there already if you used the brake.)



Open the air intake port on the exhaust port on right side.



Never adjust chains from the manual starting device. The manual starting pin can catch your chain when the engine starts or the fuel muffler may heat you. Check from the front access door.



Since you're using 24-volt power, you can start with the electric starter button up-front. You can't use this with the switchboard for the 6 or 12 volts.



If the engine won't start in 30 seconds, it may be flooded. Release the starter and open the drain cock at the bottom of the engine crankcase or drain off raw fuel. Careful with this in the cold. You may freeze a hand or start a



fire. Might be best to mark it with a tag and remove it to a safe place.

The engine can be hand-started in 6, 12 or 24-volt positions. For this, you follow the same steps as for electric starting up to the point where you push the starter button.

Instead of using this button, you open the hand-starting access door on the right.

Take the starting rope from its storage spot inside the frame of the lid. Be sure the hooked end of the rope is the side in the wheel and wind it counter-clockwise on the wheel.



The rope should be 2 1/2 to 3 feet. Anything longer may hang up and wind your arm into the wheel when the engine starts.



To start, pull the rope firmly and quickly straight toward you away from the wheel. Adjust the chain as needed from the front door.

When you close the hood-latching door, make sure the cables from steps 10 and 11 are open.

But, remember, you never operate the lift in a maintenance shop or any place where other lift's will be used.

Once your generator's chugging with engine operating assembly, use the crane in the vehicle you're storing in the normal way.



WORKING WITH JUMPERS

You can drive any vehicle that doesn't have three switches by connecting the new jumper cables from the positive and negative posts on the lift's switch-board to positive and negative posts on the vehicle batteries. Make sure positive is connected to positive and negative to negative.



Cable ends usually are marked with a plus (+) for positive, but the negative may be marked with a minus (-) or it may be blank. The same markings usually are on the lift's power posts and on the batteries.

It's good using both of the grounded cables that vehicle has a negative ground. For some have positive grounds, work it.



The lift's jumper have dotted ends that attach to the power posts. Slip the ends under the hand-held nuts and tighten. When switches are in the lift run position, you may want a lift holding the positive cable to the positive post, especially with gloves on. But take it apart it'll go.

Double check to see that the lift's switches are set for the voltage of the vehicle you're storing. There's no look-



and devices when you're using jumper like there is when you use the slave cable. You get the voltage the lit's switches are set on — high or low, so, see to it that it's just right.

Again, if it's a stuck vehicle, turn its master relay switch OFF (and turn it off till you disconnect the cables).

Stick the alligator clip of the positive cable to the positive post of the vehicle battery at one end of the battery line-up.



Then, and only then, clip the negative cable to the negative post of the battery farthest from the point where the positive cable is connected.

You're not now to try for a start with the vehicle master. But it might be a good idea to check all connections (positive-to-positive, negative-to-negative) and to make sure switches are set for the right voltage. This is no place for mistakes.

After starting, disconnect the cables in reverse, STARTING with the negative clip at the battery (if it's negative grounded). Disconnect before turning on the treated vehicle master relay switch.



To stop the engine, ground the magnets by holding the switch on (ground) just above the fuel filter) firmly in the OFF position till the engine stops.

Then, off the fuel cocks at the tank and at the filter.

If it's likely to get extremely cold before a restart, open the fuel cocks after a few minutes, leave the magnets grounding switch and the choke OFF, then push the starting button a few



seconds. This slight flooding will put it in better shape for a cold start.

Then, turn off the fuel cocks again.

KIT MAINTENANCE



Keeps for keeping it clean, dry and warm enough to operate, the KIT kit's fairly easy to maintain.

Storage, of course, should be kept clean with connections free—and properly locked up.

See that you're using the right type of batteries and check the electrolyte level and specific gravity like it says in TM Chd 390 and TM 5-614-61-200-13.

If batteries freeze, never do a quick-charge job. Thaw 'em gradually in a heated shelter. Never add water to a cold battery, and after you add it to a warm one, run the generator for a spell (about an hour) while it's still warm.

When batteries must be taken out to charge 'em, warm 'em to at least 33°F before you start to charge.

Fuel is a critical problem. Keep it clean before it goes into the tank and into well before pouring. The kit's engine, like other air-cooled two-cycle engines, is super sensitive to fuel. The oil mixed in the fuel. But an excess of oil builds up carbon that may foul the engine plug and plug the exhaust ports. So don't overdo a good thing.



There's two fuel filter-vents on the heater and one near the engine carburetor—that should be checked often.

If you get water in the gas, your best bet's to drain and refill. It's likely to rust to let and plug the system in minutes once the fuel cools in extreme cold. But, if you must go with what you've got, a little denatured alkyl can help to take you over.



When you're operating in extreme cold with snow, a heavy pair of two-way skis or a sled might be your best way to transport your M10. It's a pretty heavy load, weighing around 800 pounds.

Most people haul it on a trailer (up the M10) or on the back of a 16-ton or 24-ton cargo truck. To haul it easily and keep it in place for ready use, it should be lashed down. (It comes with 4 1/2-in. bolt holes in the bottom.)

The kit has to be positioned far enough from the sides of the trailer or truck bed so you can get at both sides and front panels. Also the top. Panels, ports and doors on all sides except bottom and back have to be opened for operation and maintenance.



DIFFERENCES BETWEEN MODELS



Like the Old 900 tells you, there are two models of this MG3 hit-book: your MG3 2540-570-1234. But there are only real differences between 'em are found in the engine-generator unit.

The MG300 and MG301 both use the MG300 engine-generator unit.

The other has a MG301 engine-generator unit, and here are the major ways that it differs from the MG300.

- It has a front-end spring member that instead of being bolted and has an auxiliary 1-qt generator mounted at its base.
- Its voltage regulator is mounted on the generator (on the MG300 it's mounted separately).
- Its control line is located horizontally at the base of the unit on the right side (instead of vertically at the front).
- Its radiator is operated by constant pressure (MG300 has a float type unit).
- Its air filter is at the top of the engine (instead of a base).
- It has a primer at the top of the engine.
- Its motor-generator is 1000 watts-21.5 volts (instead of 1000 watts-20 volts for the MG300, the MG301 has a motor-generator unit on both sides and generator).

Detailed rules on engine maintenance are in the Old 900, but here are a few you'd need to watch in day-to-day operation.

The spark plug means for large sizes with gap adjusted to 0.015. Spark plug adapter has 11 holes that may become plugged with carbon (especially with too much oil in the fuel). Inspect and clean often.

INSPECT AND CLEAN SPARK PLUG ADAPTER OFTEN.



SPARK PLUG

Clean fuel filter often (at lower end on engine). Replace if bent.

Clean air filter by cleaning in dry-cleaning solvent or volatile mineral spirits. Dip clean filter in engine lube oil and dip-dry before re-installing. Caution, though, 'cause in extreme cold you may have to leave in mineral oil to prevent clogging.



Check the engine exhaust ports for some carbon every now and then. There should never be more than 1/4 in. of carbon at the top of the ports, but it can build up as much as 1/2 in. or become so hard that it can't be scraped off without damage. Of course, if you've opened it up to inspect, clean it, no gas!ies.



Adjust your carburetor when it's needed like in steps in Part 214 of *TR Civil 200*. A slightly richer mixture may be needed in extreme cold.

General trouble-shooting info is covered in Part 216a of the *TR*.

The M40 kit is available any place described in *SR 9-15*. But it's a 'good' idea to carry it for a checkmate when you suddenly find yourself somewhere between the nearest hardware and the Yukon.



But to make best use of the kit, most of your vehicles may need a bit of *Tan-Ming*.

Like *SR 9-15* says, a lot of your vehicles may need engine primer kits and stove compressors kits, but check first to see if they're already installed.



For the M, engine primer, here are the kit's:

M2L	.....	2540-020-7780
M2T	.....	2540-020-7780
M2H	.....	2540-020-7780
M2V	.....	2540-020-7780
M2W	.....	2540-020-7780

For the M40M's you get the three compressors along with the engine primer kit, *PSM 2540-020-7780*, and you get the engine primer, *PSM 2540-020-7784*, along with the personal heater kit.

General info on maintenance of vehicles is covered in *TR's* of the 9-2000-series. See *DA Form 310-4* for the one that covers your vehicle.



But whatever equipment you're maintaining, and whether you're a checkmate or a roadblock camped between the Bear, the Klondike and the Yukon, or along the Injun or near the Dumbie, you'll like the M40 kit box.

In an emergency, you can store more the kit with a 24-wch vehicle. If you've got two kits, you can even store one kit with the other.



In an emergency, too, you can use the kit to change tires—right in the vehicle, but this is not recommended as a general practice.

And to get the most use of the M10, you need to know it inside and out, so



spend a bit of time thumbing thru TM Ord 970 (18 Jul 52) and Change 1 (20 Jan 54). A copy's supposed to go along with each kit.

Another thing: Keep the rubber, splicing tools and spare spade plugs stored inside the kit like the TM says.



There's no storage space inside for the 20-lb drum, so you'd have to stow it alongside the kit wherever it goes.

If you drop it to cover or use while hot, it may leak fuel. Besides, it'll freeze when it cools and you may have to chop it out.

And take care of those batteries. They're the heart of the whole deal.

A good steer

Here's another UNCLASSIFIED modification for your M16s: Model 667 fire truck. It goes by M16C 2-421 6-203-20/2 and covers the modification of the steering system. Good stuff for your support personnel to lend a hand.

Wick-knowledge maintenance

Take a good look at SM 9-4-910-A11 (8 Jun 42). It's the one that superseded SM 9-4-11 (6-Advised by Change 1. You'll see in the new SM that Flashlight, FM 4-228-2 (9-2-52), has been replaced by Flashlight, FM 4-228-1 (7-4-52). The big difference is that the new Flashlight has a 90-degree beam in it.

For a tip

Your M10 machine gunner had better check with your armorer to make sure M16C 9-1004-314-20/1 (if it says 02) has been applied to your weapon. It's the M16C that installs a pin in the M10's cover assembly to act as a positive stop for the latch lever—as the lever won't operate and damage the spring.

Engineer Licenses

Need info on licensing operators of Engineer equipment? Take a gander at AR 600-28 (21 Nov 47) and TR 3-200-1 (14 Jun 41) which cover the requirements, testing and procedures to follow when qualifying operators for your Engineer equipment—including generators and high pressure air compressors.

**JOE
DOFF**

WHAT'S IT
SAY TODAY,
LENN?
**COLD
WEATHER**

IT SAID ON THE
TV, "WEATHER
CHANNEL" AND
THEY SAID
"DON'T GET
OUT OF THE
WEATHER!"

WHAT'S
ALL THE
HITCHHIKING
ABOUT,
EV?

THAT'S
OUR HOME
WITH THE
CONSUMER
MAINTENANCE
APPROX
LIVING!

YEAH!
THEY'RE GOING
BLIND SIDE
FOR THE BILLS
DOWN IN THE
MID WEST!

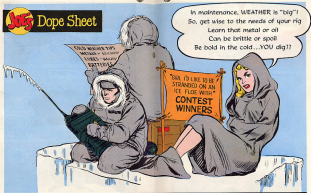
SOME
DEALS?

...FOR EFFECTIVE
COLD WEATHER
MAINTENANCE I HAVE
A GOOD DEAL?





Jolly Dope Sheet



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

IF YOU WANT TO DISPLAY THIS CENTERPAGE ON YOUR BULLETIN BOARD, OPEN STAMPLED, LET IT DRY AND PIN IT UP.

BOY... WE SHOULD PICK THE...
FIRST BIRD, RIGHT? RIGHT?
ON THE PLANE... THEN A
GROUP A THICK GROUP WHO
SHOULD OF BEEN THERE
ON THERE... NOT US... WE DO
NOW!

WELL... I DON'T GET THAT NOW!
OUR LEADERS WILL... AND
ANOTHER WERE LEFT... LET'S
WALK IT...



WE'LL NEVER MAKE
IT! I HAVE THE
WRONG BOOKS—
MY FEET ARE
HURT!

WHERE ARE WE
GOING? I DON'T
KNOW! I THINK I
LEAD
YOUR MIND.







IN MY ANGER, I
WANTED TO BE A BEAST
AND MARCH AS
THEY MARCH.

WHEREVER THERE
IS THE, ARE
THEY?

WE WOULD AS WELL,
GIVE UP AND RETURN TO
CAMP. BUT, INSTEAD OF
LEAVING THE TROOP.



HEY...HOW COME YOU'RE
BACK SO SOON?

THEY JUST CAN'T
STAY AWAY FROM
DUTY.

HAHA,
THEY ARE
SCARED
OF THE
MAY-
TRANCE!

ARE
YOU
SURE?

YOU
JUST
WANT
TO
GO
ON
YOUR
TRIP?

YES, IN THE
WINTER MONTHS,
THE TRANCE OF
SLEEPING WALK
IS THE BEST WAY
TO SURVIVE.



Dear Half-Blast,

The simplest way to start a real snowdrift is against the way for those bugs in an ice machine the subject of another letter for extreme cold weather. Drop "OES" into a conversation and some things start to slide a little more.

Do you have anything to throw into the pot on it?

H.C.M., C.C.

Dear Sign. N. C. C.,

You can bet your fuel-line neck-strap I do—and I'll quietly move down here to the end, out of the way, while I say it.

I've heard the same arguments from many a collector's accountants. They claim that OE holds up better than OES, that starting isn't too much more trouble with OE, and that they made off the number of power-packs that the "empty tank" had to replace "because of OES."

To begin at the beginning, why OES is the first place? Well, the slide-rule shaving-board boys here is figured that at least 50 per cent or more of the engine damage done by starting in extreme cold weather will happen in the first 10 seconds of operation.

OES is specifically designed to sleep

there all night at 60 below and then wake up and perform that critical job that in some models 10 seconds. (As a by-product, OES is fluid, OE is solid at -20°F.)

No power-pack ever burned up or seized or froze a rod because of OES. It may have been because of low OES, or because of contaminated OES, or because of operational abuse with OES in it—but not because of the lubricating power of OES alone.

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



CONTAMINATION—SLUTCH

The same weather conditions that will give you a go to OES in the first place also set the stage for some dramatic findings for any crankcase hole—only more so for OES because it's designed to be thin and flow under those gasketed components.

Multi-leveler temperatures create an glet zone to contract and you get more blow-by and fuel washing past the piston. At the same time, you have to grind and grind before the face up—and this gives some low-headed pistons an edge to over-point—all of which gives you more air that washing down to scavenge whatever you've got in the crankcase.

And, as if that's not enough, various



differences between ambient temperatures and cold outside temperatures set the stage for molasses condensation—especially at shutdown—then adds to the erosion of your hole and sets in sticking pistons.

SCOPING

In the engine—out in snow—that's what happens when your hole disappears into this air—what you believe, that air seems really thin.

The same conditions that give you more fuel in the crankcase also let more of your oil pass the piston into the firing chamber and burn off.

And while all this is going on, you're doing more filling and more low-gear pulling than you've ever done before—all adding to your engine temperature and lubrication problems.



WASHING THE HOLE

When a power-pack turns up in winter in snow, a real loss the next County, the damage is instantaneous, dramatic, and is usually blamed on lubrication—or lack of it. So, whatever was in the crankcase past the piston.



On the other hand, the go-getting run-rubbed damage that grinds your engine's inside during a cold run with a thicker hole will be noisy and quiet—and might not show up until later when it's now shown what a shaver does and work life.

HOW TO DO

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

Pull that dipstick—every time, or more often if your experience with your gear tells you so. It's easier to pull a dipstick than it is to change a pack with gloves on and more blowing in your face. And every enough all with you so's you can do something about it when the truck lags.



Use your nose. Keep a sharp sniff for the fuel contamination in your crankcase by sniffing the dipstick. Drain and refill if you ever suspect it.

Use your eyes and fingers. Measure (contaminated) dilution of crankcase

oil 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 chugging, the hours an engine is run can be more important than miles.

To run up—if you had to, or wanted to prove the point, you could run an engine with OIL in Texas in the summer if . . . if you kept the level up, if it wasn't contaminated, and if it wasn't diluted. The same thing goes—only double—when OIL is really called for.

Half a pint

WHO'D BELIEVE IT!

Here's a chart that some laboratory boys whunged up on the viscosity of OIL and OIL-10. In plain language, it shows how the two of 'em flow under the same conditions.

You'll see that OIL flows much easier than OIL-10 at cold starting temperatures . . . and yet at normal engine operating temperatures it's almost the same as OIL-10.

And who'ds think it? At overworking temperatures, OIL-10 usually flows out faster than OIL does! Well, mind!



THE MAIL ON THE WILLOWAY



Here is life in the land of the deep freeze and you Sherman-McNair is there to be right in your equipment gear. When Haines works, heat everything works, but when Haines sleeps... shudders!



1500000
SHERMAN-MCNAIR TRAILER

Now, whether you have the Quartermaster 1500000-RTU postman type or the Engineer 1000000-RTU trailer—or self-mounted type or any other type makes no never-oided. They all depend on you to be the life of the party. And they all need most extra-ordinary PM to make it go.



1000000
SHERMAN-MCNAIR TRAILER

The before-during-after operations PM life gets mighty important on these circuits. They're your outfit's last chance when they're happy, but your worst enemy when they're mad. It takes a valve or fuel line or a heated duct or a washed tank can make 'em real mad.

KEEP 'EM HAPPY

Squirt out heat. If you find any gas or oil leaks under the tank, crack 'em down pronto and get 'em fixed. Make sure the spark arrester's in shape and in place. See that no-carbon no-soot no-ice's collected there. Keeping a cap on the tank when it's not used will help.



THE WILLOWAY MAIL



On the 1000000-RTU job, keep a sharp eye on the safety trip lever. Make sure it works before you start the engine and see that it keeps working while the engine's running. Make sure first that it'll operate with the engine off. Look for trouble in the lever and make sure it won't tie up again: do servicing and hot drying or dumper pull rods. Cause if it won't work right, fuel and vapor will build up in there and—boom!



If you're using the heater inside a maintenance van or other trailer, be mighty sure there's enough ventilation and that the exhaust stack extension leads outside. These habits can't be real games. The little crew of the TM's are pleased with heat-up steps for safe and easy operation.

THE TM'S FOR YOU
 TM 1000000-RTU TM 1400000-RTU
 1400000-RTU TM 1600000-RTU
 TM 1600000-RTU TM 1800000-RTU
 TM 1800000-RTU

Always use the electric heater on your Engineer heater if the available power's compatible (Single phase or three phase).



You'll get smoother operation with less danger of fire and carbon monoxide poisoning. The TM's is full of steps for you.

Here're some more things to break it down on before you reach for that wrench. Drain the fuel line every day without fail. Any more in there will

- 1. 1000000-RTU
- 1. 1400000-RTU
- 1. 1600000-RTU
- 1. 1800000-RTU

leave in the fuel circuit and you'll be the limit. On QM units, drain the comp. every day too. Remember this: check water.



turns the wheels to make the burner level. Then push the carrier handles and raise the air end so that it's higher to



the engine end. This'll keep gas from collecting in the far end of the tank.

And don't forget: Always have to be on the level when going. Otherwise you won't get an even flow of fuel



around the burner. Incidentally, if your unit has an altitude compensator indicator, switch it to the setting for the approximate altitude in your locality. This'll regulate the flow of fuel just right.

USE OIL

Using the right weight oil at the right temperature is half the battle in getting these burners started. The instruction plates and the LO's in the EM's show the same kind and class.

On QM units (on engine controllers) you start mixing gasoline with 10W oil when the mercury dips below -10 degrees F. Add 70 when it's between -10 and -20 degrees, 100 between -10 and -30 degrees, and 200 when it gets colder than that. On the Reg models use OIL oil as prescribed by LO 1-4110-200-12 (11-Dec 68) for temperature ranges from 0° F to -65° F.

Go on without saying that you'll always mix the oil and gas before pouring it in the reservoir. You can figure a substantial or no amount of gas to mix 70 in the QM units.



Of course, you won't forget and get oil in the air cleaner after it gets below zero. But don't forget to wash the air cleaner with 50 (FM 5000-100-60-1) first and then dry it good.

On both QM and Engine models, check the condition of regular air cleaner every 2 hours when the mercury's above around 3 hours if it's below zero. The air's gone by changed every 20 hours when operating in over-100 temperatures and every 30 hours when it's under zero. And check whenever the air's colder it gets.

Bag models have their own-line gauges to keep track of operating hours, but on QM units you have to rely on the time you set down on the Form 1000-1.

As freeze-up and break-up times—when the mercury starts a cautious climb on the thermometer—wax cheap on for a need to change the grade of oil. If the engine starts out sluggish, that could be the signal. But only make the change after the temperature's been in the max (high) or lower range for a reasonable spell.

STARTING HINT



If the engine won't start up after you pull that rope a couple-three times, you might have to use some external heat or give it a boost. One way is to put a



manifold to be hooked with to the intake manifold heater that's on most models. Part 146 in TM 11-4128-101-10 has the dope for the QM units, while part 146 in TM 1-4128-200-12 spells out the cold-weather tip for the Bag units.

You'll usually see doing, though. You clear the 101 and 102 the flame before starting the QM engine, but you let the flame burn on the Bag model till after the engine's going. This pre-heating bit will get rid of frost on the carburetor in a few minutes.



If this method won't work on the QM unit, you might try the blow torch system mentioned in the TM. Use a tarp or cover to make a tent around the engine and then use only mild heat, heat!

AND COME (ON)

Keep on top of your mind that any leak in a fuel line, tank, gasket, valve, etc. while the burner's going can mean real hot trouble for everybody. Here's a couple ways to check for leaks in the 28000-BTU models.

To see the safety trip valve, open the manually-operated/burner fuel shut-off and monitor valves and then close the safety trip valve. If any gas gets through to the burner, you'll know the diaphragm's shot. Tell your support guys quick. Don't say on fire if you will!

To check for leaks in the combustion chamber, shoot run or start vapors from your hand color into the screen



check. Smoke should come out of the stacks. But if it also comes out of the doors, you'll know the combustion chamber's burner isn't fully raised. Shut the engine off pronto. Then hook-up a hot help. It means poison gas is going through the doors.

And while you're at it, use your ears like radar to listen to pick up any signs of trouble in the engine. If it misses or stalls or won't even turn or cranks, something's gone wrong. And if it starts or operates like it's in pain, could mean it's burning on the inside. Report anything suspicious to your support people. How's your symptoms or listen for:



Misses for Fuel — Carburetor needs adjusting.

Misses or Stalls — Valve timing.

Overheating — Blocked up baffles, fins or coolant.

And put your eyes to work on the burner flame. It should be a sharp-tipped yellow flame about six inches above the flame spreader. The flame should be the same all around too. If it's too low, too high or uneven, some-

thing's got to be wrong somewhere. Check it out and make with the fix. Here're some clues:

Too High — Exhaust stack, combustion air lines clogged combustion air flow about engine speed too low.



Too Low — Clogged fuel line or pump, dirty filter or maybe you're just low on fuel.



Uneven — Clogged valve system of the burner burner fuel line or the unit's not level, or it's dirty or loose around the point at the bottom of the combustion chamber.



DOOR'S STUFF

When the temp's read shutdown you'll probably have to close the door, change opening dampers on the QSE model. But try opening with the dampers half closed first. If this isn't enough, close 'em all the way.



Spread the word to your buddies to keep their big fat mistakes off to the side as they work back and forth. If those damn gas valves, wires or hoses or plates wrenched, they can't deliver. Make a habit of checking up 'em as you go along your business... especially the breaks, leaks and damaged threads—all of which spell lost time. And go some your way to protect those storage tubes against damn too.

some who wrap right handy and in a condition at all times.



Incidentally, don't ever make around those leakers when re-fueling 'em. They're all allright in quads. Always keep a good mechanical contact between condenser and tank when fueling up to keep static electricity under control.

Keeping water and gas outta the gas when re-fueling is quite a trick in these parts 'em. Use a chemists cloth or some of some type with pouring, and wash out as much of the inside in the tank while the filler caps off.

If you keep fuel stored in 11 gal drums, let the drums stand on their sides with the bottom end slightly higher at the top end—that makes the bludge the low point, right? Water, being heavier than gas, will settle in the lower front end. This way the water'll come out first before you draw off pure gas for your burner.

THE LAST THOUGHT

Always treat your burner like your life depended on it... it might.



First, I know, is the number one design around these cylinders. The Reg model comes with a CE-Be extinguisher (FID# 4110-100-0007)—Reg 1, Change 1 (15 Jan 64) in the Engineer TB has the full songs. For the QM models make sure there's an extinguisher of this or

STORAGE BATTERIES

!!



LIFESPAN...

Low-temperature's tough on just about everything you've got, but it's especially hard on your equipment's batteries. Unless you give 'em thoughtful care and special provisions, your hard-wired storage batteries will have about as much chance as a snowflake in the furnace.

But hold, you see, there down the normal activity of battery chemicals is temperature's sort of helplessness, as you can't rely on their great pep and capacity—and that's at a time when their jobs become tougher and more important.

And, as if being so normal doesn't mean's enough of a hardship, a battery, like other things, is afflicted with a much heavier workload because cold weather makes with-impeded labor and heavier working conditions, plus other demands on an electrical system (such as excessive use of lights, constant electronic equipment, safety devices, starting, etc.).

So...

KEEP YOUR BATTERIES IN THE BEST OF SHAPES—AND YOUR EQUIPMENT RUNNING—BY GIVING THEM THE CARE AND MAINTENANCE THEY NEED.



See how storage's deep effect is working itself

TEMPERATURE	SPECIFIC GRAVITY	CHARGING LEVEL
0°F	1.280 (full charge)	80%
10°F	1.275 (full charge)	75%
20°F	1.270 (fully charged)	70%
30°F	1.265 (full charge)	65%
40°F	1.260 (full charge)	60%
50°F	1.255 (full charge)	55%
60°F	1.250 (full charge)	50%
70°F	1.245 (full charge)	45%
80°F	1.240 (full charge)	40%
90°F	1.235 (full charge)	35%
100°F	1.230 (full charge)	30%

According to the man with the slide rule is twice you need a full charge to reach power as low as regular as 0°F, as it does at 80°F.

How do you reduce the blow of sub-zero temps on your battery? Easy—all you have to do is wrap them a few dozen things ahead of time.

Like, for example, keeping batteries at 80, 85°F.

1. FULLY CHARGED

And, that means a specific gravity reading of 1.275 to 1.280, corrected to 80°F (to be sure you compare it fully charged battery can take it up to -50°F. A low battery (1.240 specific gravity) will freeze at +10°F).

2. WARM

The warmer you keep a battery the better it can pull the you when everything else is more cold and sluggish. The experts say that to provide enough current the starting a battery should be above +30°F. Also, can you get equipment going a battery has to warm up to around +10°F before it'll take a worthwhile charge from the generator.



1. PROPERLY FILLED



Fill to level mark given on cell cover, and never pour in above plates . . . but never overfill it. A flooded battery's no good either . . . it's not only noisy, it has to go back to the shop to get serviced. As always use distilled (if possible) or deionized, distilled water available, tap clean water (like rain-water), however, is OK, and even the best you think it better than trying a battery go dry. Be careful for someone could use get a stronger solution, but the mix is something for your battery man to worry about. You're never to add electrolyte or acid in place of water. If electrolyte spills or leaks, it's up to the experts to re-serve the battery. (Adding acid to electrolyte in a place of water can cause short-circuit in those hours, and also harm its insulator.)

Yep, there's only one way to make sure your batteries have a fighting chance in the low-down cold, and that's to check 'em daily. It's a strenuous thing job, and a steady one, alright. But, you may as well be cheerful (OK, understanding!) about it . . . 'cause without a few battery nothing's going no-place, no-how.

AND SPECIAL

Even routine care is a highly critical business for batteries in cold weather operations. In its addition to giving them good cold-weather care, you do the usual stuff with special care, such:

Keep battery tops really clean, no corrosion, and knock off all snow, dirt and trash. Use a fiber or bristle brush along in a wide solution—by good technique, not to one gallon of water-to scrub all around.



Wash top of battery with clean water after the morning stop, and then wipe it dry with a clean cloth. Never wash a battery this way, however, if its top is cracked or damaged, and if that is the case to get it patched up. Certain breakdown of cells will sometimes rupture and so be sure to replace damaged parts the job.

Keep vent plugs tight and un-plugged.

Keep cables, straps, terminals, clean, tight and in good shape. On wires, terminals or distilled terminals protected with a light coat of Vaseline or similar grease.



Keep ground strap (B) well firmly attached.



Keep battery box and lead-downs clean and in good order.



Keep battery hold-down snug, but not too tight.

CRASHING/ENTERING/SPECIAL CARE

For all around help for your battery, you can:

1. Keep engine fit as possible. (Tighten up, check, oil adjustment per the maintenance manual's info on cold weather operations).

2. Use proper size of cold weather turbo and the recommended tubes and gaskets to insure quicker cranking.

3. Stick close to cold weather starting instructions in the equipment's manual. If the engine doesn't start on quick, turn-off all the engine warning switches and wait several minutes. You'll give the motor time to cool, and also, a battery's discharge will often be followed by a short recovery (charge). These few minutes of build-up (charging), even as often as every, can often provide just the kick of energy you need to start the engine on the next try.

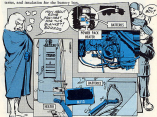
4. Bouncing the engine to re-charge the batteries is OK'd if the operator takes care to keep an eye on the charging rate, and to watch engine operation. A round 1000 to 1200 rpm (approximately 20-25 miles road speed) is OK'd for battery re-charging on most engines . . . but check your equipment's manual on this, too.

5. Engine idling at very low speeds, when accessories are applying load will discharge batteries. So here you don't get caught idling an engine too low—and just to keep yourself warm (it not only heats the batteries, it's rough on engine life, and it jacks up the cost of maintenance and operation.



HEATING

Warmth-wise, heaters do OK on equipment which comes with pre-heating accessories—or if it uses a power-plant heater kit. Power-plant heater kits for liquid-cooled engines, for example, provide a direct duct, or a heating pad for the fuel lines, and insulation for the battery box.



Some of the heater kits are for use only when equipment's on standby, or for overnight heating. That is, when the equipment itself isn't in operation. Other winterized kits (like on the newer track equipment, for example) provide a combination pre-warm and power-pack heating system, which works when the vehicle's in use, and it can also be used for warming up the equipment three to six hours before it's started up.

But, if your equipment doesn't use a

heating kit, and it has to fire manually, you have to keep its batteries warm so that you can. Like taking them indoors at night, and maybe even during long standby, so they'll be ready any time.

Remember, the batteries should be heated gradually, and take care you don't over-heat 'em ... just as they're comfortably warm to your bare skin, is a good rule of thumb. Heating them too fast (or too much) can crack the case. And, by all means keep them away from open flames and sparks.

MAN-HANDS

and, of course, when there's no help at all when they, too, require checking, and driving under such a load may damage and unpleasant conditions that you're used to you have to be mighty patient. Because that's often the case, however, handling (driving, parking, cleaning, and so forth)



COLD START

If you can use only portable power equipment (like a Stensma-Whelan heater, or the M40 Cold-Start Starting Kit) as shown on your equipment, you normally include the batteries in the warm-up routine before you start up your equipment.

The M40 kit is a real blessing when it comes to starting equipment with low, or cold batteries, on a frosty morning. See page 16 of this issue for one of the M40 kit on starting equipment.

The M40 can also be used in an emergency for things like batteries. But that's a job for someone who knows the M40, or TD Oct 1991, and his equipment real well.

BOX COVER

On equipment with exposed batteries (which you can't take indoors), you can do other helpful things... like putting insulation in the battery box. Stuff like rock wool, asbestos, spun glass fiber, cellulose fiber and other combustible materials are OK. You insulate all sides and the top and bottom of the box, and attach the material with wooden strips. If you use bolts or wires on the strips be sure to counter-drill the heads on the metal won't touch the battery. Also, be sure that the battery box drain holes are open after you insulate the battery box.



Batteries sitting in open frames can be protected with an insulated wooden box. The box cover should be easy to reach and remove, also, so it'll be convenient for checking batteries.

CLIFF OVER

On some vehicles (like the M41 2 1/2-T, 6x6, rough-road, the M41, M11, and M51 2-T, dual axles) the batteries are mounted in an inclined area (see under the front seat), and they're kept warm by a heater line from the power plant house. Bring in the cable makes it easy for the batteries, but with this setup you have to be very careful about keeping the battery box closed and the seat down, when you're in the cab. Especially when you're working with any kind of rock. If you create a spark when the batteries

happen to be gasping (just a little bit too much), they could blow up right in your face.

As a matter of fact, you've got to be extra careful anything you're handling, such as mechanical objects around the batteries... don't drop 'em or hit the battery box and don't get anything about smoking around them either.



CHANGING TEM

The best argument in favor of checking batteries daily is the fact that a low battery not only won't deliver... it'll freeze fast. Take a look at this chart.

Battery Reading (Normal 12.7V)	Freezing Point (%)
1.300	-30°
1.250	-40°
1.200	-50°
1.150	+ 0°
1.100	+15°

See, you see, in extreme cold you'd get no choice. To stay in business you gotta keep your batteries charged just right.

Let's talk right here and talk about converting hydrometer readings. Since the specific gravity scale on a hydrometer is correct only at 80°F, you have to juggle the figures up or down to bring the reading in line with the actual temperature of the electrolyte you just ticked up into the hydrometer. You knock off four points of specific gravity for each 10°F below 80°F, or you add four points for each 10°F above 80°F.

TM 9-287 (Sept. 69) section of Cold-weather materials in extreme-cold weather, on page 13, gives a handy chart listing corrected specific gravity readings, and the percentages of charge which can be counted on at the various readings.

TEMP	CORRECTION		PERCENTAGE OF CHARGE
	TEMP	TEMP	
100	0.000	0.000	100
90	0.000	0.000	100
80	0.000	0.000	100
70	0.000	0.000	100
60	0.000	0.000	100
50	0.000	0.000	100
40	0.000	0.000	100
30	0.000	0.000	100
20	0.000	0.000	100
10	0.000	0.000	100
0	0.000	0.000	100
-10	0.000	0.000	100
-20	0.000	0.000	100
-30	0.000	0.000	100
-40	0.000	0.000	100
-50	0.000	0.000	100
-60	0.000	0.000	100
-70	0.000	0.000	100
-80	0.000	0.000	100
-90	0.000	0.000	100
-100	0.000	0.000	100

TEMP
CORRECTION
PERCENTAGE OF CHARGE



The hydrometer (EEM 4048, 511, 521), hydrometer, syringe, lead-acid battery, also gives info on correcting specific gravity readings, right along with instructions.

For example, you take the float reading, and if the correction figure given appears the measurement is in the black column, you add the "correction" figure to the float reading. If the correction is in the red column, you subtract the "correction" figure from the float reading.

That's all there is to getting an electrolyte reading corrected to 80°F. You can clip out the chart, for your wallet, if you want a handy reference.

To be in top shape, a battery's cells should read pretty much the same. When cell readings vary just a few points it could be that you've used too much water, or that you took the readings too soon after adding water. However, when cell readings vary more than 15 points, it can mean there's serious trouble in the battery's gas, or get



to all the equipment and how the battery shop sees's you-out.

You're never to add water to a cold battery. In addition, whether of a battery's not charging, the water'll stay on top and not freeze before it can mix with the electrolyte. Get your electrolyte temp up to around +80°F before water's added. So, when a battery's warm, or you can operate the equipment for at least one hour after adding water, it's best to make the battery indoors and warm it up before you water it.

IN CASE OF EMERGENS

And, incidentally, when you're responsible for the charging and of the battery business, you need the facts and figures on charging methods, charging equipment, etc., given in TM 5-4148-108-11 (Jul 58) "Storage Batteries Lead-Acid Type". It's good, paid for battery men in all situations... so grab yours if a copy.

THE FROZEN BATTERY

A frozen battery has to go indoors to thaw out slowly at room temperature. And, freezing, if it goes far enough, can tear up a battery inside and out (external leads, plastic tank or leads, and the separator cracks). So you have

to look 'em over carefully after thawing 'em out. Also, a frozen battery never goes on the charger... (or on equipment, normally) — the grids will get damaged, and the active materials will break down.

NO SUBSTITUTE FOR WARMTH

**Lesson:**

The heating and cooling history of standard and weatherized houses varies in the same manner shown in our reality.

And in the key coils and rigid insulation of the latter the difference and the built-in gas pockets, it comes in fuel and clear-bidimensional.

It is the "average"—the way most value of common and comparatively the common and define an bit of ready in a weather and indifference wilderness.

And behind the average—something you'll find a dry cell battery almost small enough to put between your fingers of hand, small, you... has powerful enough to make both distance and distance and come out covering every time.

All it requires is means & a little human warmth and understanding.

It needs human warmth because that's the only kind it can get most of the time it's operating.

And it needs understanding because without it, it may not get the warmth.

When you're in a cold-weather area, you've found special cold-weather dry cell batteries (shown in the 2000-watt).



They have a lot more oomph to them than your regular batteries—hey, you have to handle 'em just right to get the benefit of 'em.

When the internal temperature of a dry cell battery slips much below zero, the capacity of the battery is so small it's hardly worth mentioning.

As our low internal temperature, the only difference between a cold-weather battery and a regular one is that the cold-weather battery will come life with its heat on. The regular one just dies, period.

So you might say that when a cold-weather battery is warm, it's very, very good—but when it's cold, it's fright-

ful. Just remember—it's the temperature of the battery that counts. It means that very cold weather will in the winter some persons small it begins to get chilled itself. But a frozen battery won't get out at all, even in a warm temperature until it warms up.

Here's where the human warmth comes in. Treat those cells just as if they were part of your own body... because in a sense they represent your ears and your veins.

If your battery dies of coldness, you and your unit may become both dead and stuck in an area where rescue can mean death.

When there's no other source of heat, keep your batteries inside your clothing, wrapped in a thick material so you can warm them very to stay alive because it's possible.

Oh, the battery can feel hot only when necessary... and always be in your own hot hand as you get. The only warning needed you can get your hands on to keep one of warm after you get to home is...



I know battery's just about as cold as a frozen stick, but I think you, what the hell has this thing, but you bring it.

It is necessary, you've had a battery over a fire or stove... Just do what little to let them warm up gradually in a heated shelter. After they're brought life a heated one they'll work, even though they're equal of it as much as possible to keep in this feeling.



Since cold-weather batteries are intended for cold-weather use they shouldn't be exposed to temperatures much above 70°F, for long.

So warm up only in many spaces so you'll cool—and store the battery at a temperature below 20°F. This cold-weather depends the chemical action and makes the batteries last much longer in the dark!

FRESH OF FROZEN EQUIPMENT

Arctic cold is the last guarantee made change you won't be needing till another year.

But the Engineer equipment you need is one right now—the usual, thinking, eyes, and generators, and compressions—nothing can put you out of business quicker than this time Arctic cold.



"This one" is the one. It's got your snow, and better, and glow plugs to boot. It can't get too cold for any equipment.

Build strong—if your equipment's in shape to operate.

But it'll be in no shape to operate if you haven't maintained this and the cooling system (see p. 24).



It'll be in no shape to operate if you haven't maintained this and the cooling system (see p. 24).



And it'll be in no shape to operate if you don't keep up the fuel supply with alcohol. It takes a ton of alcohol—about 1 quart to 10 gallons—to keep the water in gasoline from icing, and to keep alcohol itself from freezing.

Engineer advice, starting advice get live equipment going. But you can't expect 'em to make the deal.

These cold have work enough when equipment's in all shape, and worked to the very best Arctic cold.

ENGINEER

Some of your Engineer team-like generators—on their own hand-built, and a few of your better models' eye might had over-night chills in the service shops.



But mostly—except for an extra from the last year's portable space heater—your outdoor work has to be made with the best that come with your Engineer equipment.



Especially with outdoor work in Arctic cold, you'll be in no shape to operate if you don't keep up the fuel supply with alcohol. It takes a ton of alcohol—about 1 quart to 10 gallons—to keep the water in gasoline from icing, and to keep alcohol itself from freezing.

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AND IT TAKES TIME

With glow plugs to warm up portable engines, and water to keep them from freezing, you'll be in no shape to operate if you don't keep up the fuel supply with alcohol. It takes a ton of alcohol—about 1 quart to 10 gallons—to keep the water in gasoline from icing, and to keep alcohol itself from freezing.



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THE NEW 1988
BENTON COLE IS ...

THE BIG ONE

Do you just get the wind?

Does Mason's Bickler® up her back again with a monster of low pressure loaded your way, loaded with more. It's a good thing you kept an eye peeled on the weather forecast. ... You've just got time to prepare your aircraft from the snow.

Cover the low protection you can get in a nice warm blanket. But if there isn't enough space to get around, your bird's gear is not it right on the site ... especially in hazardous operations where there's no longer space at all.

You can reduce the blow by moving your bird to any spot that'll give the best protection available for your aircraft ...

and that using your mounting kit and wind checks. You can use either FIM 1730-004-0011 (should be mounted from the supply system used) or 1730-004-0012. OIA 71-211-1-15, substitute check you need. Just be sure to mount your bird facing into the main wind. 1-847-541-1100

And what about using your bird's cover? They can save you a lot of snow-chasing work when a storm. Your maintenance manual, loaded up by 1730-

1730-004-0011 (Feb 84): "Installation, Removal, Cleaning, Reparing, Reconditioning, and Storage of All Types of Aircraft Protective Covers" has the story on your cover.

But before you get the cover on you'll save yourself a big headache if you don't store your ship with Lockheed-Healey. FIM 1730-004-0012, deliver" ing-airline Fleet, ME-1-7945. This bird comes in 7-gal case and the 1730 for your bird in the industry 1-847-541-1100 from TC.

The only thing is, before you see the bird, you've got to follow TC 1730-004-0011 "Installation, Cleaning, and Re-Conditioning of Protective Covers" 1730-004-0012 ... a warning to the TC should be the obvious choice. There are safety tips and certain ways to use the drying field that you'll want to follow, step by step.

If you don't see drying field before you get the cover on, knowing how you can get up under the cover and from the top of the 1730-making, you might want to get off ... the drying to get to storage with gloves on.

When the cover's over and you take the cover off, you'll find the combination of drying field and cover will hold more ... and by the way, a check state water level for low-landing job of taking



stove and let off the heat several every time. After you get your covers off be sure to wash them in soap and water and let them dry thoroughly. Covers get away cheap so you go to get right quick.

When covering a chopper it's a good idea to give the pilot's special attention because it can get scratched up real easy. You might use a layer of tin sheet under the covers for added protection.



Use all the covers you've got and they'll keep you out of a pack of trouble. In fact if you have a Kawan OH-211 you should use tall water covers, FOX 1700-225-0121, to any freezing temperatures. Some machinery has a habit of getting lost the rear holes and freezing. It can throw the snow over-the-board in short order like it says in THE 6-11-21-0115-011 Feb 011.

Oil stoves, the bigger the bird the less surface your covers will protect. You can cover a Bird Dog (0-0) almost 100 per cent but it's a different

LET FROSTING COVER



story. For example, with the Gardner GAC-01. Covering that big bird would be like trying to cover a football field.

But suppose your big bird's an airplane. The best way to keep a coverless bird that is a moon is to keep the aircraft's surfaces wet with deicing fluid—use some other method.

You get the most coverage with the least effort by spraying the fluid on your aircraft. If you don't have spraying equipment you can put the fluid on with a mop, brush, or automatic brush.

Another thing you have to be watching to do when you put the fluid on, watch your step... that fluid is ground lightning under fire. You best bet is to work from underneath much.

CLEAN SNOW OFF BIRD

When the snow begins to fall it can pile up fast. To sweep the snow off with a brush or broom as it builds up. Then



KEEP
WALKING
THE LINE
OF SNOW

comes the end of the storm she'll probably only end up with a thin layer of ice. But this isn't the time for anybody to make like an ice man... that one you tried to.

He had a sure-fire way to get the ice off using brooms, picks, screw drivers and what-have-you. Fortunately he was cultured before he could make his slip look like a dive.



The safe and easy way to get the ice off the blade's side is to use drinking fluid. If you're not in the bushlands, you can clean a bird undergoing maintenance out of a hangar and get your operational blade down and it's completely dried-out.

You shouldn't use weapons either. They can scratch plastic sensitive areas. If you've waited for time and want to melt the ice with your portable heater, make sure you know it is the kind and the area is heat dry. Otherwise water can drip and melt around hinges and control cables and other lines, either on the ground or in flight.

There's no compromising with ice, frost or snow. It's all gotta come off down to the bare metal. A quick run through of your operator's manual will show you that the blade's airfoil has to be clean to get the needed lift for take-off. Taking off with even a light coating of snow, ice or frost could be like trying to get your BISC sandwich airborne. When it comes to heat from any source, speak to your



CLEAN YOUR AREA

A white blanket is a couple feet deep is bound to run down operations until the plow dig into it. When they do, make sure all the area you need to move

your aircraft's around is cleared—right off the line. It's a lot tougher to clean up snow after it's been marked by the run and taxi on ice. And don't work for anything less than the cleanest job sites.

Take your dropper size. It should get the clean sweep treatment "specially" if the snow is powdery. Crankle' up a dropper in this puff can stay a down-wash blessed all by itself. Blind the pilot and maybe cause an accident. If



time is the number one concern you can run some trouble or other vehicles over the snow and push it down enough to go on with flight operations.

Getting your fixed wing aircraft off the ground will take a little longer since the landing strip has to be plowed—unless you're in the country. Again, don't work for less than the best... and the run will take care of the rest.

There's no gentle way from the fact that heavy horses can conjure up some damn heat. Heating coils and wet snow means in winter, that you can take the edge off the big snow with just a couple of preventive maintenance steps.

Keep one eye peeled for snow warning systems... and get together all the protection for your aircraft that you can lay your hands on.



There and for maintenance you get several inches on some of the bigger belts sitting around on heavy strips and helpfully those days. So when the old leaves won't do the job, try the tape which are some of these high-backed leaves.

A common issue can bring a tape across the top of the package and rub the down, here and there. Some thing the high winged jobs. Starting from the wing room, work the tape from end to



while moving outward on the top. Be watch out for loose like covered lights and sensors. It doesn't take much to heat up parts already made brittle by low temperatures.

Pay particular attention to how you wear the glass head and side assembly during winter removal... and keep in mind how easy you can damage it any time you're taking off or putting on aircraft covers.

It goes without saying that leaving even the slightest trace of snow or ice on them delicately balanced control blades and exposed control linkages is asking for trouble before you even leave the ground—if you can, that is, with the opposite effect of them, more or less covering the blades (8).

With the Starvac (34-11) in particular, you've got the added worry of keeping the windshield clean, so the cockpit and transmission heat will do the mopping job for you in flight, with a waxy-coupled or the mesh.

DOGS AND WINDING

The only slight control surfaces, but all doors and sliding windows should be checked for freedom of movement. Accumulations of dirt and oil can trap moisture in the door and window tracks and locking mechanisms. Even a minimal addition of behavior during field air shows in flight whenever you forget to remove the stuff.



Aircraft windows often deserve special attention in winter cold. Heavy accumulations of frost may take a look of a long time to remove by a slow, even application of heat—but it's better that way than a quick blast of hot air, which can crack or warp the glass or precipitate. You can help things a little by knowing to leave a window open, where possible, to equalize the inside and outside temperatures. This gives moisture less chance to hang around windows.



LOADING GEAR

Movable parts of landing gear can freeze up even quicker than flight control surfaces, especially after working through slush. It's understood that you never lock your parking brakes in freezing temperatures, but that doesn't mean that moisture won't get in the brakes and lock 'em for you. That's why some are of what covering comes in handy.

Even with a combination landing gear, working brakes can be put to rest

in some cases by partially retracting the disk.

As for the rest of the landing gear, a cloth dampened with deicing fluid—or even hydraulic fluid—should be used to wipe off all exposed operating surfaces, such as screws and pinions.

On retractable gear, too, on the ground or check that brakes lock in an altitude can jam the retracting mechanism and leave you hung up—of course—in somewhere in between.

OTHER TIPS

And while you're at it, why wait for engine warm-up time to discover temperature on your aircraft's fuel into filter. Using an engine cover will prevent this. But if you've caught parked without a cover in a driving rain or snow storm, yank the filter and dry it out in a warm place. If you can't do that, you'll have to wait for heat applied on the exterior of the aircraft. But this won't guarantee you a completely dry filter.

A light coating of glycerine or de-icer fluid on Mikaluk (AG-11) and Corflow (AC-11) de-icer boots is better than a lot. These substances will run out of an airplane up. Its job remains a clean rag and wipe them. Yeah, there's been on the frontlines (3-21), too. The they're already covered with a special mixture, so please keep the "airfield" mixture off.

There are still more specific points that could be mentioned, but instead of going on and on, let's just say that if long as you get the idea, you'll know what areas to watch when ice and snow are making trouble for you.



IN A FOG

Everybody's loaded up on "home remedy" or wonder for keeping the fog off the windshield in cold weather. Some say take a slice of onion and run it over the windshield. Others say vine-gar is the best bet.

Then you'll find at least one guy in the outfit that has worked something out. Maybe he tapes a piece of plastic to the inside of the windshield.

What they have or what's available and authorized for total protection.

Once you get your antifogging compound, you'll not have any problem using it. Naturally, if it comes in a spray, squirt with a dispenser, then that's how you'll use it—spray.

There's a little more to it than that though. When you're using it on your windshield for the first time, you spray it on—then wipe it dry with a soft cloth or soft tissue, paper. Then you repeat the procedure—spray then wipe dry.

Now if you're wondering whether you spray both sides of your vehicle's windshield, you don't—just the inside.



Commercial antifogging compound is your best bet. Ask your Chemical Guys representative for it. They'll tell you



There's something to keep in mind when you're antifogging your windshield. It'll protect it before freezing, but the temperature has to be above freezing when you put it on—maybe an inside job, hold the car—open. Do not—do not lay equalizer on your plastic street windshield or bubble unless you've seen it confirmed on Mill Spec MILK-4481. Many chemicals can't be used on those acrylic plastic street windshields.

Connie Radd's BRIEFS



No sweat here

You military man—don't let the A or B in the All Star show you what it comes to using the hydraulic flasks instead under P/N F150-345-8412. It's strictly man vs. whether the spec reads M.I. 8-4003A or M.I. 41-6081B. The change has nothing to do with the quality of the use—of the field.

Pandy hand hint

There's only one way you can run the 220-hp pump in your AM/MPG-23 and 24 water sets without the magnet-levitating sprayer to it...and will keep the pump from getting damaged. And that's by using a by-pass line between the mangle input and output lines connections. To do this, of course, you have to have a true-fake valve. In other words, the mangle wants to be completely out of the street electrically—the filament has pulled and circuit breaker off—there.

Food mistakes

The Ordnance people want you to use one kind of decontaminant per vehicle container. That's the kind they have under P/N 4830-840-7910, with the manufacturer's address, activated. You get 18 bags of the stuff in a 2-gal can. Where's it listed? On page 4 of The S.I. 410-500-205.1 May 1962...that's where.

Long for B-1 light

Any time the B-1 war, type M1 45, runs long in your B-1 Ignition Timing Light P/N 4830-355-14491 comes out—see cat. P/N 4830-179-1814 (long) will get you the replacement lamp.

M50 tank gun shield cover

Having trouble getting a gun shield cover for your M50 tank? This is an authorized item even though you won't find it in the current issue of the MOP. Ask for cover quantity, gun shield, P/N 2148-371-0442.

Light way to paint

Finger painting is not only bad man-made—it's also non-approved marketing to a child-like consumer. What if metal pointers aren't made either, either. The preferred item for skin's sake, some shorts' is a narrow beam flashlight. Ask the man who knows...the Finger Field!

Pub conflict

Any time you find conflicting information in more than one publication, whether it be in The, The, The, The, MPO, or any Department of the Army publication, always remember...the info in the latest dated publication in the one that counts. A.S. 310.1 May 1962, page 12 makes this a hard and fast rule.

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

BE READY

