

Issue 199

PS

1989 Series

THE
PREVENTIVE
MAINTENANCE
MONTHLY

THIS IS THE
FOURTH TIME
YOU'VE BOMBED
OUT ON US...AND
DON'T YOU
WANT

NOT ARE
YOU BIFFING
ABOUT... I'VE
GOT A NEW IDEA
DON'T WORRY
YOUR COMPANY
WON'T... NEVER
REPAIR AFTER-ALL,
DON'T WORRY
SUPPLY HOUSE!
FORGOT... AND
WE'RE "GREAT"
ABOUT REPLACING
ME WITH A
SPEC. 2...
DON'T FORGET
FOR THE AGE
WORLD
AGENT!



Walt Disney



IS YOUR
TESTER

DUSTY?

A lot of guys who do maintenance on engine-driven equipment also own the electrical system like it was a ghost ready to guide 'em up.

What's more, when something goes wrong in the electrical system they give them out generators, regulators and batteries like mad. But 'em can't with your LYCET! Needs happen!

The guy who's a pro knows it's easy to check out your electrical system's parts. All you need is a little time, patience and know-how.

You can do it with the Generator and Voltage Regulator Test Kit (GVR 4818400-0106) which your work has in its Common Test Kit.

The words and pictures on how to use the tester are in either —

IN-1-PHASE 110V AC

It's like the Model 1028 and starts replacing Model 1018

IN-1-PHASE 220V AC

For Extra Information See Model 1040

So, make like a pro and get your tester off the shelf when it's time following that. Use the manual to learn how to check out your electrical parts. The pro makes easy believe for those not a part. Try it. You might be amazed how easy it is.

P.S.

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It's much, much hotter than you think... gasoline, diesel, alcohol or jet fuel — all in liquid form! ...

Whenever you push, the cooling system has got to be in good shape or you're not going anywhere.

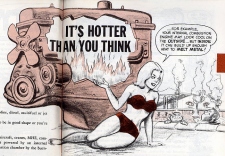
That's no joke. That's a fact.

On engines, tanks, tubes, IFCs, APCs, steamers, aircraft, cranes, AMTs, construction, generators — to anything, in fact, that's powered by an internal combustion engine — the heat created in the combustion chamber by the burning fuel is downright killer's hot.

For example, in some vehicles — tanks where the burner fire — heat may go as high as 4800°F. Some jets, my friend, make air around 2000°F. Oh, so the fuel vapors will be — the ocean heat generated by a turbocharging, high output engine could reach a 200-pound engine block in 10 minutes.

Doesn't your auto cooler than other eyes, but they will get you plenty hot. And, of all the fantastic heat only about 1/3 is used for power. Another 1/3 is handled by the exhaust system. Getting rid of the rest, so that as possible, is the big job of your engine's cooling system.

While it's why you've got to know your engine's self-protecting components, and you've got to mind your cooling IFCs and IFCs. Cause, if even the cooling system fails and you don't catch on fast, the engine can quickly end up a heap of junk.



COOLING SYSTEM CHECKS

In addition to getting rid of excess heat and maintaining safe engine operating ranges under all conditions, your cooling system protects the engine against overheating, which can also stop you fast. And, it usually provides cooling or warming services, as needed, for other components, accessories or systems on the equipment: differential and/or transmission oil coolers, heaters, compressors, auxiliary engines, etc.

Your equipment is cooled by either a liquid cooling system or an air cooling system. One cools with a liquid, which in turn is cooled in a radiator by a fan and outside air. The other uses a cooling fan and depending on their air flow, screen and around the engine and other hot spots in the engine compartment.

HERE ARE THE TWO MAJOR TYPES.



WATER COOLED



Some air-cooled engines may use a blower instead of a fan assembly to provide the cooling air. And, in landing already, for example, the opening in the engine cowling, right behind the propeller, provides the air passage into the engine compartment. The cooling air is aimed right at the cylinder cooling fins. The air flows around the cylinders, and shrouding, baffles and tubes focus the air in the other two compartments, as is customary of the engine compartments.



COOLING HELP

All the special design features, such as heavily finned cylinder heads and cowling in air-cooled engines, shrouds, air baffles, ducts, vanes, deflators, grilles, shutters, panels, doors, etc., are

also important factors in engine cooling. They're used to direct the cool air to exactly the right places, and to push the hot air out of the engine compartment too.



With richer cooling systems, a running engine must be occasionally hit by streams of cool, outside air. And, much, it's up to you to make sure that the

incoming air flow doesn't get blocked, disturbed or slowed up in any way, and that the used air can stream away freely as it won't be recirculated in the hot engine.

Both air-cooled and liquid-cooled engines cooling systems get a big helping hand from the engine's lubrication system. The cooling and lubrication systems, in fact, are highly dependent on each other for proper operation. Each system must do its main job just right; otherwise, it'll create serious problems in the other.

The lubrication system helps cooling by reducing friction heat in the engine, and carrying heat off as it lubricates the engine. And, it cools bearings, shafts, seals, and other moving parts as it flows through the lubrication system.

The oil in turn is cooled by the cooling system before it's recirculated in the engine.



COOLING THE ENGINE LUBE

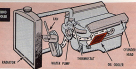
In your liquid-cooled engine the hot oil may be circulated through an oil cooler which is cooled by engine coolant circulation, or it may be cooled by the engine cooling fan, or by outside air that's stirred directly as the oil cools, oil flows, oil pans or containers.



The equipment's transmission oil cooler may also be piped for coolant cooling, or it may be cooled by the fan.

The oil and the coolant have separate passages through the oil cooler. The passages are designed to transfer heat easily from one liquid to the other. During

ENGINE COOLING



Warm-up the best: From the coolant warm up the oil, and during operation the flow of best is from the oil to the coolant.

In engines cooled by air the hot oil is circulated through an oil cooler, where it's cooled by the engine fan. The fan draws outside air from under the engine or from its sides, or it may get air through grilles, screens, slats or other cooling air inlets on the equipment.

On some heavier equipment tanks, DP's, recovery vehicles, etc.—if engine cooling fans, located on top of the engine, will handle 2 or more engine oil coolers . . . and, they'll also cool the equipment's transmission oil cooler.

The equipment uses radiator-type oil coolers which are mounted along the top sides of the engine, and handy as possible to the overhead fan. The hot oil circulates through oil lines to the front part of the coolers, and the fans keep a strong flow of air rushing through the coolers.

Thermostats and valves control the flow of oil through the coolers and control panel gauges and warning lights report the oil's temperature and pressure.



GOOD LUBING—GOOD COOLING

To help with cooling, of course, a lubricating system must be clean and in good order. And, it must have the right amount of good, clean oil. Contaminated oil, the wrong oil and low oil levels are functionally capable killers. While they're causing wear and damage to the engine and the lubricating system, they'll also kill



up overhauling problems that'll tax the cooling system.

And, clogged, dirty oil coolers, oil lines, oil filters and strainers in the oil pan or sump will not only interfere with oil circulation and lubing, they'll also insulate the oil against the cooling system.

On the other hand, if the cooling system fails, the oil's lubing power can be quickly fouled up by the excessive heat that'll build up in the engine. Then varnish and other harmful deposits will form in the engine and the lubing system.



While you're thinking that up to the fan on an air-cooled engine, here's how they cool the hot spots on the engine:

In addition to drawing air through the oil cooler, the fans pull outside air through the cylinder cooling fins and they also fit an intake fan compartment in the engine compartment. And, straws and baffles are used to direct the air behind each cylinder to completely surround the hot cylinders. That cooling air, in fact, is a matter of life or death for the cylinders. So, if you ever find stranding or baffles missing, cracked, loose, installed wrong or in anyway out of line, you'd best forget about operating the engine until the problem gets fixed. Same goes when cylinder cooling fins or oil cooler cores are damaged in any way.

TEMP GAGES

The big things you've got going for you in bird-bugging the engine cooling system, of course, are the engine temp and oil temp gages on the control panel. On some equipment you've also got a coolant temp gage.

You have to keep a sharp eye on the gages when you crank-up—and you check 'em often during operations. The instant a gage reading starts to climb past the safe operating zone, you have to stop fast, cool the equipment and troubleshoot for cooling problems. Also, during warm-up, if a temp reading swings up suddenly, you have to stop quickly and check out the problem. Some gags if a gage or a warning light refuses to give you a safe reading or signal when you crank up.

A speech bubble containing the text "HOLD UP!".

A speech bubble containing the text "I'M STOPPING!".

A speech bubble containing the text "GIVE".



A speech bubble containing the text "TEMP AND OTHER READINGS TOO!".

A speech bubble containing the text "GIVE".

A speech bubble containing the text "GIVE".

WARM DATA

Along with the gages, most equipment uses data plates and dials on the control panel to tell you what the gage readings should be when you crank up, when the engine's running, and when you shut down. The same strip is spelled out in greater detail in the equipment TM's, but the sooner you memorize exactly what the temp gages should be saying at all times, the safer you and your engine will be.

If you're not paying close attention to the gages, overheating problems can leave you with engine knock, loss of power, excessive fuel consumption, and in liquid cooled engines by loss of coolant (leaking, boiling).

OVERCOOLING

With most equipment, to guard against overheating problems and damage, you have to keep the warm-up time as short as possible. You also stop fast if the gage readings don't start moving up to safe operating temps like they should.

Although overcooling may not be sudden death for the engine, like overheating is, it can cause serious headaches. For one, the engine'll run rough, lose power and waste fuel. In a cold running engine, fuel exhaust and water vapors blow by the piston rings and into the oil sump where they'll form acids that'll corrode the engine. Lower operating temps also

A speech bubble containing the text "I'M A VICTIM OF OVERCOOLING".

interaction with normal reading of indicators and gauges in the air system. These too, can mean up the hills enough to bring on engine damage or increased wear.

Operating conditions, instead of a basic cooling system, are often responsible for overcooling problems. For example, long idling, underloading, low speeds and short hauls can keep an engine cold. Skidding or loaded downhills, downers, ponds or dunes, will do the same, especially in cold weather.

ADDED LOAD

EXTREME CONDITIONS PUT AN EXTRA BURDEN ON YOUR COOLING SYSTEM!

A cooling system's big job gets even trickier — and the system needs added care — in extreme hot or cold climates.

In extremely hot weather you have to eye the cooling system carefully several times a day, like the TM says . . . and, in some real hot, dry places, you may have to do it even more often.

To protect the cooling system in cold weather you've got to really warm-up to the special operating instructions for the equipment, some of which may be keys for you right there on the control panel. To beat real arctic weather you've got to be on the ball about a few other very important things — like wearing aids, special tires, fuel, coolant and winterization. (We authorized for your equipment.)

It's also handy on the cooling system when your equipment must be operated at a very high or very low speeds for a long time, or when a vehicle makes long uphill hauls, rolls cross-country, or in muddy, sandy areas.

For example:

Flying debris, mud, dirt, leaves, branches, bushes, logs, rocks, gravel, and sand clog and damage radiators, oil coolers, fan shrouds, fan belts, air passages, screens, ducts and air filters. They'll clog, crush, burn, wear or otherwise



beat up the blades, rotors, belts, drive shafts, oil pans, oil and coolant lines and hoses, rear beds, and clamps.

Equipment vibration will loosen mountings, shrouds, baffles and connections. It'll cause cracks and leaks in reflectors, oil coolers, hoses and lines, and it can damage pulleys, pumps, shafts and tanks.

COOLING AIR: GOOD ALL AROUND PM

Under any kind of operating conditions it's tougher on the cooling system when the engine, itself, is set up to stall. Drivings, loadings or stalling in the field, air or exhaust systems also make things harder for the cooling system. Actually, you can usually cause an cooling system trouble anywhere the engine or any related system on the equipment is over-heating, idling or not idling.

The cooling system's burden can also be increased by a rough, careless or gase operator. He can bring on over-heating, problems and damage by too-prolonged, loading, stopping, idling or logging the engine. A real cool operator you might say, is a big cooling plus-in any piece of equipment.



DON'T DIE IN COOLING

Overheating damage is a big threat even when you stop after a hot run. Proper shut-down SOP is important PM for all equipment, but it's especially critical for some vehicles.

Basically, you have to cool some engines slow-like by idling 'em low for a few minutes before you stop 'em. Two to 5 minutes for a few cases of fast idling

is usually enough. But after-cooling needs vary for different kinds of equipment, and the length of time the engine has been running may also make a difference. So, for now, you know exactly what your specific equipment needs... how fast and how long to idle, and what your wrap-ups should read when you get ready to stop the engine.

After-cooling looks down to this—



In these few minutes of fast idling, the engine has a chance to cool off more evenly. If you shut down suddenly, without after-cooling, the trapped heat—which is greater in some parts of the engine than in others—will cause uneven contraction of metal as the engine warms cooling. The uneven contraction can stick or warp the engine block, cylinder heads, damage pistons, piston rings, bearings, and valves, and foul up fuel injectors, the exhaust manifold, rods, gears and throwers.

LEAF IN THE TURBOCHARGER

After-cooling is doubly important on vehicles equipped with turbochargers.

A turbocharger is free spinning and the only way all its oil from the engine idling system. It's constant whirling like most turbo 50,000-100,000 RPM's, without lube, when the engine is stopped suddenly. Idling the engine for a few minutes keeps the fans working and the oil flowing, so the turbo can cool somewhat the spinning run down a bit.

Without after-cooling the turbo's heat from the dry spinning can damage the turbo's seal, freeze the bearing on the turbine shaft and warp the rotor blades.





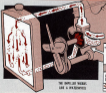
LET'S TAKE A
GLANCE LOOK
AT A LIQUID
COOLING SYSTEM
...IT'S THE
KIND YOU'RE
MOST LIKELY
TO FIND
AROUND.

THE LIQUID COOL



And, there are 10 smaller hot air radiators.

THEY ARE USED TO COOL THE ENGINE AND THE...



HERE'S HOW IT ALL WORKS



OVERFLOW TANK — Loose, rusty, leaky. Pressure accumulating, damaged. Drain clogged or overflow line plugged, damaged.



PRESSURE CAP — Wrong cap. Damaged, loose, dirty. Spring damaged, valve stuck. Spring broken weak.

CHECK THE DRAIN LINES AND DRAIN COCK SYSTEM.

FIX AND DRINK — Fan blades cracked, rusty, grimy, worn, mounting shaft loose. Fan shrouds, covers, belts at or off-rotate only. Fan belt cracked with frays, not held out of adjustment, worn, cracked. Drive belt, belt, cracked, causing fan.

CRACKS — Saffle plate or filler neck (plugged, loose, overflow pipe cracked, or clogged, stopped. Leaky, rust, corrosion in radiator case, seams, upper or lower tank. Radiator very clogged, blocked, fan test, cracks, radiator mounting loose, damaged. Cooling tubes clogged with rust, grease, corrosion, sludge of rubber hose hoses leaky, cracked, worn, pulled, hard-wired, collapsed, swollen, sucking air. Hose pumps, belts, blocked. Damaged threads stripped. Hose leaking wrong.

BE SURE THE HOSE IS IN FIRM CONTACT ON COUPLER TIPS... SO THE HOSE CLAMP IS BELIEVED (JOINT) ON-HOSE CONNECTION... OR HOSE WILL BLAST OFF WHEN SYSTEMS UNDER PRESSURE.



The spring control in many position pump equipment has a switch or handle to disconnect fan for testing. The control must be set to correct condition when not testing... or spring is dead it will cause engine continuing on damage.

DISCONNECT — Rusty, damaged, missing, water seal or leak. Wrong thermostat, or thermostat installed upside down. Missing parts.



When the system is closed, the thermostat should be removed/installed in hot water for the required opening and closing forces, and if it fails to make the proper either way, it must be replaced.

DRINK WATER MOST — Leaky, clogged, head bolts loose, damaged. Head gasket installed wrong. Corrosion, rust, clogging or leaks inside jacket.



COULD AND CAUSE IN CONTACT CLAMP YOU WOULD TAKE THE JACKETS AND RADIATOR (AND YOUR BLOOD) VERY CAREFULLY!

Installation of head gasket and fitting of copper head bolts must be in for the back to prevent leaking and damage in the engine and in the cooling system.



BEAT OR BURNING WORKS... THE YOU ARE TO PROCEED!



WATER PUMP — Worn, loose, damaged, working air, leaky. Bell crank oil, worn, frayed, too-light or loose.

Most water pumps are sealed, but some need oils. Many years in service, the type and bearing frequency will be noted in the UC or maintenance (DP) manual book, or manual.

COVER HOLES, LABEL, FUSES, PLUGS (FUSES, GASKETS, CONNECTIONS)

Leaks or damage in cooling system hoses or lines or heaters or other water pressure-using system of connections of cooling lines, don't follow or pipe-gate line of tube, or the connections or the pump or hot components.

RADIATOR

The radiator cools and sends the water. It has a bottom tank to hold the cooled water for recirculation and a top tank to receive the hot water from the engine water jacket (some tanks are on the sides of the radiator).

The radiator cap is a very vital part of the cooling system. It seals the system so a fair amount of pressure builds up, so you have to make sure your equipment has the right pressure cap.



With coolant under pressure the engine can operate at much higher temps without the coolant boiling over.

The cap has a pressure safety valve, a vacuum valve and a gasket.

The pressure valve seals the overflow pipe during normal operating temperatures, but when steam pressure or boil-

ing coolant forces the valve open, the overflow pipe is opened to relieve the expansion.



The most transport vehicles the cap's pressure valve is set to open at approximately 7 or 13 PSI. At 7 PSI, for example, the coolant's boiling point is raised to around 230°F, an sea level. At 13 PSI it's raised to about 251°F.

On some motor vehicles the cap's pressure opening is set as high as 17 PSI, which raises the coolant boiling point to about 265°F.

The pressure rating is stamped on the top of each cap.

The cap's vacuum valve opens as the engine cools and the system's pressure drops below the outside air pressure. As the vacuum valve opens, air rushes into the system through the overflow pipe. The automatic suction of air prevents the collapse of the hoses and thin, unsupported parts in the system. When the system's pressure and the outside pressure are about the same the vacuum valve closes.



ENGINE WATER JACKET



Water passages in the cylinder block and the cylinder head form the water jacket. In the block the water jacket surrounds the cylinder liner and passages between the cylinders let the water circulate around the cylinders. Water passages also protect other hot spots on the block, and plates or baffles may also be used to help the circulating coolant hit the hot surfaces. The engine may also have a water distribution line or tube which also cools at the cylinders and the valve seats.

Water ports between the cylinder block and the cylinder head let the coolant flow into the cylinder head to cool the top of the cylinders and the valves. Or, there may be small water jets or nozzles built into the cylinder head to cool the valve seats.

The engine head gasket, along with its other important sealing chores in the combustion chamber, provides the seal that keeps coolant out of the combustion chamber, and flames and heat contamination from leaking into the water jacket.

Water circulates in the water jacket, just as it does in the radiator, whether the engine is running or not.

WATER PUMP—HEART OF THE SYSTEM

The pump takes cooled water from the radiator's lower tank and forces it into the engine water jacket. Today's power-cooling petroleum pumps may have no circulation between 4,000 and 10,000 gallons of water an hour.

DIAPHRAGM

The diaphragm regulates the engine temperature by controlling the coolant flow through the radiator. When the engine is cold the diaphragm valve stays closed and shuts off practically all coolant circulation in the radiator. As

the engine warms up, the diaphragm valve opens gradually to allow the coolant cooling cycle to begin. During equipment operation the diaphragm will open and close as often needed for by the engine operating temperature.



The 2 common diaphragms used are the bellows type and the metal spring type.

The bellows type remains a liquid that'll create gas pressure, as the bellows expand when the coolant reaches a given temperature.

The other type is fitted open as the coolant heat expands the bimetallic coil spring.



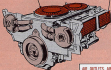
The fan pulls outside air in through the radiator core to cool the water tubes, fins and the coolant. With help from the radiator shroud the fan also blows or draws cool air directly on, over or across the fan engine. The fan is belt driven, runs off the crankshaft and normally shares a pulley with the water pump, generator or some other component.

AIR COOLING SYSTEM CHECK POINTS

The big things to watch on an air cooling system are:

FAN BELT DRIVE METHODS — Binding, noisy, damaged, dirty, clogged. Shafts or clutch assemblies worn, damaged, loose. Fan blades, motor fan cracked, bent, dirty. Fan housing or towers damaged, loose, clogged with trash.

OIL COOLERS — Radiator cover missing, fan damaged, clogged. Cooler mounting loose. Oil tube clogged. Oil lines dirty, leaky, damaged.



CYLINDER COOLING FINS

— Bent, cracked, unattached, blocked, grimy, clogged.

CYLINDER RAFFLES, SHROUDS — Bent, cracked, loose, missing, installed wrong, dirty.

AIR INLETS, AIR FILTERS, AIR FILTER COOLERS, FANCL SCREENS, FANCL SCREENS

— Damaged, stuck, blocked, missing, installed wrong. Their seal, points or attachments worn, damaged, missing, installed wrong.



SATURDAY IN SHORTS EQUIPMENT

On things like generators, compressors and other engine-powered tools or support equipment, you also have to make sure that the equipment has plenty of breathing space—that it's not crowded by other equipment, walls, trees, fences, embankments or potholes, that'll block the flow of air to the engine and its air filter.

THE IDEA IS TO MAKE SURE THAT HOT AIR DOESN'T GET CHASED BACK TO THE ENGINE!

The proper care and replacement of belts, pulleys, strands, doors, etc., is very important. They must be in place and in good shape for the cooling system to work right.

When you get down to the 1- and 2-cylinder engines used on some tools and equipment (small generators, com-

pressors, chain saws, etc.), you have to remember that their cooling comes mostly from flywheel fans, shrouding and the normal circulation of air around them. So you have to keep 'em clean, unobstructed and unshrouded so they're hit by outside air from all directions.

GETTING ENOUGH?

...COULD OF FIG?
NOW YOUR QUOTE CAN GET
ENOUGH BY BEING IN A NEW
SA FORM 12-4 TO THE AD
PUBLICATIONS CENTER, BALTIMORE.
ORDER THE QUANTITY YOU NEED.

SO, WHAT



On any piece of equipment, regardless of size or MCR, it'll help the cooling system a lot if you shade the engine compartment from the direct sun blast—wherever possible. It's especially helpful to paint an engine compartment when the equipment is overhauled.

ABOUT ENGINE COOLANT

Keeping the coolant solution clean and at the right level is top priority PM. And, a good place to remember in checking coolant is that coolant expands and its level rises as the engine warms up, and the level falls as the engine cools. So, whenever you're refilling the radiator you have to refuel the coolant level after the engine has reached operating temperature to get a true reading. Run the engine a few minutes and then refuel the coolant before you restart 'er.



The coolant should be visible at the bottom of the filler neck, or just as much over the radiator bulb's glass. But, exact level and filling SOP will vary with different equipment, so that's PM SOP you have to learn by heart for your equipment.



Overfilling, or filling when the engine is cold, can cause coolant overflow or coolant waste. And, repeated overfilling will reduce the coolant's anti-leak and rust-inhibitor protection.

On the other hand, with a short measure of coolant you'll have poor coolant circulation and warming, especially at low engine speeds. And, of course, it's not very healthy at higher speeds, either. For example, low coolant will let air into the system. The air'll create bubbles and air pockets which'll reduce the coolant's cooling power, and the air will also cause rust, foaming and further loss of coolant.



FILTY COOLANT

Rusty, oily, sooty or otherwise contaminated coolant won't carry heat off well at all. And, coolant that's contaminated means the inside of the cooling system is hurting—in's easy to see, or it's got inside leakage, or it's been going—they wear. You've got to drain contaminated coolant as soon as possible and clean the cooling system before you add new coolant.

Cleaning a coolant cooling system normally calls for Cleaning Compound, ESN 6810-198-7128. But, cleaning and flushing and use of the compound take special care and know-how. On most equipment it can be done by the regular national maintenance experts, but on home engines the job is done by experts. See your trusty TBC.

Use of the cleaner is covered in TB 198-611 (Nov 68), Use of Acidic Solutions and Cleaning Compound in



Engine Cooling Systems. The supplements TM's and TM 9-1018, with Changes 1 and 2 (May 68), Cooling Systems: Vehicles and Powers/Coolant Equipment, also give info on cooling system cleaning, flushing and use of the cleaner. And, a page of instructions also comes with the stuff.

When you clean a cooling system, the Tech want you a bunch of Caution Inhibitors, FSN 6810-713-4967. It comes in a five oz. and you mix in 1 ounce to each 3 quarts of water. The stuff comes in a light powdered form, though, and has to be mixed with warm water before it's added to the radiator. It won't dissolve completely in the warm water, but the important thing is that the inhibition doesn't have any lumps.

LEAKS AND OVERFLOW

JUST DO A JOBBY—
WRITE DOWN CAN INCLUDE
CYNOSURE SPINBLE
I PAID!



Another important contact check point to remember is that a clean, leak-proof cooling system will lose only a very small amount of coolant through evaporation. Any heavy loss of coolant during normal operations means leaks, not just age or overflow problems. Problems, that is, that won't be solved by simply filling and refilling the radiator.

A damp spot will give away leaks away, but some are so small and dry as fast when the engine is hot, that it's hard to catch 'em in action. But, the giveaway on slow, persistent leaks is usually a rusty or grayish-white stain at the leak point, or wherever the coolant hits. And, don't let small leaks mislead you. They can rob a cooling system of gallons of water in just a few hours—so they've got to be stopped, as soon as possible.

When leaks aren't obvious, you have to suspect overflow problems. Constant coolant overflow and over-heating can mean real problems, like:

- Radiator hoses swelling into cooling system.
- Ignition or water pump off.
- Radiator tubes damaged, bent, or partially damaged (blocked).
- Air spots that are mixed, clogged, or mixed.
- Caddy overflow.
- Radiator pressure cap damaged.
- Ignition head gasket not installed properly.
- Water pump together loose, or not.

- Oil is mixed (or leaking into system through damaged hose, through hose cracks or pump connection.)
- Radiator and hoses are cracked or swollen.
- Radiator tube damaged or replaced wrong.
- Radiator hose damaged.
- Fan or water pump belt damaged, not of adjustment, belt not replaced or stretched out.
- Water stopped, exhaust pipe bent.

ANOTHER NOTE

Acid, such as antileak (ethylene glycol) is a mean for liquid cooling systems in temperatures ranging from +127°F to -111°F. It causes under:

FOR 400-442-1111 24-hr. toll-free
FOR 400-424-8228 24-hr. toll-free
FOR 400-442-1111 24-hr. toll-free



The exact time for adding antifreeze is normally set by local maintenance SOP. Instructions on use and care of antifreeze are in operator TM's, TR 700-611 and TM 9-2058.

Antifreeze has a high boiling point, it doesn't readily evaporate in use, and it gives complete protection from freezing when used in the right amount. A mix of 50 percent water and 50 percent antifreeze, for example, will protect at temperatures as low as -32°F .

But whatever mix you use, you'll need to use the hatches with a hydrometer to be sure you have the protection you'll need. Once the cooling system gets its antifreeze, you use the hydrometer on one of the hatches when you have to add water to the radiator. And, as nobody'll goof up your solution, you do a top-offing antifreeze into the radiator like usual.



Antifreeze doesn't carry off engine heat as efficiently as plain water does. So, during antifreeze season you have to keep an even closer check on coolant level and condition, and you keep an eye peeled for any nasty leaks.

At the end of cold weather, you drain the cooling system and dump the antifreeze. The cooling system gets a fresh batch of clean water and some corrosion inhibitor.

Keep extra antifreeze in all year round, as long as tests show that its corrosion inhibitor is still good.

And, when the antifreeze is drained it is real good time to give the cooling system a complete going over for leaks, damage, wear, proper adjustments, etc., from the thermostat right down to the water pump.

1984

STRICTLY OFF LIMITS!

BETTER CHAIN THE HAMMER SPRING.

BUT... I GOT THIS EXPERT TO HELP ON IT, RIGHT?

I REASSEMBLED THESE RIFLES, DID I?



However, before making sure that hammer spring's been put in right, no matter who did the job, "Chain" unless the spring goes on top of the trigger pin, your exp-machine just might not fire when you need it most. That's because the hammer won't have its full force and the trigger pin might fall in line for priming.

Another thing, if the rear pin's sticking up in the air like a sore thumb, an automatic fire. Somebody goofed. Not only is the rear assembly installed wrong, but you could damage this spring when you close the receiver.

So, check your receipts. If the hammer spring's on top of the trigger pin, do it **CRK**.

But, if the hammer spring's under the trigger pin or if the rear spring's pointed toward the sky, get your rifle in D3 pronto.

Word's around that some civilians and amateurs are loading up tracking gear in the lower levels of their M14's—like putting the hammer spring or rear assembly in backwash.

But, when, back-up!

Lower receiver parts are **OFF LIMITS** to anybody below the D3 level. So, please to keep your mind some clear.... except for necessary cleaning and lubing, otherwise. No matter what you may have read or heard any where any time, this is like it is, **Blat!**



KNOW BEFORE YOU GO

So, Zappier, you're set to head into action and you've done so close with that skilled crew. In a critical situation, you're never much healthier than your rifle.

You've done all the things you've equipped us do in the way of choosing and looking, but when you gotta go, you gotta know: Is your M16A1 ready to go make the big score with you?

If your weapon has any of the ailments listed here, run to the repair or get another rifle's healthy. These ailments can cause some of other ailments, too, but let's say here to stay for in the GI "hospital" for the status.

SLINGER LINKS — Slack, won't hold position.



BOLT CATCH — Won't hold in open position.



REAR SIGHT — Easy to set, wobble when damaged, is bent/stuck.

C-MOVING HANDLE — Won't extract bolt and set carrier; will break.

FORWARD ASSET ASSEMBLY — Won't clear bolt.

BOLT STICK — Bolt hangs loose, separated from lower receiver; failed gas button or gas spring; bolt not open enough; won't hold any deep cuts, cracks or breaks that weaken the stock.

LOWER RECEIVER — Cracked.

BARREL ASSEMBLY — Bent or won't hold, buffer badly corroded, cracked, spring broken.

TRIGGER PIN — Loose, tight.

TRIGGER MECHANISM AND LOWER RECEIVER BOLT — If it's damaged, assembled wrong, won't work.

FRONT SIGHT — Loose, bent, direction defined and good check.

REAR SIGHT — Release spring weak, broken; flange bent, broken.

BARREL — Bugged, bent badly pitted.

LEFT OR RIGHT BOLT-COVER — Won't open and clear the shoulder housing.

FLASH SUPPRESSOR — Loose, bent.

FRONT SIGHT — Bent.

MAGGAINS — Deep cracks, rolls or breaks that make it too weak to trap, front and rear areas burred off; won't hold in place when clip isn't pushed up; clip ring damaged that'll keep it from doing its job.

CHAMBER — Pitted.



CARRIAGE PIN — Missing, cracked.



BOLT — Cracked, too badly pitted; locking lugs stripped; ring bent.



BOLT CARRIER — Body cracked; badly pitted; firing pin well is corroded.

CARRIER KEY — Cracked/bent, badly corroded; gas port clogged; spring and key screws sheared/off, missing.



FIRING PIN — Cracked, bent, missing.



FIRING PIN RETAINING PIN — Bent, missing.



EXTRACTOR — Bent, cracked, case damaged; spring weak or deformed; pin cracked.

UPPER RECEIVER — Cracked, locking lugs badly pitted; gas hole bent, badly bent.

TRIGGER — Won't work.

MAGAZINE CATCH BUTTON — Slack; won't hold magazine after you've adjusted.

MAGAZINE — Overloaded (more than 20 rounds); tube deformed; plunger spring badly broken; weak; follower stuck.



AND LEAVE THE COMMANDS TO ME... LEAVE THE BUILT AND MAINTENANCE ALONE... IF THEY KNOW WHAT... THEY'RE BRAGGING!

PURBS

PURBS



THE 1000 MOST COMMON NAMES OF PLANTS AND ANIMALS IN THE UNITED STATES. BY W. W. BRIDGES. 1928. 160 PAGES. \$1.50.

RECENT ARRIVALS

THE 1000 MOST COMMON NAMES OF PLANTS AND ANIMALS IN THE UNITED STATES. BY W. W. BRIDGES. 1928. 160 PAGES. \$1.50.

THE 1000 MOST COMMON NAMES OF PLANTS AND ANIMALS IN THE UNITED STATES. BY W. W. BRIDGES. 1928. 160 PAGES. \$1.50.

THE 1000 MOST COMMON NAMES OF PLANTS AND ANIMALS IN THE UNITED STATES. BY W. W. BRIDGES. 1928. 160 PAGES. \$1.50.

JOE'S DOPE

I KNOW YOU
WANT SUPPLY
ECONOMY
...BUT THERE
ARE YOU WITHOUT
**SUPPLY
DISCIPLINE!**

WITH
SUPPLY
DISCIPLINE,
A SUPPLY TYPE
IS BUILT ON
THE WALL!

LIKE, YA
KNOW IT?
AND IT'S
A SUPPLY
SPECIALIST!

BUM!





ALSO YOU KNOW YOUR SURVIVAL KIT
IS ESSENTIAL IN THAT
YOU CAN USE IT FOR
CAMPFIRE, ETC.



ON AUTHORIZED ALLOWANCES
-HOW TO USE BIRDS' NESTS
TO FIND UP ALLOWANCES
AUTHORITY.

LIVE REVEREND
REVEREND
REVEREND
REVEREND
REVEREND



-THIS INCLUDES SCHEDULED
KEEPING STOCK ON HAND
OR ON ORDER AT
ALL TIMES!



YOUR TROOP'S DEMAND
MAY BE TO USE BIRDS' NESTS
TO FIND UP ALLOWANCES
AUTHORITY. ALL THIS OCCURS IN
A MUST!

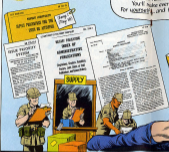


LIVE REVEREND
YOUR COUPS
QUARTERS AND
DELIVERING BIRDS' NESTS
TO FIND UP ALLOWANCES
AUTHORITY. ALL THIS OCCURS IN
A MUST!

YOUR TROOP'S DEMAND
MAY BE TO USE BIRDS' NESTS
TO FIND UP ALLOWANCES
AUTHORITY. ALL THIS OCCURS IN
A MUST!

Jobs Dope Sheet

With disciplined thought in supply,
You'll know what to do—even when
You'll be functioning right,
You'll make everything bright...
For yourself... and that Other Guy!



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

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

NOW, A SPECIALIST ALWAYS IN BATTLE AND REQUESTS ARE MADE THROUGH THE BATTLE LINE TO THE SUPPORT AND TO THE LOGS.

Y'VEAN, I SUPPOSE, THE SA BORN FROM BATTLE... RIGHT?



AND THERE'S PRIORITY CODES (SOME PRIORITY DESIGNATION) AND LAND (LANDING) OF NEED DESIGNATION?

WHICH I ASSUME YOU CAN READ SECRET IN AN M55-23-1, DEC. '67



SUPPLY STATUS (M55-23-1) MUST BE KEPT CURRENT AND CORRECT.



YOU MUST MEMORIZE SUPPLY STATUS CODES... AT LEAST THE MOST IMPORTANT ONES.

I HAVE A POUCH THAT ARE M55-23-1 AND ADVISE, STATUS AND IDENTIFICATION CODES.



CAMOUFLAGING MUST BE MAINTAINED... AND FOLLOW-UP CHECKS MUST ONLY AFTER FREE BROWNS OR SAFETY CAMP OR REQUEST... OR ON CHECK RETURNED BY SUPPORT.



... YOU USE PCL STICK TO FILL THE REQUESTS QUICKLY?

RECORD DEMAND AND REORDER PCL REPLACEMENT RIGHT?





YOU AND YOU USE THE
SNAKE INTERDEPENDABILITY
AND TO-PERFORM NEEDS-
FORMS PART!



WELL, THERE'S RECONCILIATION
WITH... LINE KEEPING POINTS OVER
FIGHT ADVISORY... SO... FOR YOUR
SUPPORT PART, ACCURATE
REPORTS?



DO YOU WANT TO BE CHECKED
ON THE EASY AND MAKE
SOME IMPROVABLE OF
THINGS ARE PROPERLY
TAKED WITH OR FORWARDS.

WELL TO BE HONOR
AND APPROVING
THAT IS ALL HAND?



OF COURSE, GROUP
INVENTORY CONTROL
WANTS ALONG A
PHYSICAL CHECK
OFFER!

AS
CALLED FOR BY
ARTICLE
AS YOUR
OFF...



WELL

EXACTLY! I'M NOT UP SUPPLYING PARTS FROM SUPPORT IN TROPICAL... PROTECTING THEM WHILE IN STOCK, KNOWING HOW AND WHERE IS THE SUPPLY MAN'S RESPONSIBILITY!

ABOUT THAT... MY SON'S BEEN DOWN SINCE FEBRUARY AND NONE OF OUR FRIENDLY PARTS!



CHEER, MAN, LET'S JACK IT UP WHERE YOU HAVE BEEN ALL DAY!

GETTING SUPPLIES... WHEN INDEED... YOU SHOULD HAVE BEEN FOR A LONG TIME.

PLEASE, EVERYONE IS BEING... TO SUPPLY PRO-LINE!



THE LIES WHO MADE THE SECURITY PROBLEM? THE SUPPLY MAN WHO KNEW THE PROBLEM AND HIS SUPPLY MAN, AND THE COMMANDER WHO KNEW THAT PROBLEMS ARE FOLLOWING... IT WASN'T CREDIT... TO MAKE IT WORK!



AIR INDUSTRY

"CHOOSE YOUR PIN, PARDNER"

ARE YOU
SINGLE-ACTING
OR DOUBLE-
ACTING?



Time Chevrolet (CHEV) owners, better check the engine mounts for security—and focus on the air stream.

Make sure the quick release pin used to attach the engine support link to the mount is a single-acting type . . . one of the good guys. It has a handle.

A double-acting pin is something else again . . . one of the bad guys. It has a pull ring in place of a handle.

Trouble is, a pull on the ring—check pin security via, spot the apple cart! The pin moves enough to allow the locking balls to enter the hole—the

pin binds and locks tight.

During flight the pin works loose and your engine will be held by 2 mounts instead of 3. That's a healthy situation.

Next-to-last, you don't want double-acting pins, P/N 15-1126-200-1001, fig 64, item 8 of TM 15-1126-200-30P-1 (28 Mar 88).

Make sure your engine is secured with a single-acting pin . . . one of the good guys. Order the right pin, P/N MAX118A200, P/N 15-1126-200-1001, listed on page 601 of the parts pub.



SAVES ELBOW GREASE

Quick-Lites.

Have been taught it is to shoot grease into some push-off method bearings as a stopgap theory?

You can't fit the standard bearing into your hole, so, the real fix is to take off the hole to get at the bearings.

To save time and elbow grease, we now put off the real steel grease gun bearing at a time—using a handy made lubricator.

To make this little bore just drill a hole in the hole, thread the hole and insert a suitable cone fitting. Add the necessary lubricant.

It's simple to use the tool. Put one end on the hole and use the hand. Add a second flat washer with the 1/2" longer than the OD of the bearing inner hole and the OD long enough to rest on the outer edge of the bearing.

Insert third washer and tighten nut. Super tight.



Made with the grease gun and you've got these bearings pressed, easy as pie.

Chris T. Bopp
For Knapex, Inc.

Old Man—Looks like a real handy tool for tight places.



A quick-change valve on the right is a pro. A mechanic who is a quick-change valve with parts is an amateur. Be a professional, not a part changer, by retooling your equipment.

"SOCK IT TO ME"

Kicking a bird like me on inspection won't prove anything. But a rap on the MA-1 shoulder harness looking real, P/N 14-4126-25-440, will.

The real is in the Mojave F08-2100 for one. It may also be supplied as a repair part for your bird.

You can yank on the payout cable till lightning comes to check the automatic locking feature of the real, and it won't lock.

The whole assembly has to be accelerated 2-3 "G's" for the spring-loaded locking mechanism to work.

What to do? Well, real's are concerned on surfaces that will yield slightly under "G" forces.

So, with the harness looking lever in automatic, give the real a sharp rap with the palm of the hand. Then pull on the cable and you'll feel that it's locked.



To unlock the real, move the harness lever forward to the lock position and then back to the automatic position.

There's no problem checking the automatic locking feature of the MA-2 eye real, used on most birds. A sharp pull on the cable will do the trick.

TBO VARIATION

Dear Wally,

How about a reading on extending the operating life of a time change item in accordance with the rule to page 26 of 11 12-1228-250-14 (Mar 87) on component replacement?

How do you get that unit maintenance can extend the operating time on components, only under emergency conditions of equal or greater, if also calls for a real check entry in the MA Form 1400-19.

When we extend's LTR if engine change as that it falls on a Periodic and we getting under emergency conditions?

14-C, E, H.

Dear Specialist C. E. M.,

Minor read This is a normal TBO variation — no real check needed.

Normal variations of an engine TBO, per page 26, is encouraged to get full use out of the engine. It also avoids the use of extra NORM time which would be needed on an engine change between Periodics.

ARE YOU
PERIOD?



WITH A LITTLE HELPING ...

A LITTLE POST-FLIGHT PM

"Don't panic, trouble in your old life bag and smile, smile, smile!"

That's the way, wags grapple-air-borne escapees have added to an old proverbial belief . . . make it work.

You'll be helping the 100th AAB rig gear, and yourself, by taking care of your parachutes and air-delivery equipment. A little maintenance can mean the difference between an exhilarated and expired.

101 01

Like — when you land and collapse the parachute, get the harness into the life bag, please . . . If the tactical situation will let you. Never drag the harness along the ground because the quick-release hook, for example, is a nice device and can get jammed with dirt.

Keep the bellyband hanging out of the bag so you can locate the chest.

Go to the chute apex and grab the bridle loop. Gently pull the chest to straighten the canopy and suspension lines. Be sure you don't drag the canopy over straps or ribs. The dirt on you's likely to wear some of the gear system.

Fold the sides of the canopy into a width of about 2 feet.

Go back to the apex and lock down the bridle loop with your hands. Spread out your arms and make like a soaring bird as you gather in the canopy and suspension lines in a figure-8 motion.



Never fold the canopy more than necessary because friction can cause the nylon to fray.

Put the chest on top of the tent and secure the chest with the waistband. Make sure you don't pull any of the canopy down the waistband adjuster because you may tear the canopy or wind up with friction burns.

Put the reserves chest on top of the main canopy. Fasten the kit bag and you've got it made in the shade.



**FOR BROWN CLOTH,
BROWN PA**



Necessity of things chest is something else again—most material to get men up and longer suspension lines to get raised! . . . unless you use TAC.

Whatever you do, never jam the chest into the necessary bag in a bundle or it'll take all day for the riggers to figure out which one's up!

Stretch out both the canopy and suspension lines by lifting, not dragging. This will help keep sand, dirt and debris out of the canopy.

Take off the clear extension and ground-anchors. Put the shrivelinks lay



the clothes from which they were removed. Lock the seat back in place on the shrivelinks.

Now, daisy-chain the suspension lines. This will prevent tangles in those long lines.



"U" hold the canopy line, the deployment bag, fold the suspension lines and rest on top of the canopy.

When you're recovering small cargo items, like the G-15, put the suspension lines inside the deployment bag first. Then fit the folded canopy into the bag.

Tip the bag down with any cord or hand line's run suspension lines, and your chute is ready to make the trip to the tower for inflation and repacking.



SMALL CARGO—E-L-L-E

When transporting your chute to the flight line or from the drop zone, think "close". The kit bag is not waterproof or oil-proof.

Never pile the chute into a truck that you loaded full of oil drums, grease, batteries and the like. That stuff will get into the kit bag and ruin the chute.

Use a covered truck and if the floor is a nice dory, spread down a tarp or power your equipment. That's T-E-L-E in action.



If you're the type who likes to do a little homework, park your car at the tech library and scuffle up with some of these gems.



TM 15-125 04 Jun 58: Technical training of paratroopers.

TM 15-1076-21 3-15-12 Sep 54: Parachute, personnel, drop-back 11 in. air nylon canopy, type T-15.

TM 15-1076-21 4-15 117 Jun 58: Parachute, reserve, personnel, drop chute 19-1/2 dia., nylon canopy, type T-7A, T-15.

TM 15-1076-21 0-15 115 Mar 54: Parachute, cargo 34-25/4 air canopy, type G-15.

You'll find all the gems for your other chutes listed in DA Pam 310-4. Dig—dig—dig, Tiger!

WITH **TLC** IT'LL DO RIGHT

YIPPEE!
TLC'S "T-RACK"
A "WORKING"
PHONE... YOURS
WHEN YOU
CALL 800-451-1111

WAS IT
THE NEW
NEW TYPE
BATTERIES
... THEY'RE
MAKING
UNPRECEDENTED
ALL THE TIME!

A long-range tough guy it isn't, it won't need to be. This skin-it has ... so it won't pull you off balance when it's in your pocket ... or feel like a cork when it's dangling from your belt.

It's got Audio, sure, but your \$1 of equal value (AM/FM-2 and AM/FM-5) is undergoing a constant facility that'll let it do a better job for you.

Range will still be 1000 yards or less under good conditions and down to 100-200 yards in thick brush ... but then, you know that you gonna get from your equal leader, man? Or how far's he gonna get from you?

That lightweight job isn't supposed to get out there like the bigger stuff. And, or, how'd you like to dangle an AM/FM-25 from your belt when you're walking wind from your equal leader ... or show your back with equal leader gear, rifle, combat pack and Pack-111 Lite, give it the TLC it deserves. T-Rack's built for single-business occasions.

Even so, there's more and more improvement that'll show you how—things like better batteries, with longer life, better noise-reducing, weather resistance, and so forth.

MARINE

Available right now is an aluminum shell'd, magnesium battery, the BA-4000/1, that'll allow you the life of the original BA-3000/1 (up to 40 hours continuous service). You get the maximum job with 800-612-055-8630.



Some other advantages: The BA-4000/1 has longer shelf life, needs no re-charge during shipment and storage ... and runs better in heat.

ATTENTION
ALL PARTS &
... KEEP A 100-
FREE PHONE
FROM 800-451-
800-1011



The EA-299 transmitter battery slot is improved... which you may've learned by now. Because of moisture problems, each battery comes sealed in a plastic bag.

Keep it in cold bags!

Insert battery, bag and all, into the side plug of the transmitter. Fasten the plastic with the pins and slide the battery into place.



It may not be the usual answer to waterproofing, but it's a better deal than the EA-299 without a bag around it!

After salt water sailing removes the transmitter battery lithium power pack, use, if you splash it, dry the battery and contact points, and reinstall it. Keeps corrosion.



LEAD STORAGE

If you don't have Arctic accessories and the temps below freezing, a couple new storage cables will let you keep the receiver and transmitter batteries snug in a pocket or under a coat.



Both called Calks, Special Purpose, Electrical, you can get CE-11900/P88-2 with P/N 199-179-0294 and CE-11904/P88T-4 with P/N 199-179-0297. Each is 14 inches long.

Connect one end to the equipment and the other to the batteries and you get heavy joint problems less with the heat.

For Arctic conditions there's a parka harness and accessories spelled out in operating Change 5 to TM 11-5810-149-11.



LOOK HERE

Wicker joins an harness. Later model BA-109A's and all BA-105's have aluminum cases for better insulation and damage protection.

Finally, when wiring either receiver or transmitters, check the voltage range of your batteries with the AN/PSM-13 or SN-1180/P88 test set. Be sure you get a wide reading of 14.000 . . . and check your spare batteries, too, before going out on a mission.

ATTENTION:

The latest production model receiver antenna (AS-1190) features a capstan screw which won't back out and leave you with a wobbly "wick."

The screw will help keep the antenna pointing at the sky, where you get maximum range. The best way to view the antenna around is on your helmet



Happy accident, much? The real test is a ground plate, which is not in your package.

If you wear your AS-1200 cassette antenna to put out No. 1 style for you, raise it all the way. Also, slip a finger under the base and push it up till it won't go no more. Otherwise, it might bounce down and ground itself on the battery compartment clamp.

Also, while transmitting, be careful not to ground the antenna on your belt. The word you're putting out won't make it to the next block.

Meanwhile, back at the farm, there's a new model AS-1200 that keeps them quiet when you pull up the antenna... preventing slippage during use.

AS-701-4

To make the latest Model, the PRT-44, compatible with the special modes on the AM/FBC-12 and AM/FBC-13 series radio sets, a 110-cycle tone generator was added. That way, the 4 model, also in the C-17 MHz range, can get along with the other sets. Naturally, primary control will be with the PRC-25.

OVERIDE SPRING

Byhold the override spring next time you want only TONE or VOICE operation. If it doesn't drop down over the rail-edge, it defies its purpose... then you can hear both TONE and VOICE. If the spring rides high, give it a tap with your finger so it'll slip down over the right or left side of the rail.

A heavier compression spring is on the way to later production models and it should eliminate the override problem.



If, for some unforeseen reason, you cannot get the TONE/VOICE switch and locate the retaining nut on the case, be sure to reposition the case so its lower edge is parallel to the rail. If not, the override spring won't be able to snap into place . . . even with a heavier compression spring.



LASTING

Recent production models also feature a remodeled keyboard holder, with symbols and a stop which allows you to freely attach it to your business slide.

There're 3 handy little crystal modules in your transmitter which make the job of removing



your best a 1000 percent easier. Be sure the clip does not hit inside between the contact plate when you install your crystals. Bump the switch and you'll damage the crystal when you remove it.

And since we're here, some good goes for the receiver crystal.

If, for any reason, you must remove the module from the PPA, insert the larger screw in the top hole. The smaller one will secure the module if you clip it to the top.

ONE MORE

Couple precautions are necessary when you remove the microphone elements for cleaning.

First, be sure the rubber seal on the top and bottom of the element cap with it. Break 'em off or lose 'em and the rubber contact pins won't make good contact with the base buttons on the chassis.



And, about those fuse burners, the only thing holding 'em in place is friction and gravity. They can fall out or otherwise get lost during cleaning, so be sure they stay with you. Otherwise, forget about transmitting. A conventional plug and socket arrangement in place of fuse burners is being put in the FWT-4A.

WATT CHECK

Quick power run: You can check out the transmitter battery by holding the TONE/VOICE switch in the TONE position and listening to the sidetone in the meter. A steady whine, gurgle or otherwise tone that you hear the battery's in good shape. If you hear nothing, replace the battery.



When adjusting the loading coil (page 8-15 of the .11 TM and also in TM 11-6629-257-11, May 68), stop turning when you feel torque . . . or you'll strip the threads of screw that in the plastic loading coil adjustment screw. Use a small screwdriver so you can feel the resistance.

Coming up: a design change aimed at locating the frequency drift problem, and elimination of the 2 "dummy" battery pins on the transmitter . . . leaving only the 2 that do the work.



BE STRAIGHT

Keep straight . . . when you connect or install the receiver battery. When you install the battery, make it in place in a straight line. This gives it a gentle shove and the contact pins are fully engaged. Back it straight out when you remove it.

Any other way can break the pins. And, since burners now are aluminum covered, sliding 'em through the receiver clips won't damage 'em or allow oxidant to get to 'em.



REMOVING

If you were behind the door when receivers were passed out, you should know that they come with the receivers. They come in mighty handy for spare listening, so ask your supply people about 'em.



When you get your computer, and see it, an occasional check on the computer cable run guy dividends in licensing programs. Keep it up. An improved model has the cable permanently attached to the computer . . . but it may take a while to get to you.

As you attach the receiver to your helmet, have money on the spring clips. They go over the steel helmet only—over the helmet and lines. Having the clips over both can break 'em in spring 'em so much they're useless.



Talking about muscles, have you heard what you can do with the volume-control switch. Turn it clockwise for action, but don't force it—you'll lose it up! When you feel resistance, stop! Chances are, if you don't get any noise you're due for a new battery . . . or the record is in speech setting.

After a while, when you're tired, and covered up, and about to take some pounds off your head, hold and remember, your receiver's still attached to your helmet . . . so don't slam it on the ground. The helmet's tough, but that little of receiver . . .



The old eyes will be happy to learn that some production models have a plastic barrier in the base which keeps mud, sand and water from half way up. It keeps the gunk from getting in deep and putting your receiver out of business.

If you're cramping down this kind of mud, give the receiver an occasional shake to let the gunk come something on.

UNPRECISE ??

Somewhere along the way, by school or by accident, you may've heard of the "ANYPRECISE," a "combined" PRE-2 and PRE-4. Well, the PRE-2 and PRE-4 are as combined as they are ever supposed to get, but UNPRECISE has taken notice to manufacturers "ANYPRECISE" as the manufacturer . . . as a means of identifying the receiver and the transmitter under our identification.



WATCH THE JOKER

There's a sleeper card in this beautiful Southern Aids giveaway game. Combine poker with this kind of poker could make you—and your whole crew—right out of the road.

The name of the card is . . . *Sighs*.
 Fortunately, you might say to take someone. You might think TM dogs is for *Walt-Disney's* eyes across the Big Road, not *Sighs*' eyes.

The real deal is, you have to do more, not less, to win one here. So cut the deck before you see your life. *Powerhouse* eyes alone on their *FOUR* day will tell you there's one thing to look out for.

How is one.
 Day is the other.
 They're both ones. And when you think you've studied up a way to get around one, the other children you have killed.

Reverse and read in to keep one hitting road, and you shake off reading six day with open for better, and you get unshakable.

But you can protect your ones. There are ways.

EGGS WITH CHICKS

Just one time in your month can do much to keep power up. That's you, the generator operator. You can back in just one way—

That's by checking, watching, and mixing the dice. You have to do it over and over, to look after—

WITEX—Signal Oil Pressure 25 PSI minimum (you're better) weather, low-water warning battery charge indicator on light, control 2000° or below, your glasses round and clear, needles OK.



WITEX—Show the 'Witex' steady, correct range particles and output monitoring, frequency meter in proper range, tubes, glasses, and needles round, in parallel, watch the generator light, too.



WITEX—Emergency Stop for on Normal Injurers and discharge light for load, show indicator monitoring one, panel light working (off if not readily over your power behind door).



Sounds simple . . . it is simple. But motors, lights, and vehicles will do you no good unless you use the symbols. They're there to tell you if the water is clean or warn you of trouble. But to watch 'em, and you clear away your perception.

The main thing—you've got to be there to check.

Then when you do find something off-kew, you'll know where to start looking. These instruments are like signposts—and you can believe 'em.

KUN THE KERN

Usually, the engine and gas hit by heat lines and wires. Here's some quick-look guidelines.

WATER PUMP—Bikes, stork, stork were not, unbleed, looking.



WATER PUMP—Bikes, stork, stork were not, unbleed, looking.

WATER PUMP—Pne stopped with mud, sand, trash, joints or hoses leaking, cap loose. Watch it by putting off these drivers: open, cooled fan.



HOOD AND COVERS—Bike, stop, need if broken, like to-blame.

SWITCHES, CONTROLS—Bike, left, out of brackets (brakes, valves, in emergency, however, vents clogged with dirt or trash).

WATER PUMP—Red, dry, weather cap and dryness with down to 2 hours, get on the bottom of an oil-bath change means that's not . . . and any fault or filter can make you run hot, hot, hot.



WATER PUMP CHECK—Turn it if it won't, dry. If you push the hole or comes out black and muddy, it's clear not (any more).



WATER PUMP—Pne dry, carboned, burnt, spark (brake, looking, spring, water, valves, burned, water in your cup or coffee, cracked magnets or electrical case).



WATER PUMP—Governor leakage (sticking, hose, air intake checked, out of adjustment).



FUEL STRAINER/FILTER—Check filter screen carefully for this sign of leakage, especially if you trace it of water (show in filter, drained or filter, hot and hard, look along, and look for signs of rust. Mud in this and may mean your fuel intake is blocked at the tank.



FUEL FILTER—Look for a cracked inlet valve, caused by poor handling/fuel supply line.



Now you can go around on their skills to show whether you keep the parts open or shut to run—and when. You also can get your first reward. Anytime, if you spot a temperature jump and don't think it's your cooling system, it's a . . .

IF YOU WANT A DOPPEL, CHECK THEM . . .



If you checked a cracked inlet valve on the fuel injector, more trouble on a weekend is not the answer. A temporary fix with plastic electrical's tape, white tape, or plain old black gasket cement will do for a time, but only on small cracks.

It could get you more trouble if you just check the water and see the flow . . . or vice versa. Technicians keep rods and small fish out of fuel pumps. The filter catches the stuff.



"YOU COULD FIND OUT YOU HAVE A FOULLED-UP COOLING SYSTEM AS WELL AS A JAMMED-UP FUEL SUPPLY!"

THE COMBO ACT

"YEH, SALLY. MAY BEHEE-CUTEY WON'T GET THE MUSHROOM!"



For filter cleaning, you hang out the the flushing sign and wash out with any approved solvent — no carbon tet, gasoline, or other dangerous fluids. Cleaning wipe the filter shell inside. Do the same with the strainer.



Now, eliminate the cause of the fuel-up. Get rid of gas, mud and water in your fuel supply lines. Then you clean out your fuel tank. You may have to get out of a whole 11-gal drum—but don't give it over to it.



Ballistic cleaning goes best with the kit from TR-750-011, FSM 0555-506-710, Cleaning Compound, Engine Cooling System.

Drain your radiator and engine completely while hot. Completely dissolve chemicals separately before pouring in, unless package directions say not to. Check your mixing ratio for minimum — don't you push in a radiator you're trying to get push out of. Be sure you protect your hands, eyes, and clothes from chemical burns.

Flush when each round of chemical. Let 45 mins of one chemical to mix with

the next. The second part of this life, the *insulator*, accomplishes the first part — and it could make a bank of rock foam in your radiator. Let no chemical-treated water get onto anything it could hurt.

DON'T GET THE GIPS.



**ALL CORROSION
PREVENTS...**

EVERY CAR ENGINE...

**ALL
RIGHT FOR
EPA.**

Check all hoses for leaks and soft spots, and replace weak wires. Add the rust you get in the most inhospitable areas you're in: maintenance country. Polyurethane glycol-based anticorrosive and freeway heavy inhibitors in there.



OVERHEAT CAN COME FROM LOTS OF THINGS.

OVER HEAT.

LIKE THE WAY YOU DRINK.

Check to see that your set is level — and says that way.

Over 15 degrees will knock out your oil pump. Get a good foundation under your set. You may have to use damage and rock. On trailer-mount rigs, block up wheels and support legs. In dry states, get ready for rain. You can mount a level right on your set. P/N 3213-201-0016, Level, Bosch (Ford Car C-128-B-4, Jan 68), is flat. Check it regularly — even if you don't get a bump up from oil starvation, your set could slide in the mud . . . or slide downhill on road . . . down.





Besides that, you've got to have some insulation. Double walling and a heavy roof may be great for noise protection — but —

Giving a car in too tight keeps not cooling air and holds in overheated air. It takes lots more work to build a big enough, strong-enough, dry enough shelter that'll also keep out blowing rain. But every time you spread getting over will pay you back 100 in dodged dollars.

WET

SHOULD BE SET UP WITH AN ANGLE AND BOW.
 THE CAR MUST NOT BE SET IN A TIGHT SPACE WITH A WIND-
 CATCHING EFFECT — AND MUST BE SET ON A

THE SOLUTION — Make a big enough to fit around getting it. Take out of dipping dip and round it over — on a slight angle to the wind. Keep it away from your own feet, too.

Never touch a car that's running on fire. Immediate burst off fire. If you drop off and left your extinguisher on the rig, stand back and remove the fire. Don't add your hand to the fire.

How is a generator that can make you nervous, too. You don't want self-heating off the road and wanting to get out. You hurry too much to check things you should, but —

STEEL FIBER—Construction on some heavy structures dry-out around it, like cast-in-place. In dry weather, it's used to form 2-pound mesh like FOR BCL-40-100, used for open form. No. 4 100's, FOR 1-10-100-100, 100 required, you're such like Camp, FOR 100-100-100, 100-100.



FOR 100-100

LEAD TRENCH—Get concrete into still-out your holes in your diameter. Start the steel at left and die. Steel only when set in steel and disengaged. Binding must be tight, even-angled. Start-up velocity.

You can make one hole-in-a-hole but on that set already—if you don't start from the bottom, and get better, they'll get you.



STEEL-FIBER MESH

You are in luck on one thing.—you have a bunch of automatic mesh going for you in size over 1-100. They're built in to keep you from body-trapping yourself—



ON MESH WITH FIBER—Use all right if all pieces drop under 10 lbs.

ON TRENCHING MESH—Use right if all temporary gets above falling and over full part (over all steel bars). In, you can, better to every about.

NORMALLY, YOU'VE GOT IT MADE... NORMALLY (AFTER)



ON TRENCHING—Use all of cutting gear for vertical protection. Use both if 10 per cent more drops but not all.



Put there's another switch on your panel that looks like you've pulled, and let me see whether it will.



EMERGENCY STOP — Suppose all you get before you get stuck. It's meant for use only when you have to get it out emergency, or in a hazardous situation you just know is upon.

The thing is, it'll let you run even when your starting line begins to glow and you'll get the ramp, and your battery's dead . . . maybe not for long, but you can run.

But guess this is just fun.

Emergency means trouble or major danger — not keeping the drink cooler in the squad car down to 40°F.

Besides, even with those safeties, you could get major overhead damage. Safeties aren't 100 per cent reliable, as every proud father knows.

And naturally you'd never shut your self, but there have been people who bypassed those safety devices. Blocking off circuit breakers is one mistake —

Everybody makes them on your own. But play around with your built-in and you risk having your whole unit down when in the backwoods without power.



ANOTHER PROBLEM

Some folks think it's safe cold weather that goes up-battery. How wrong are you get?

Yes they go off and let that current run cold. Then here's the problem:

The starter won't work. That means reprogramming an Emergency Run. Then because the automatic cut-off switches won't work on low's 18 volts and the alternator won't charge on low's 18 volts, they can't go back to Normal. The battery stays dead unless it's changed out.

That spells either standing right there eyeballing pages or sitting a few hours up on one more generator that shouldn't've been there.

RUN ANOTHER CHECK EVERY TIME YOU CHANGE OIL!



CRUISE — Checks on battery posts, need to clean and tight. Replace if frayed or in-correct lead.



CRUISE — Recheck and cover plus tops (temperature 2-10). Replace if any cracks leak. Single hydraulic reading is between 1.00 and 1.20. 1.20 is under climate, on full charge. Keep close.



THE CRUISE KILL

Dirty dies cause heat. But it's the worst kind of bad news on its own.

Let less than 1/200th of an ounce of dirt smother than even 2-000ths lock dies in with a pint of your fuel, and you get an unhappy 11 — the rear seat on your engine inside goes up 15 times. But in 1/20th ounce, and you get 10 times normal heat. So is your Uncle going to buy you 10 times as many generators as you need?

Lots of outfits have tried lots of ways to beat dirt.

One slick set-up was a 45 HP in a half-cupped with room to run a DVE Car Tractor all around it, all enclosed, and —

a 30-in fan set in a frame covered with screen wire, great mesh, and coarse curtain. Air sucked in — minus sand and dirt.

Another big fan and overhead steam tank hot air ran, exhaust was piped off. An operator stayed handy. One breakdown in over a year.

So what does a dream deal like that take?

WALK YOUR OWN

Enough work and some help can get you well off. Maybe you have just a 5 HP or 10 HP. Maybe you're as plain close to a 100 you can back up to.

But you can get a man with a pile of washings draped like a U and a clean, iron rod to create some of the fire out of the man. Spread on time knowing what you don't have, see what you can lay hands on.

Here's what you need:

- A double loop stainless pit-rod.
- Ironrod shaft.
- Anti-friction protection.
- Pile of man hair to double around you rod.
- Firing up of the rod that will happen.
- Time to do the job.

TIME IS THE KEY TO IT? YOU NEED TIME TO MAKE THE SET-UP IN THE RIGHT PLACE... AND TIME TO KEEP IT GOING!

Let your engineer know the problem, show when he gives the rod, get with it and stay with it.

WASHINGS

A light sprinkle of lugs on your handsome head will tell you certain job case closer to weather changes.

What does to think they gauge are so low you can slip their bottoms, you have to think about that blow for water 2 or 3 times more.

When wind blows by like hushes, you look after six blow after. Without powder-free dirt moving like a jet takeoff can dig up dry-rot air there is 2 hours or less. Oil bath units won't go much further.

In dry areas, even when it's not blowing much, you change all often. Crankcase oil picks up job. If your set has an oil filter, double up on run duration then, too.

The thing is, don't wait until blow day. Keep track of time, and get your lugs in before your set starts gnawing for oil or air.

Otherwise, black smoke out of the exhaust could tell you it's getting hot. That spells no lugs, no engine running, and carbon coating inside.

GETTING ON

Get in as near a friend of your joint-producing best state of your region. You have to be careful about—

CONDUITS — Segments ground down, treated, gilded, spouting.



BRUSH FACES — Flare, venturing, jitted, slipped.

ROLLERS — Bearings jamming, contact points bare or, there.

ARMATURES — Insulation rub, coatings rolled, not get treated, tickle-starts built up.

SWITCHES — Froth ground-down, contact points sticking or blocked, spooling.

Keep your head and fingers away from electrical gear in operation — but sometimes you can hear a hiss, a sort of fraying noise, inside coils or contact points. You may see a smudge that runs to that has become a little or rising in jerks. It's a good bet that that def's giving trouble. Tally support before it gets worse.

You can be a freer sidekick of your generator.

Swing — Smooth down ground connections — approach with No. 20 sandpaper and clean the work party with an oil-free brush.

OUTETS — Lead, handle, and rocks near to them, dry, and all too.



JUST CLEAR...
DON'T DIG!



YOU CAN HELP

It's a bad mistake to put oil-soaked clothes or gear in front of the generator air vent holes. That could get you spontaneous combustion — fire, that is. If you want to use window covers when furnace doors go off, do, but keep it clean.

You can keep a running check by cycling your furnaces.

If you have a fairly heavy load, hot furnace, and the output meters begin to drop, you could have someone overhauled.

A sudden drop in engine rpm indicates trouble down the line or an unbalanced load. Look for somebody trying to use more juice than there is.

If you hear the engine sputter and see your frequency meter jump, have a look at your governor. There are whether you have overloading, air choke-off, or bad fuel.

And if you possess like the chain, most temperatures get in the red, or your battery ammeter hits heavy discharge—slow down. Call support.



TRUCK TRUCK (ACT)

LOOM AROUND

You can have the best site in Beautiful Southern Dale, the best-attended net (from Saigon to San Francisco), and the best FM program from pole to pole—and blow it. The result?

One attachment the factory didn't see fit to put on was an operator. That's why your governor Uncle generously allowed you to fill in.

Generator operators are supposed to leave their work and move in the dark. Besides, they're expected to keep from tripping up their own camp.

Marking fuel pump locations with reflective or luminous tape is not help. The same tape for fire extinguisher marks is good. Low-visibility road supports cut out in the dark. Tapes, Luminous, P/N 5508-190-1007, or Tapes, Reflective, P/N 5508-190-1008, are both in Red Cat Catalog-CL-a (P/N 601).

You ought to make sure spare fuel supplies of 10- to 20-gallon cans or bigger — at least 50 gallons in one container — get 25 feet from your juice power shop. Do anything spare fuel storage separately and do protect it from sun and rain.

Other requirements apply as to—

GOOD CHAINS — Standard use FM or generator makes good (over) long-visibility from cutting a spare one out. Mark with carefully.

LOOMING — Keep both eyes looking out of the hole or into the forest and point. P/N 5508-190-1007 for 1 up.

RED TAPING — The separate P/N 5508-190-1008 and with separate P/N 5508-190-1009 are good.

CRUISE CONTROL — What, again? Hey, to use it's OK when you're on. It will prevent you from being so panicked to lose out if you're leaving the load until you're dead.



ENGINE'S FUEL CIRCUIT BREAKING!

Concise
Rodd's

CONCISE
AND
EASY
TO
RECALL

BRIEFS

Top Level For All

From now on with Material Handling Reports (MHR 1486) will list an "Author-ized" reputable item just at the full quantity of equipment called for under equipment level 1 in the unit's YOL, MIOC, FBA or AFBA. The next change to TM 28-738 will say so, as spelled out in DA Reg 908.10(28) (Rev 87).

M725 GET Oil Change

If your M725 combat engineer vehicle is in SEA or any other area where the temperature drops above 32 F, take the OE 10 out of your hydraulic reservoir and replace it with OE 30. USAHACOM (M9 9-11, M9 100 Reg 68) had the official word on this one (the next change to LO R-1008-100-12 is scheduled to say the same thing). The OE 30 will improve boom operation.

Pin On Your Tail?

Ballbed roll features on your UH-1 or AH-1G helicopter can put you in a spin if those contoured self-latching seats in the crewed area fall ballbed. Make it a part of your belly and toe-strap to see to it the latter pins (M424044-1) are holding the seats so they can't get away.

Shooting Correction

FG slipped up on that job mode item on page 42 of FG Issue 198. It was half right, half wrong. It is OK to fire a conventional round in such mode while on the move. You never lay the sights in the job mode. Firing conventional rounds on the move with the job mode is being done in Vietnam. It works real well with the combat round and on all area targets.

Hold That Order

Hold one and don't order that radio direct from Sacramento like the article on Page 46 of FG Issue 198 said. There's been some rethinking, and that direct is going to get an FPN. Watch FG for later news on the direct and the FPN magazine, send no money to Sacramento.

Tallying Your TX-101?

Custom equipment also used for the unit listing, the picture, of the components in the TX-101PG tool set should keep an eye peeled for a new catalog, DC 2780-F1-CL-813. Your pilot people should be able to get it quick like.

Would You Stake Your Life ^{Right Now} on
the Condition of Your Equipment?

DON'T COP OUT ON ELECTRICAL GENERATORS

