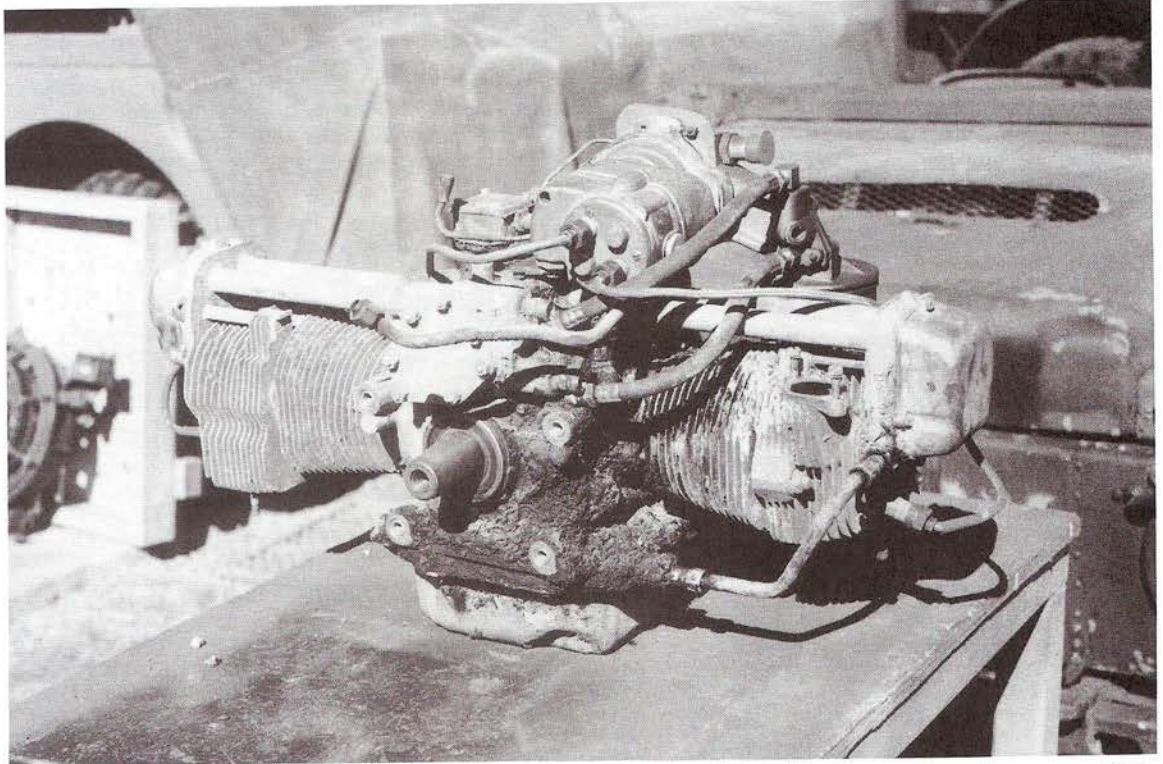


# CONVERTING MILITARY STANDARD ENGINES FOR YOUR MULE

BY PHIL KERN

Like most M-series military vehicles which were phased out of service in the mid to late 1970s, many parts for the M274 series Mules which were once cheap and plentiful are now drying up very quickly. As the number of sources and available spares for the popular platform carriers decrease, the prices for the remaining repair parts increase, often to a level where it is painful to reach for your wallet. Thanks to standardization by the U.S. military forces, there is relief at hand when it comes to replacement or



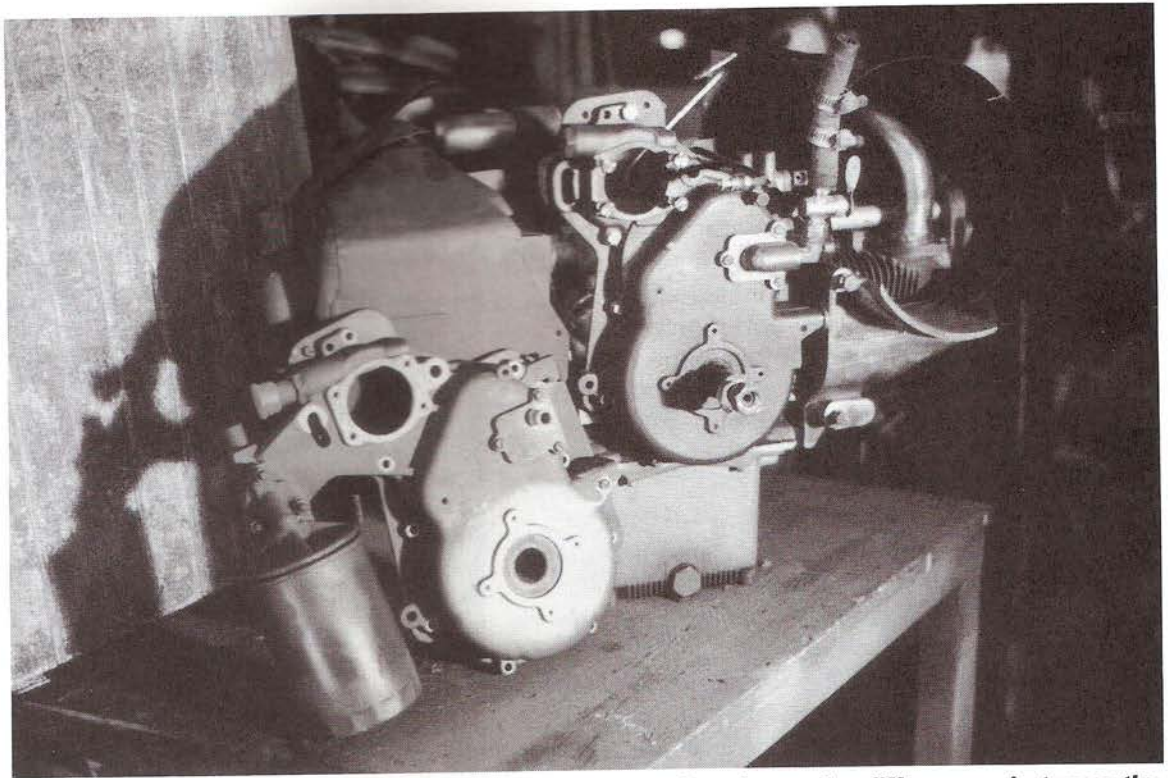
*Dead Mule engine shows the level to which it must be stripped for the conversion, as well as signs of the oil leak that killed it off. Also shown is the routing of oil lines for a typical military standard engine which interferes with the replacement of the cooling shroud over the pushrod tubes.*

rebuild of the engine in your later M274 Mechanical Mule. While the earlier M274 and M274A1 Mules utilized the air cooled, horizontally opposed Willys AO53 four cylinder 53 cubic inch engine, the later M274A2 through M274A5 Mules used the two cylinder AO42 engine. This change of powerplants was partly due to the desire to standardize on an engine for the U.S. military which would be suitable for a wide variety of applications. These applications included engines necessary to power pumps, generators, compressors and other "end items" used by U.S. forces. When the officials in charge of procurement for the military selected the AO42 as the standard engine in the ten horsepower range, it was installed in the Mule and the AO53 fell by the wayside. Fortunately for MV collectors and restorers the AO42 survives to this day in an improved form, although internally it is basically the same engine as first installed in the M274A2 Mule in the mid-1960s.

As mentioned, prices on NOS Mule parts have escalated as supplies have dried up. While NOS or rebuilt AO42 engines for the Mule are still available in the crate, prices are now in the neighborhood of \$500 and up when, and if, you can find one. A complete rebuild of your present engine is also an alternative, although the rebuild kits alone are over \$300. In addition, you will still have the investment of your time, labor and possible machine work involved in pulling the heads, splitting the cases, yanking the crank and so forth to properly complete a full rebuild. A better alternative is the purchase of an NOS 2AO42-2 or 2AO42-3 engine which has the same case



and cylinders, and which will readily accept the necessary engine accessories and sheet metal from your tired or dead Mule engine. These engines are typically more common than original Mule motors, cost significantly less (about \$200-\$400 typically) due to lower demand for them, and avoid the usual hassles of completely rebuilding the motor.



***View of the rear of the partially reassembled Mule engine shows the differences between the original rear cover as mounted on the engine, and the later 2AO42 cover on the left. Note the additional bracket and different mounting of the oil filter.***

The conversion of a 2AO42-3 or -2 military standard engine for use in a Mule is a relatively

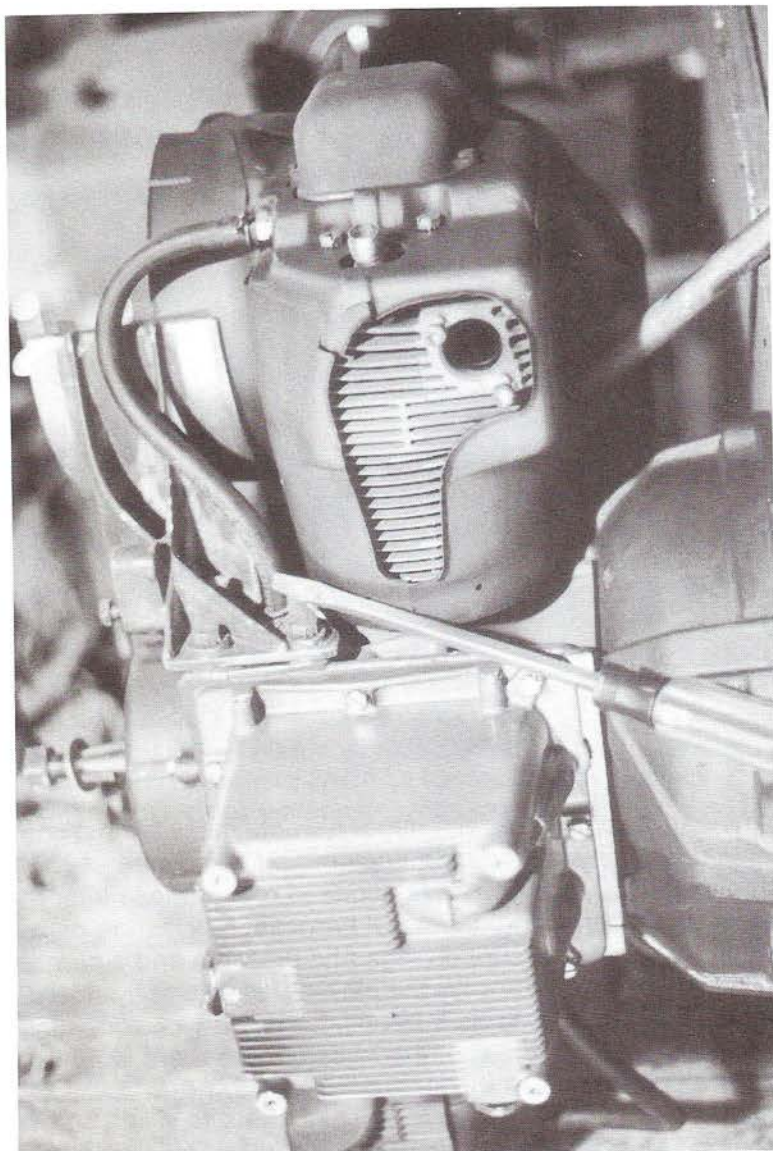
simple procedure and, with minor exceptions, is almost completely a bolt-on conversion. The 2AO42-3 engine I found happened to be manufactured by Teledyne in 1987, and arrived in NOS condition on a pallet at the local surplus store. Once you have acquired one of these later model engines it will be necessary to remove the sheet metal shrouding, electrical harness, air cleaner, carburetor and intake manifold, exhaust manifold, magneto, governor, support legs and brackets and a number of other minor parts. Basically, the engine needs to be stripped down to only the bare essentials of cylinders, heads and case. The flywheel of the 2AO42 engines also functions as a fan as they are air cooled, this will also need to be removed as well as the "bellhousing" (if that's what it is called, since there is no clutch) and starter, if one is present. The pulley on the other end of the crankshaft will also need to go, in addition to the stator which is located underneath the pulley.

Your old Mule engine will need to be similarly stripped after removal from the vehicle, although with a little more care as many parts will be need to be cleaned up and reused. Also take the normal restorers care to avoid misplacing precious parts (like putting bolts back in the original holes) or recording which parts go where in case you may have any doubts later on, especially if you specialize in long term projects. Unless you like three dimensional puzzles, write the position of the sheet metal shrouding on each piece ("left front", for example) as it is disassembled and set aside for cleaning and painting. Manifolds, carb, magneto, governor, oil filler tube, oil filter and bracket, blower and bracket, etc. will also need to be removed. The flywheel will need to be removed after the clutch and pressure plate are off, and it can be a bear. There is a circlip in the center which retains the pilot bushing over the flywheel nut. Remove the circlip with pliers, clean the gunk off the bushing and its retainer and soak it with penetrating oil if necessary. A 3/4 inch diameter bar can be inserted inside the bushing and gently worked around to loosen and remove the bushing and retainer. The flywheel nut is now exposed and can be removed. Use a puller to take off the flywheel as well as the fan pulley on the other end of the crank, soaking these up ahead of time won't hurt either. Of course, "military intelligence" has not yet worked its way down to vehicles yet, a total of four separate pullers will be needed for the two flywheels and two pulleys as no two are exactly alike in bolt spacing and diameter. Once the flywheel is off the bolts underneath and the bellhousing can be removed. The only reason I go into this much detail here is that the description of the details of this phase of the work in the Technical Manuals for both engines were pretty weak, hopefully this will save you some time and effort. Finally, the rear engine cover over the cam gears must be carefully removed as it has to go on the new engine. If you are lucky and your engine hasn't been left exposed to the elements, you can save the crankshaft



seal for reinstallation, otherwise both the seal and cover gasket will need to be replaced.

Reassembly is the reverse of the two disassembly processes which you have just gone through, with a few little twists. First, carefully reinstall the rear cover over the crankshaft to avoid damaging the seal. Next the inner pieces of sheet metal shrouding can be installed, don't forget the small pieces with rubber grommets around the pushrod tubes. At this stage the sheet metal installation must be carefully coordinated with the replacement of the bellhousing, oil filter bracket and oil line connections to the oil pump at the top front of the engine. The bracket for the oil cooler on a Mule is mounted at the left front of the engine on the bellhousing, while on the later 2AO42-3 engine it is at the left rear on the rear engine cover. The oil lines and fittings from the AO42 must be removed and reinstalled on the new motor after the top front piece of sheet metal is reinstalled, after that the bellhousing, oil cooler and bracket can be remounted. Expect to make a trip to the local auto parts store as some of the brass fittings will need to be replaced, since you will probably not be able to remove all the old ones without chewing them up. Many people chose to mount a remote oil filter or cooler on the Mule for convenience, this is the time for the changeover if you so desire. The Mule engines typically used aluminum tubing for oil lines with compression fittings, while the later military standard engines use neoprene tubing for this purpose with barbed fittings. Another oil related concern which arises during the conversion is the location where the oil line from the right cylinder head enters the crankcase. On the newer engines it enters the case somewhat higher than the original Mule engine, interfering with the bracket for the blower. Unfortunately a relief cut about  $\frac{3}{4}$  inch wide must be made in the bracket to clear the oil line and fitting, which should not be a problem as the bracket is otherwise nicely supported by four well placed bolts. Being careful to get the intake manifolds (AKA elbows) in place, sheet metal reinstallation can continue along with reconnection of oil lines, blower and bracket installation, oil filler tube replacement and other incidentals. At this time the flywheel, pilot bushing, circlip, clutch disk and pressure plate can be installed. Reinstallation of the Mule's carburetor, magneto, exhaust manifold, starter and upper sheet metal usually come last. Replacement of the old carburetor (about \$30-35) and all filters is also recommended at this time. The engine can now be reinstalled in your Truck, Platform Utility, 1/2 Ton, 4x4.



***Looking from the bottom of the engine, flywheel to the right, the screwdriver indicates where a relief cut must be made in the blower bracket to clear the oil line. Either the original aluminum tubing or later neoprene oil lines can be used at your option. Also notice the much larger capacity oil pan on this later engine, compare this with the original Mule engine in the first photo.***

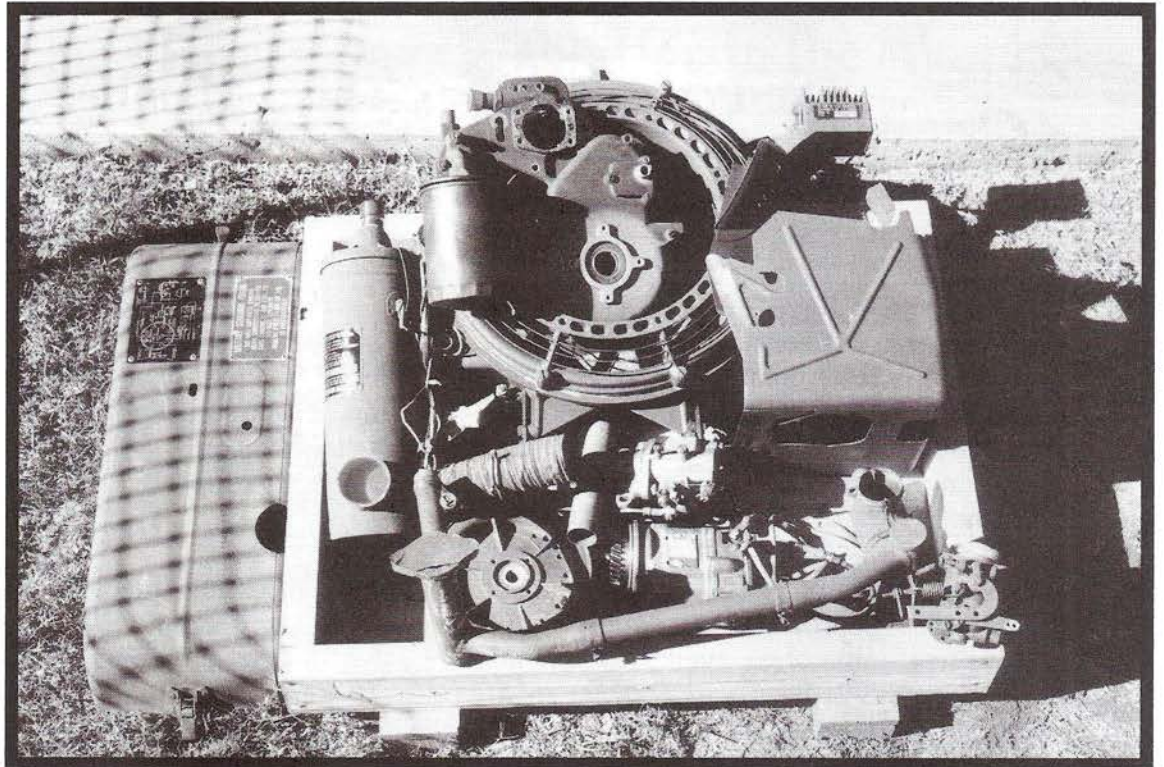
If you have any wise ideas about using the newer high performance, high tech engine components from the later military standard engine to soup up your Mule, let me clarify the situation for you: FORGET IT! The newer carburetor does not fit the earlier intake manifold or the elbow connecting the air cleaner. The automatic choke set up, of course, does not work with the earlier carburetor. The magneto off the 2AO42-3 engine is a  $\frac{1}{2}$  inch or



so longer--just enough to interfere with the intake manifold of the Mule engine. The oil filter location at the left rear of the engine causes the bracket on the rear engine cover to conflict with the Mules original oil filler tube. The oil lines to this location also interfere with installation of the original sheet metal shroud. The stator that comes standard on the later engines, and which would be nice for running lights or charging a battery (although 24 volt), does not appear to be adaptable to the Mule pulley or blower without

major machine work or fabrication effort. The only engine accessory that I found that will work on both engines is the fuel pump, although it appears the governor may also be a candidate if you elect to run that particular piece of equipment on your M274. I'm not saying that reuse of these components is impossible, just that it looked to be more trouble than it was worth. It would be interesting to hear from persons that have successfully adapted these later parts to improve the performance or reliability of their Mule.

Well that, in a nutshell, is the conversion process. For about 400 bucks and a couple days of effort, your Mule can be back on the road with a new engine. Don't forget to follow the depreservation procedures that should be shown on a tag attached to the new engine. A preservative oil present in the engine must be drained and replaced with the proper grade of lubricating oil prior to operation, otherwise you should be in business, no problem. The only thing left is to figure out what to do with all those fine looking parts left over from the military standard engine. Happy OD motoring.....



***Leftovers from the conversion of the military standard 2AO42-3 engine include rear cover, shrouding, exhaust manifold, air cleaner, flywheel, bellhousing, carburetor, magneto, stator, pulley, voltage regulator and so on. Hopefully, there is a military generator guru in your neighborhood who will take this stuff off your hands and throw you a few bucks on the side to cover your expenses.***

**THE END**

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