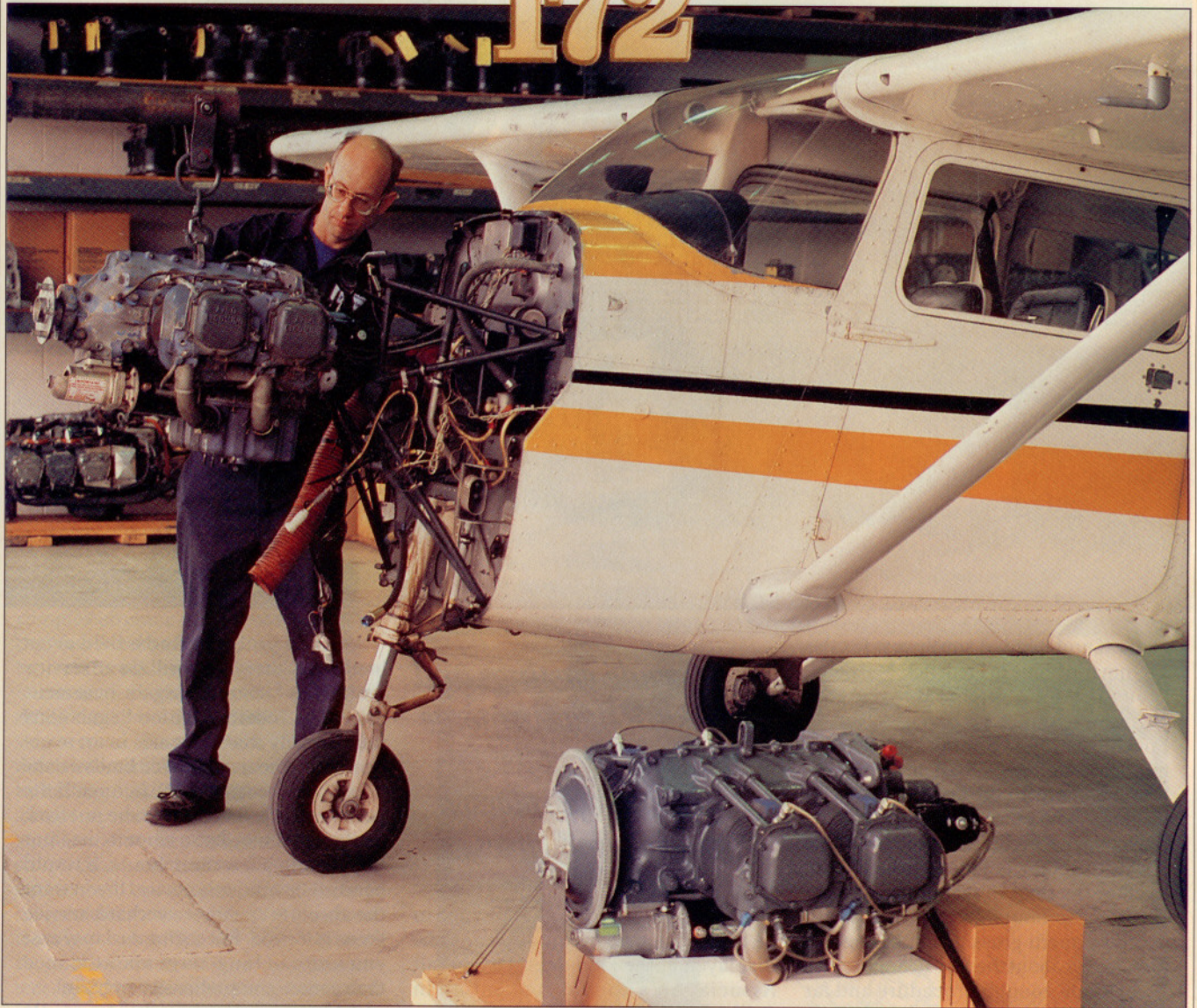


GOOD AS NEW
172

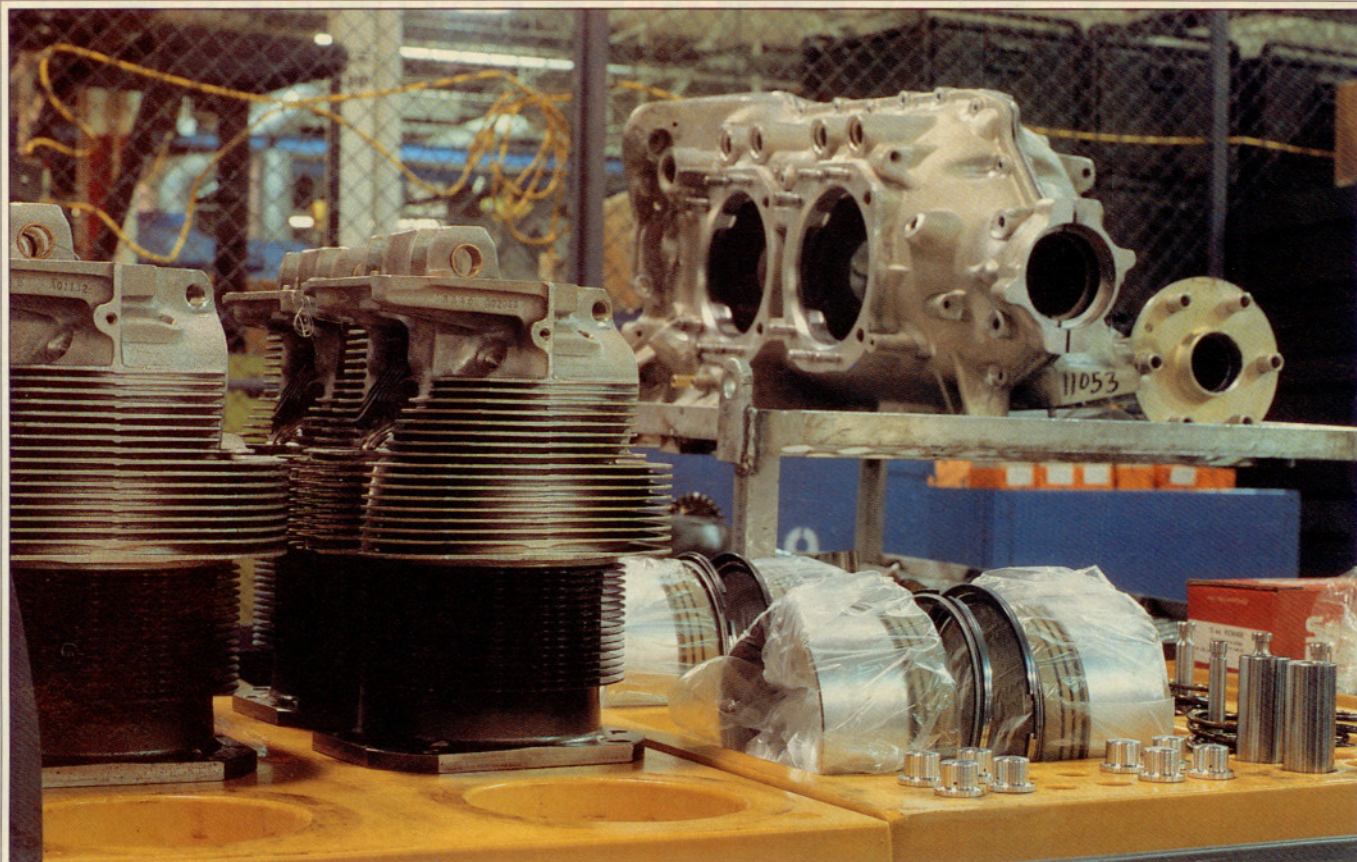


ENGINE OVERHAUL

A 172 makeover. Step three.

BY THOMAS B. HAINES

Just before I rolled the egg-yolk yellow and white Cessna 172 onto Runway 12 at Williamsport-Lycoming County (Pennsylvania) Airport, I asked the tower controller for permission to spiral up over the airport to 4,500 feet msl. It's not that I didn't trust the little O-320 out front, but why tempt fate? ■ My hesitations were for naught; the freshly overhauled engine eagerly pulled the lightly loaded Skyhawk around a couple of three-sixties, and we soon lev-



eled off and headed southwest for the 110-nm trip home to Frederick, Maryland.

Instructions for breaking in the engine were simple, according to Larry B. Roush, Textron Lycoming's manager of airport operations: Run it at 75-percent power or more for the first two hours, no leaning. About every 30 minutes, pull the power back a bit for a few seconds. The goal is to get the engine thoroughly hot to allow the rings to seat properly. After the first two hours, fly it normally, but avoid frequent gross power changes if possible for about the first 10 hours.

A simple enough procedure and far easier than the process we went through in deciding just what type of overhaul we should have for our "Good as New 172" project.

AOPA bought 19-year-old N13057 in February for two purposes: To give those of us at *AOPA Pilot* (and, ultimately, the readers) the opportunity to learn what it's like to refurbish a used, but still sturdy, airplane and, secondly, for AOPA to give away the "like new" finished product as part of the association's annual membership sweepstakes. We've already written about the purchasing process ("Good as New 172: Skyhawk Sweepstakes," April *Pilot*) and about what it took to bring the airframe up to snuff ("Good as New 172: Airframe Aspects," June *Pilot*). With the overhaul just completed, we've turned our attention to the

From crude castings and chunks of metal emerge beautifully polished pistons, cylinders, shafts, and cases.

avionics panel, which was scheduled to be finished in time for the airplane to be displayed at the Experimental Aircraft Association's annual convention in Oshkosh, July 29 through August 4. Stop by to see the in-progress project on static display at the north end of the display area, just west of the Warbirds section.

Later this year comes a new interior and paint in time to show off the airplane at AOPA Expo '93, November 3 through 6 in Orlando, Florida. In January, after the sweepstakes drawing, some lucky AOPA member will get to fly home with our handiwork. (For details on the sweepstakes, see p. 19.)

As we found out, the options available to the aircraft owner seeking an engine overhaul are about as varied as the number of overhaul shops. There are basically three types of overhaulers: field, specialized overhaul shops, and the factories, with the bottom-line cost usually following in ascending order.

You can probably find a field overhauler out there who will do a "service limits" job for some bargain-basement price. The Federal Aviation Regulations require only that the parts in an overhauled engine meet service limits established by the engine manufacturer. If the part meets the limits, it can be put back in, though it may be so close to the limit that, within a few more hours, it would be worn beyond tolerances. If you want the absolute cheapest overhaul, service limits is for you. But such a deal may cost you more in long-term maintenance than a more comprehensive overhaul.

A better route, though admittedly more expensive, is to new limits. Here the parts must meet or be refurbished to meet the engine manufacturer's specifications for a new engine. Because of the more rigid tolerances, it's more likely that the engine will make it around again to the TBO (time between overhauls) recommended by the manufacturer. Remember, there is no requirement for operators under FAR Part 91 to overhaul an engine at the recommended TBO. If the powerplant is still efficiently doing its thing, oil consumption is reasonable, and the compression within limits, many pilots will elect to keep right on flying. Before flying beyond TBO, check with your insurance company. Some may decrease coverage once you pass TBO. Commercial operators

under FAR Part 121 and Part 135 also can fly beyond TBO but only with an extension granted by the Federal Aviation Administration.

N13057 had about 2,000 hours on it when we bought it, right at TBO for its Lycoming O-320. Compression was still fair, and there was no metal in the oil screen, but it was burning a quart of oil every couple of hours—not alarming but an indicator that this was an engine nearing a need for an overhaul, and frankly, it was rather inconvenient and expensive to have to add a quart or two of oil at every fuel stop. With our goal of making N13057 “good as new,” we knew right from the start that an overhaul to new limits or a new engine was for us.

That in mind, we sought advice from other aircraft owners who had been through the experience and the counsel of a number of maintenance shops. If you’re flying a simple airplane often used in flight training, a good source of information is the mechanic at a busy local flight school. Find out where the school sends its engines and whether the service has been satisfactory.

Aircraft type clubs also can be a fount of knowledge, particularly if you fly a complex airplane or a bit of a knock-off that few mechanics deal with. A list of type clubs and their addresses can be found on p. xxviii of the 1993 edition of *AOPA’s Aviation USA*. AOPA’s membership services specialists also can provide much information. They can be reached by calling 800/USA-AOPA. They can’t always recommend an overhaul shop in your area, but they do maintain a list of shops that have had complaints filed against them by members. AOPA’s technical specialists are anxious to know about members’ experiences with various shops. If you’d care to share your encounters—good or bad, send the details to the attention of Ray Gebhart at AOPA, 421 Aviation Way, Frederick, Maryland 21701, or leave a message on AOPA Online.

We limited our search for an overhauler to the Mid-Atlantic states to reduce travel time from AOPA’s Maryland headquarters.

For a field overhaul to new limits, we found prices averaging about \$6,000, not including accessories but including new cylinders. Overhaul of accessories, such as alternator or generator, starter, magnetos, and the like, would add about \$1,000. It only makes sense to have such original accessories overhauled or replaced at the same time as the engine is rebuilt. It’s also a good idea to inquire about new engine-mount bushings, which take a lot of abuse, and new hoses all the way around. Wouldn’t you hate to

put your airplane and its brand-new engine in the trees because a 20-year-old fuel or oil line burst? Expect to pay about \$300 for engine-mount bushings for an engine in the O-320 category and about \$200 for new hoses.

If we had elected to have our own cylinders overhauled, we could have saved about \$500. But many of the shops we spoke with were offering good deals on new cylinder assemblies because Lycoming recently lowered the price of new cylinder kits.

Downtime and other miscellaneous costs also should be considered. Aero Services, a busy overhaul shop in Winchester, Virginia, for example, said it could complete the job in about a week. Its \$7,000 price included engine removal and installation and a six-month warranty on parts and labor. Many overhaulers charge separately for removal and installation of the engine, usually \$800 to \$1,000. Your local maintenance shop may be able to do the task for a little less, but then you must add in shipping charges, which will be \$200 to \$300, depending upon distance.

Another option is to deal with one of the large overhaul specialists. Because of their greater overhead, these shops typically charge more than a local field overhauler. But it may be money well spent because these well-established shops have a vested interest in keeping their customers happy and in honoring their warranties.

In our region, we contacted several specialty shops and came up with very similar prices. Penn Yan Aero Service in Penn Yan, New York, and Mattituck Aviation in Mattituck, New York, for example, bid prices within \$34 of one another. Mattituck could do the deed, including installation, for \$9,466 compared to Penn Yan's \$9,500. In each case, the job included overhaul of N13057's own engine to new limits, including accessories, and new hoses and mounts. Exchanging our old cylinders for new ones added \$1,380 to Mattituck's price. Penn Yan could do it for \$1,200.

Once you get that far into the process, you must decide on other options. Should you get Cermicrome cylinders? Do you need new cylinders? Should you opt to exchange your own engine for one overhauled either by the shop or perhaps from the factory?

An airplane flown often probably does not need Cermicrome, which can

cost about \$50 to \$75 per cylinder. Seldom-flown airplanes may benefit from the process, which helps prevent corrosion in steel cylinders. Cylinders take lots of abuse during an engine's lifetime, and some shops believe swapping them for new ones at overhaul is the only way to go. But if yours comfortably pass tolerance muster, there may be no need to ante up the extra cash for new ones.

Finally, exchanging your engine for one off the shelf might be the way to go if yours has been through several overhauls. Swapping out your engine also can reduce downtime from several weeks to only a few days.

As sales of new engines have waned, Lycoming has gotten into the overhauling

book, but they come standard with new cylinder assemblies. Both the remanufactured and overhauled engines are run through the factory production lines alongside brand-new engines. Authorized distributors and dealers for both manufacturers will be happy to sell you any or all of the options.

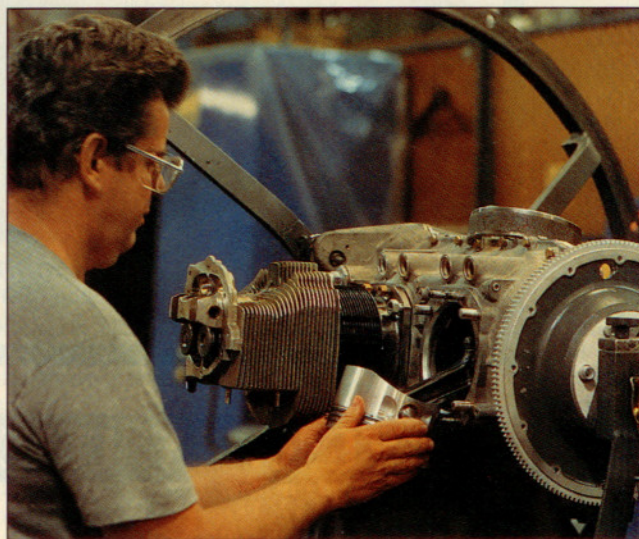
Changes in the marketplace have generated lots of competition among distributors. Some have begun to sell directly to aircraft owners for a set amount over their cost. Air Power, Incorporated, is one such outfit. It advertises factory reman, overhaul, or new engines at \$300 over cost. You order the engine, and it's shipped directly to your local shop for installation. Your shop then returns your

retired engine core to the factory for credit. We found that by the time shipping and installation are added in, the cost is not significantly lower than what you might pay a specialty shop for an overhaul of your own engine.

At Lycoming, an aircraft owner can elect to have his own engine run through the factory overhaul process. In that case, the engine is shipped to Lycoming's airport operations facility instead of the factory. Once the engine is disassembled and the major components tagged to keep them separate from others on the production line, the engine is shipped across town to the factory where all parts are replaced or brought up to new limits as necessary.

Upon hearing of our Good as New 172 Sweepstakes project, Lycoming President Philip R. Boob generously offered to exchange our engine for one of their factory-overhauled powerplants for a price we found hard to turn down: gratis. Lycoming's normal \$11,450 price includes new mounts, flexible hoses, accessories, and engine removal and installation. Knowing a good deal, we accepted. But as might be expected in the case of a 19-year-old airplane, it's not quite as simple as just bolting on a new engine. The old engine baffles were in shambles, as was the carburetor air box. Roush's team worked some welding miracles and got everything back together for about \$1,300.

Lycoming's generosity was not exclusive, however. Shortly after hearing from Williamsport, we received a similar offer from Quality Engines and Parts in Charleston, South Carolina. They offered to overhaul our existing engine for free instead of the customary price of \$9,275,



Hefty workers muscle connecting rods into cases, pistons onto the rods, and cylinders over the pistons.

business as well. Both Continental and Lycoming also offer factory-remanufactured engines and, of course, brand-new never-seen-an-airplane powerplants.

Despite what you might see bandied about in advertisements, only the factory can remanufacture an engine and so-called "zero time" it. After the remanufacturing process, the engine gets a new data plate, new serial number, and new logbook. For all practical purposes, it meets the specs of a brand-new engine, even if some parts, such as the case and crankshaft, are used.

Like engines overhauled in the field, Lycoming's factory-overhauled engines do not get a new serial number or log-

plus \$245 for new cylinders.

On an overcast May morning, I add yet another quart of oil to N13057 for the engine's last ride and take off for Williamsport. An hour later, I hand the keys over to Roush, who immediately sets about lifting the tired powder blue engine out of the airframe and readying the propeller for shipment to Sensenich for an overhaul of its own. Unless specified by an airworthiness directive, there is no requirement to overhaul a fixed-pitch propeller. But usually for less than \$300, a shop will strip, carefully inspect, paint, and reassemble the prop, providing a certain peace of mind.

Meanwhile, Peter G. Bates, Jr., Lycoming's manager of advertising and promotion, leads a factory tour. Lycoming over the years has manufactured some 600 models of engines and currently overhauls and supplies parts for 400 of those models.

From crude castings and seemingly shapeless chunks of metal emerge beautifully polished pistons, cylinders, shafts, and cases. Whirring automated milling machines smooth, turn, and bore cases, while in other parts of the mammoth nineteenth-century facility, hefty workers muscle connecting rods into cases, pistons onto the rods, and cylinders over the pistons.

The finished product—whether brand-new, remanufactured, or overhauled—is run on a test stand for 30 minutes to an hour, and every twentieth engine is run and then disassembled for quality control purposes. Throughout the process, any piece that doesn't meet specs is replaced with a new one, so many reman and overhaul engines leave the plant with lots of new parts.

By the time we get back to the airport facility, Roush is ready to lift out Old Blue in favor of the still-crated New Gray. When it was in the piston airplane business, Cessna specified that all its engines be blue. But now Lycoming paints its products gray. Seeing the chafed blue engine uncowed and hanging on the crane, I realize that though they look worn on the outside, many engines, like this one, still run pretty well, even, in this case, after nearly two decades.

Still, there's nothing quite like buttoning up an airplane after its first flight with a new engine and smelling that tart scent of hot, fresh paint and mineral oil. From the outside, N13057 still looks its age with its chipped and oxidized paint, but hidden up front is a fresh engine eager to fly a couple of more thousand hours. In fact, I think I hear it calling me now. □