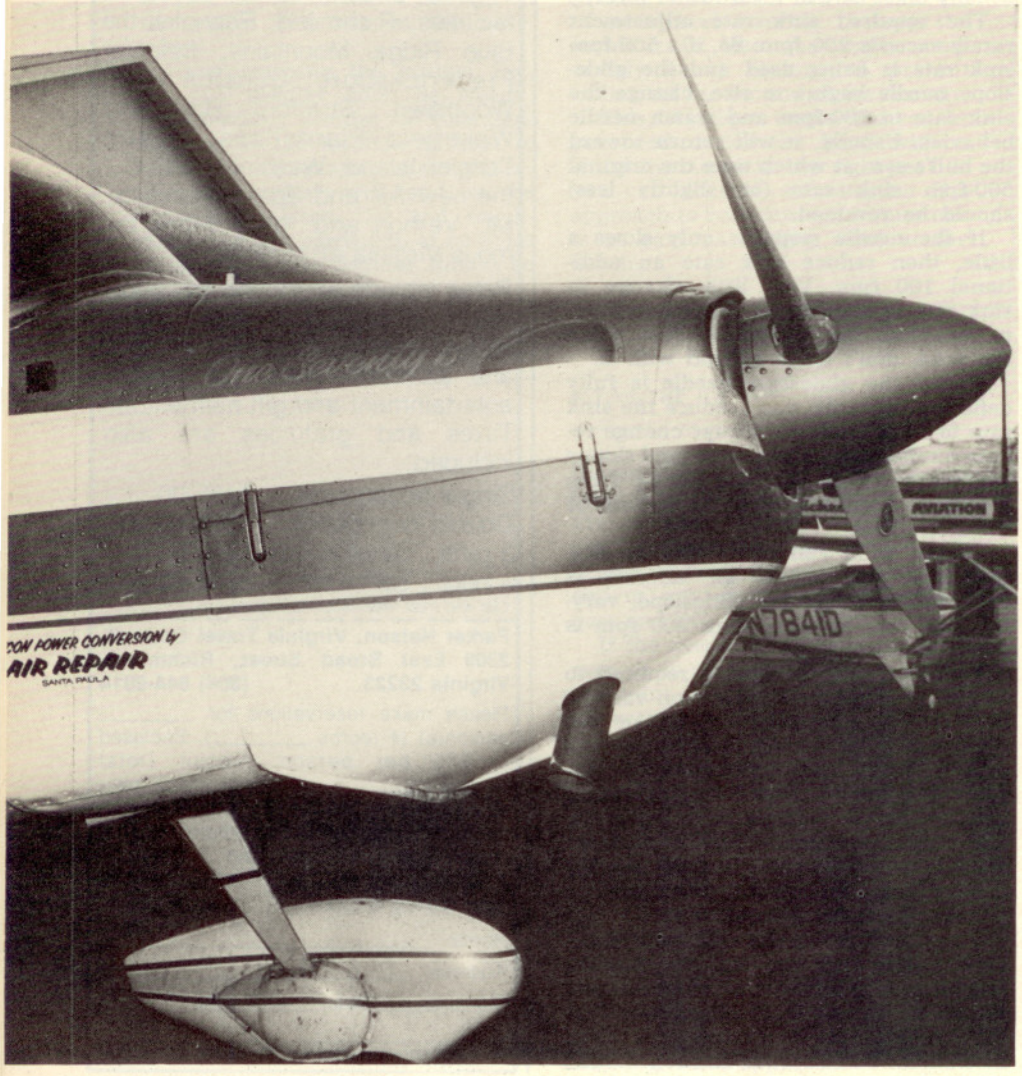
Rebuild, Modify or Trade Up?

Choosing the best route when your engine comes up to major overhaul time

by DON DOWNIE / AOPA 188441

The original engine in this Cessna 170B, a six-cylinder, 145-hp Continental, was designed for 80 octane. It was replaced by a 180-hp, four-cylinder Lycoming designed to run on 100LL fuel during installation of an Avcon Industries conversion kit by Air Repair, Santa Paula, Calif.



■■ Do you own an airplane that's more than five or six years old? If so, chances are good that you'll soon be faced with the same problem 75,000-some other aircraft operators are today. When that engine comes up for a major overhaul, which way do you go?

Add all the vagaries of our 100LL fuel, still a not completely resolved issue, and you may have a real problem. When it comes time for an overhaul, or when something serious shows up forward of the firewall, you're faced with a very expensive decision, no matter which way you go.

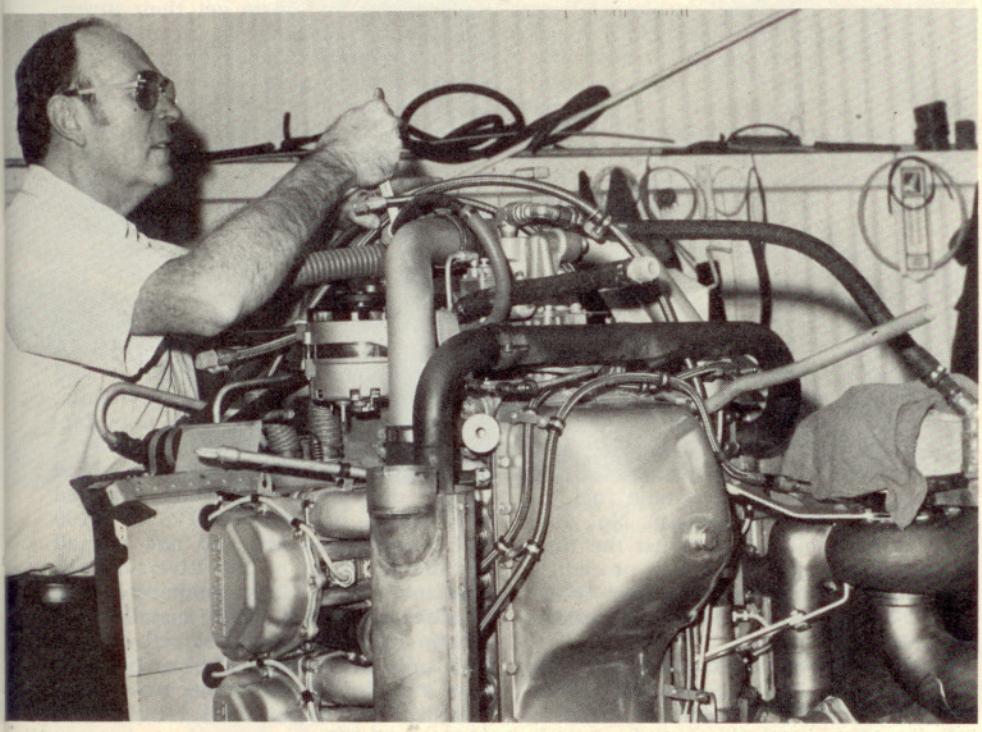
In the order of costs, you can nickle-and-dime that present powerplant along by doing a major overhaul one cylinder at a time. This approach stretches out the painful process of paying for flying, but it increases the potential of an in-flight failure from runout parts. Privately-owned aircraft, not operated for hire, can exceed the manufacturer's recommended TBO (time between overhaul) and be completely legal as long as the powerplant checks out properly. Some feel this is really not the way to go, as such "make-do" overhauls can result in some anxious moments over rough terrain, at night and/or IFR.

The next alternative, as cost escalates, is to take your engine to a reputable local overhaul shop. This approach will call for a considerable outlay of cash, all at one time, but it guarantees both continuity of repair and the predictable dependability of a complete teardown, magnaflux and other inspections, replacement of all out-of-tolerance parts and a double-checked reassembly by a shop that has both a reputation and a product liability insurance to protect.

One of the several Southern California establishments specializing in this type of work is Lynn's Aircraft Engines, in Long Beach. Lynn Cooter has worked at the same airport for 25 years. As a ball-park figure, Cooter estimates that a major overhaul will cost about half the price of a new engine and about $1,000 below a factory remanufacture on the smaller engines that have run into most of the 100LL problems.

Cooter feels that one of the advantages in a complete overhaul of your own engine lies in the fact that the history of the engine is already known by the owner or operator. There is a continuity of equal usage in hours for all parts that are not replaced with new ones.

However, Cooter feels that it is not economical to major a general aviation engine a second time. "If the engine is flown properly," he says, "it should go to the recommended TBO—from 1,200 to 2,000 hours. By the time that engine comes around the second time, I'd recommend a factory exchange because



Overhaul is one alternative open to an aircraft owner whose engine has "run out of time." Here, turbocharged Continental engine is reassembled at Lynn's Aircraft Engines, Long Beach, Calif.

you'll probably need to replace too many worn parts to make the second overhaul economical."

Downtime becomes a problem on any engine overhaul or replacement. During a local rebuild, Cooter figures between three and four weeks if cylinders must be chromed back to original tolerances and/or cracks are found in the engine case, since these operations are farmed out.

A third option is an exchange, factory remanufactured engine, taken off-the-shelf, which can be installed in two or three days. Even on the West Coast, Cooter figures this would stretch to no more than 14 days if an engine would have to come from either Continental or Lycoming factory stock. Despite the added cost, the factory remanufacture supplies a new, zero-time log book that will certainly increase the resale value of your aircraft. There is also the assurance that all last-minute factory bulletins will be included and that improvements incorporated in new engines, such as valves, guides and newer alloys, would also "modernize" the remanufactured engine.

If a run-out engine is turned in on a factory remanufactured unit, there is a possibility that all the worn parts may not be suitable for another rebuild and some discount is taken under these considerations. However, Cooter explained that he has never yet had an engine that he has turned in for remanufacture where the complete trade-in value was not approved. Cooter is a fussy operator.

Actually, this report is written partially from the heart, since our family business-and-pleasure aircraft is a 1952 Cessna 170B, a grand, matronly bird powered with an older-style Continental O-300A, six-cylinder, 145-hp engine. This particular powerplant now has some 1,000 hours on a good major and runs fine, except when exposed to repeated dosage of 100LL fuel.

While industry studies on 100LL are at long-last beginning to be done in depth, I can report from purely personal experience that the bill on our last annual inspection included removal of three cylinders because of excessive lead deposits around exhaust valve guides. These deposits took place during two trips to the Midwest where almost no 80 octane fuel was available.

I can't help but believe that those of us flying with engines designed for 80 octane fuel really do have an immediate problem in areas of the country where this red-dyed fuel is not available. Hopefully, the recent decision by Exxon to make 80 octane available to dealers east of the Rockies will lead to a general easing of the situation.

"After extended periods of time

(1,000 hours and above) with other than 80 octane aviation fuel, the exhaust valves on some of our low-compression engines have shown mild to severe head erosion and cracks which, if not corrected, could lead to eventual valve failure," says Lycoming's Joe Diblin. "This phenomena is new since these 80 octane engines have been operated on 115/145 octane fuel by military flying clubs, and certain overseas locations using the higher 100/130 octane fuel, without any valve problems . . .

"However, in January of 1976, as a precautionary step while the field input was being evaluated, we started using in our low-compression engines the exhaust valve which was also used in our high-compression engines. We felt this would improve the service life of the engines certified for 80 octane fuel."

Lycoming Service Bulletin No. 404, soon to be published, will list the time of compliance and inspection procedure for four of Lycoming's smaller O-320 and O-540-B series of low-compression engines.

Both engine manufacturers and the FAA strongly advise against any use of automotive fuel or automotive additives for aircraft use. However, an increasing number of pilots are using automotive additives for either fuel and/or oil in an effort to prolong the useful life of 80 octane engines in a 100LL environment.

Several AOPA members have reported good results with various additives, but it is not the intent of this report to encourage such personal experimentation —and that's exactly what it is. Should you have an engine failure and it can be proven that you were using any unauthorized additive, your aircraft insurance and your pilot's certificate could be up for grabs.

It is this writer's personal opinion that both the FAA and the industry have been derelict in not providing a program of controlled testing of additives that may have the potential of easing lead deposits in older engines. Rather than making the blanket statement that all additives are illegal, immoral or fattening, it would seem constructive to have a scientifically controlled evaluation by NASA or some other disinterested party.

Another alternative is the modification route. An increasingly popular, although expensive, way to solve the 100LL problem and assure predictably trouble-free flying is to work from the firewall forward with an FAA-approved STC (Supplemental Type Certificate) and a new or rebuilt engine designed for modern fuels. Such a modification assures continued reliability to an airplane that you already enjoy flying, have equipped more or less the way you want and may even have finished paying for.

Originally, owners who purchased STC'd engine conversions figured that they would have to fly the time out of the replacement engine to get their investment back. 100LL has changed all that. For example, the latest "wanted" classified ad section in the newsletter of the 1,500-member Cessna 170 Club indicated a need for these conversions. "Would like to buy 170B with Doyn (Lycoming 180-hp) conversion or good 170B with high-time engine for conversion" read one ad. Another would-be purchaser said, "170 airframe must be in good condition. Would consider 180 conversion."

Two old-time STC advocates, particularly in the Cessna line, are MASA (Mid-Continent Stol Aircraft, Inc.) and Avcon Industries, Inc., both of Wichita, Kan., home of Cessna's main manufacturing facility. MASA handles the STCs originally developed by Doyn. Brad Isham, director of marketing, reported that MASA has sold well over 2,100 STC'd conversion kits and has a small installation team at the Riverside Airport in Wichita. The company has a fixed-fee price of $8,765 to install a new 180-hp Lycoming and Hartzell controllable prop in a Cessna 170A or B, a 172 or a 175. Installation takes two weeks. Your run-out engine will return from $800 to $1,000.

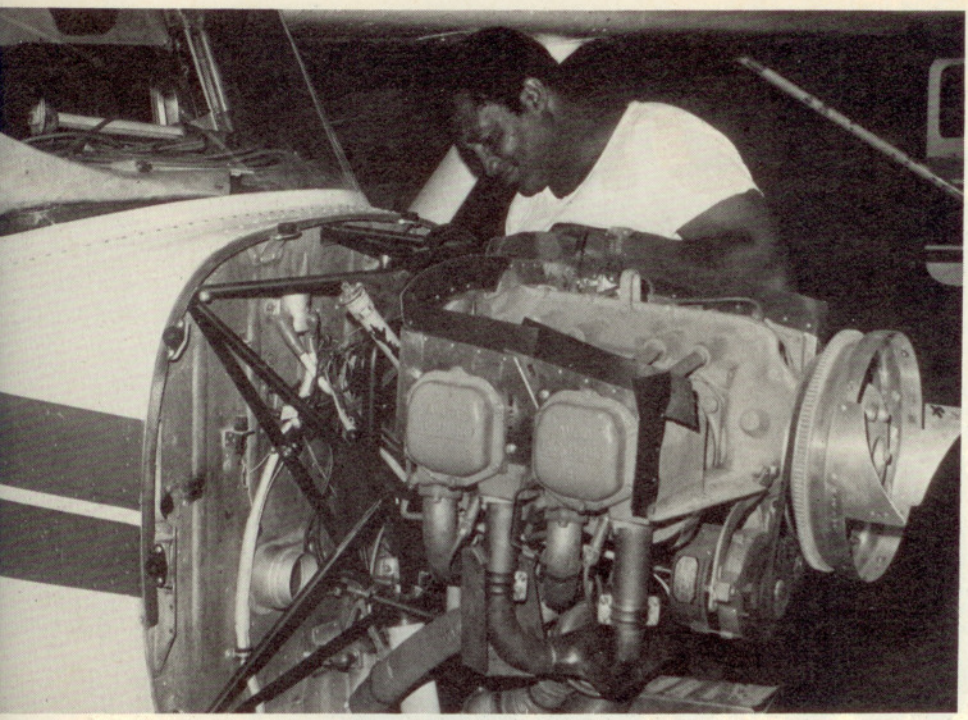
Both MASA and Avcon report that run-out, trade-in powerplants designed for 80 octane fuel have become increasingly difficult to sell. The bulk of these older engines go to homebuilders with an increasing number of sales to airboat companies.

Isham confirmed that MASA has had a definite increase in orders from the areas where 80 octane fuel is not readily available. He listed the entire East Coast and the South, "with orders from as far west as Arizona on a steady increase."

Jack Graham, sales manager for Avcon, reports a 25% increase in the past three months. Avcon's cost for a 180-hp Lycoming and Hartzell prop is $8,800 (less trade-in on your old engine). Graham says this price will remain firm at least until May at any one of the five approved installation shops. (California labor rates are approximately 20% higher, advises Avcon.)

While more than 50% of MASA's kits are installed in Wichita, Avcon installs less than 10%. Jack Graham of Avcon states that any reputable shop can make their installations, but cautions that "it takes about eight hours longer for a shop to make their initial kit installation over subsequent jobs.

"Our experience has been that the conversion customers have a good airframe they are comfortable with and have equipped the way they want it," explained Graham. "Rather than trade up for more performance and go through the ordeal of inheriting other people's



Cessna 175 receives a 180-hp Lycoming engine as part of the STC'd conversion installed by Mid-Continent Stol Aircraft, Inc., Wichita, Kan.

problems, they convert. The conversion cost, in most cases, is less than moving up to a larger airplane, as are the insurance and operating costs. While we don't have firm figures, we have been told by many customers that their cost per mile is the same after conversion.

"While we were obtaining our STCs, we purchased seven airplanes of various models and resold them after converting and certifying. We made money on six of the seven. Recently one of our converted Cessna 170s sold for $15,000."

Almost all STCs involve engine changes for compatibility with 100LL plus an addition of more horsepower as a secondary benefit. An exception to this is the "Machen Magnum," a strictly-for-power 300-hp conversion of the Rockwell 112/112A. The series was factory equipped with a 200-hp engine already designed for 100LL. Predictably, the added 100 hp produced substantial gains in takeoff and climb performance, as well as a healthy increase in cruising speed (and fuel consumption).

Very recently, this STC package received approval of a gross weight increase from 2,650 to 3,000 pounds. Since Hugh Evans of Spokane, Wash., developer of the power package, also has seven STCs on the Swift, he has little trouble in selling the 200-hp engines he removes from the Rockwell Commander 112s.

The basic problem facing today's owners, as seen by John Rademacher, director of marketing for Machen Magnum is, ". . . not the desire or the need to convert, but whether the individual can afford the money. Pilots will 'make do' with what they have even if it is not as safe as it should be. This is also true with the 80 octane problem. People who fly 100 to 200 hours a year would rather pay the smaller amounts in increased maintenance costs than have a larger one-time layout in hard dollars."

"If safety were the factor, not money, you would see many more conversions, both ours and the 100 octane conversions. The serious and high-time flyers that need their airplanes on a regular basis will be the first to buy and the others will save for the day when they can afford the large cash outlay."

The last option for the owner of an older powerplant is to trade up to a new or nearly new aircraft, preferably one with a powerplant that is compatible with 100LL. Pilots planning to go this route should check carefully with a reputable engine overhaul shop to find out how well the powerplant of their new-aircraft-to-be operates on 100LL. This single factor can drastically affect the resale value of some older aircraft.

The skyrocketing cost of new and nearly new aircraft may force the individual owner of an older aircraft to take in a partner or two during the trading-up process. He may go the lease-back route where his new aircraft is hopefully paying for itself while others fly it with varying degrees of skill. In either case, the pristine advantages of owning an airplane all by yourself can be overridden by the economies of later sharing the entire cost of an overhaul, STC or new aircraft as well as the other ownership costs.

Single ownership still has that unique advantage of climbing back into your airplane, secure in the knowledge that no one has flown it since you last climbed out of it. And, even with an older aircraft, there's the ever-present opportunity for TLC with solvent, paint and polish that's part of the fun of flying.

So, you pays your money and takes your choice. □