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Twenty Questions to Ask Your Overhauler

by Kas Thomas

We get a wide variety of inquiries (written and phoned) here at Editorial Headquarters, but the most frequently asked questions have to do with engine overhauls. Who should I take my engine to? Should I go for a new-limits job, or a factory reman? Should I go with chromed cylinders, or grind oversize? How long will it take? How will I know if I got a good deal?

The last question is perhaps the hardest for most operators to get a handle on. The best deal on an overhaul isn't necessarily the cheapest deal (nearly everybody agrees on that), but slogging through the murky waters of overhaulers' hype isn't easy. Far too easy to get mud on your Raybans.

In the interest of keeping readers out of trouble (and keeping our phone bill down), we've put together a checklist of sorts to aid operators in getting the best possible overhaul for the least possible money, with the least possible Roloids consumption.

Try these questions out on your overhauler (put them in writing and send them off in letter form to any overhaulers you're seriously considering doing business with) and see what you get for a response:

1. What kind of engine do you specialize in? (Or: How many engines of my make and model did you overhaul last year?) Generally speaking, you don't want to take your P-Navajo's Lycoming TIGO-541-E1As to a shop that's never seen anything bigger than an O-200. Find out what the shop's specialty is (Lycoming fours; geared Continentals; round engines; or whatever) and be sure they've done your type of engine before. If they claim they specialize in "all types of engines," be wary.

2. Do you overhaul to new limits, or service limits? Most shops now claim to overhaul to new limits, but you can cut through the B.S. by asking for a few simple dimensions. The proper "new limits" bore for a 320-, 360-, or 540-series Lycoming cylinder, for example, is 5.125 inches plus .002, minus .005. (The Lycoming "Service Table of Limits" limit of 5.1305-in. is a service limit.) Ask about ring gaps and

side clearances, and whether pistons are customarily thrown away and replaced with new. If the shop is in the habit of reusing pistons, as yourself—and them—how they obtain new-limit ring fits with worn piston lands.

3. Do you reuse exhaust valves? The answer here should be a firm no. (Lycoming no longer allows the recycling of Inconel valves. See this month's Q&A.)

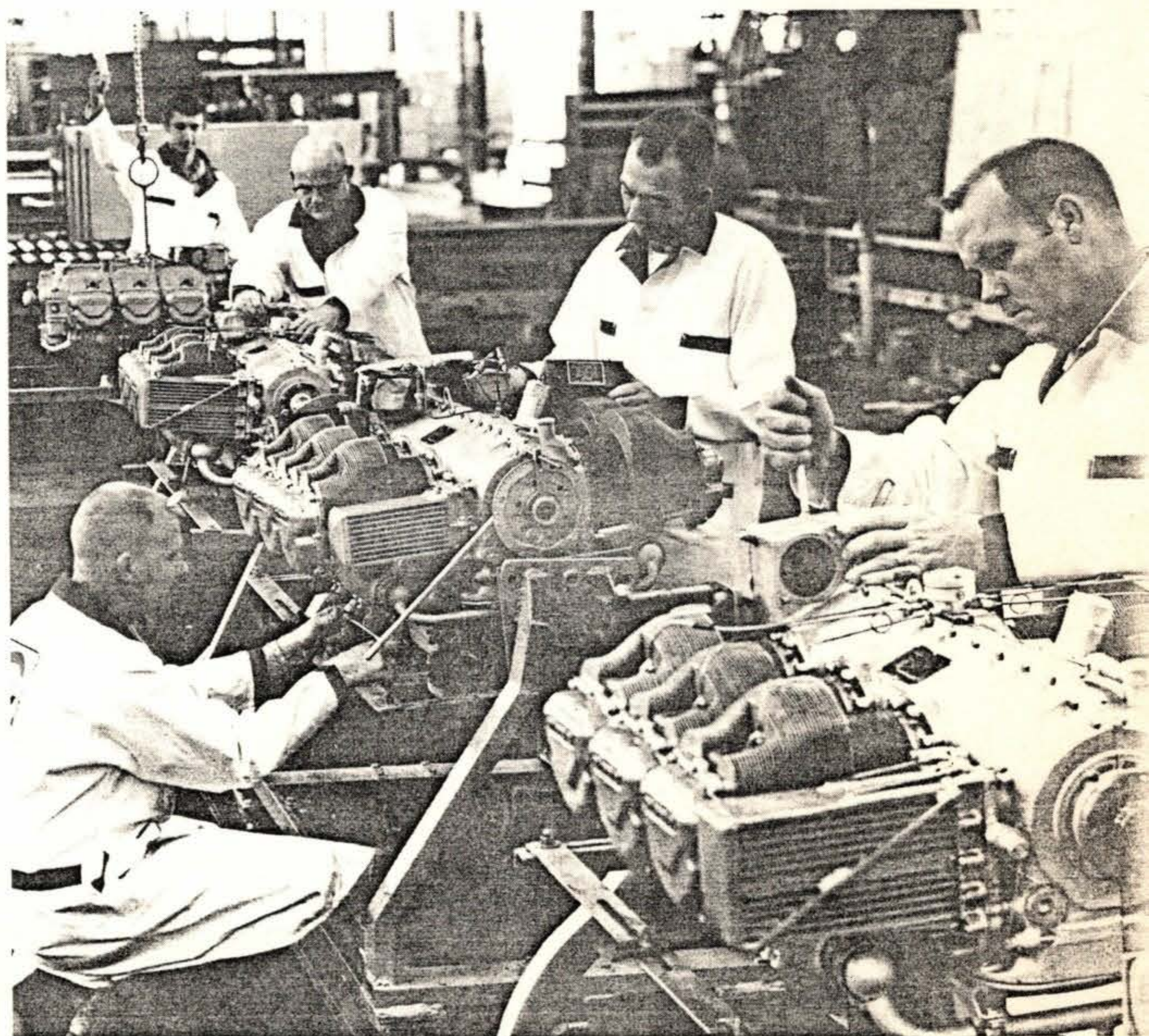
4. How much choke do you put in reground cylinders? This is particularly important for O-470 and IO-520 Continental owners. Look for an answer in the .005 to .008-in. range. Anything less than that is an invitation to a top overhaul 500 hours post-major.

5. What style piston-pin plug do you use (Lycoming)? There are three different types of Lycoming wrist-pin plugs in service: the P/N 60828 alu-

minum plug, P/N 72198 aluminum-bronze, and the LW-11775 "doweled" plug (see Q&A, January '85 for a complete discussion). The plugs are interchangeable and are used in a wide variety of Lycoming models, but the various P/N plugs have widely differing failure rates. *You want the doweled plug, in conjunction with heavy-walled P/N 14077 or -14078 wrist pins.*

6. What style valve guide do you use? This is a rather lengthy discussion unto itself, but the essence of it is, Lycoming and Continental have each made major changes in exhaust valve and guide materials over the last few years, and generally speaking, you now want your high-output Lycoming or Continental to have Nimonic valves in cast-iron (Ni-resist) guides. (Continental's latest exhaust valve for -470 and -520 engines is P/N 646286.) Nitralloy guides have proven somewhat unpredictable for Continental owners; ask your shop what their experience has been (bear in mind that

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Crank, cam, and lifter regrinding can add extra cost to an overhaul. If grinding is needed, who pays for nitriding? Dynamic balancing? (Who warrants the reground parts?) Get answers in writing, ahead of time.

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you have to replace your exhaust lifters with special high-oil-flow variants), and if you decide to go the nitralloy-guide route, be sure you're getting the latest part number (P/N 648014 is current).

7. Do you substitute PMA parts for genuine factory parts? What's my price savings with parts by Superior, Precision, or ECI? This is a sore point, admittedly, because most overhaul shops *do* use PMA (Parts Manufacturer Approval) parts—aftermarket valves, guides, pistons, rings, etc. (which are often half the cost of Lycoming or Continental equivalents)—and most shops *do not* want owners knowing about it, because the cost saving, by and large, isn't passed on to the customer. (Ask for a basic price quote on your engine. Then ask for a breakdown into two price quotes based on the use of genuine factory parts or PMA parts.) FAA-PMA parts are generally just as good as—and in some cases slightly better than—factory original parts. But you're the customer, and you should know what you're getting (or not getting), so you can meaningfully compare price quotes from other overhaulers.

8. Do cylinders and valve guides come with proper micro-inch honed finish? Honing was discussed in the April '87 issue of *LPM*; ask for actual micro-inch RMS numbers (answers should be in the 25-40 micro-inch range), and ask if valve guides are honed (to 30 micro-inches RMS) per

Lycoming Service Instruction No. 1200A.

9. Who does your crank regrinding? Does it cost extra? Does it include dynamic balancing? Most

shops send cranks out for grinding; you want to know that the regrinder has been around awhile, specializes in crank grinding, and is an FAA-certified Repair Station. (AEA in Dallas and ECI in San Antonio are two of the better-known names in this field.) If your overhauler tells you that the customer must guarantee the crank to be serviceable, what does that mean, exactly? Does that mean it must be regrindable, but the customer pays for any needed regrinding? Does it mean the overhauler pays for regrinding? What about nitriding? Counterweight reconditioning? Magnafluxing? Ultrasound? What if (horror of horrors) your crank is unrepairable? Get it all in writing ahead of time.

10. Will my camshaft be reground? (Lifters?) By whom? Who pays if the cam is found to be worn beyond repair? Who pays if reconditioned lifters start tearing up a cam lobe in 100 hours? Again, get it in writing.

11. What accessories are included in the overhaul price? Who certifies

Horsepower Upgrading: Weighing the Pros & Cons

There's an old saying in hot-rod circles that "there's no substitute for cubic inches." You can fool with camming, timing, tuning, and porting until you're blue in the face (or until your valves are blue in the face, as the case may be), but if what you really need is raw power, you'd best get a bigger engine.

Many plane-owners openly lust for thrust but are unable or unwilling to trade up. (Once you're comfortable with a given cockpit, it's difficult to let go—especially if you've dumped so much green into paint and panel appointments over the years that you can't justify selling the plane.) As major-overhaul time approaches, the natural temptation is to keep one's present airframe and invest in a horsepower upgrade.

Skyhawk owner (and *Aviation Safety* contributor) Brian Weiss states the case for extra ponies: "I fly my 172 up and down California, and it's got adequate performance, considering I fly solo or lightly loaded much of the time. But I could definitely use some extra rate-of-climb on hot days at high altitude. It's

embarrassing when ATC clears you to eleven thousand feet from nine, and asks you ten minutes later if you think you're going to make it."

Weiss loves the plane's existing 160-hp Lycoming ("The O-320-D2J is a solid workhorse," he maintains), but as the original engine edged past 2,000 hours (it's now at 2,300), he began to weigh the trade-offs involved in a 180-hp conversion. "I decided on the Penn Yan conversion," Brian explains, "not because of price—the Avcon 180-hp conversion is about the same—but because the Penn Yan mod uses a fixed-pitched prop rather than a constant-speed. I have two partners in my airplane, neither of whom flies much, so a more complex airplane would not have been a good idea. It wouldn't have encouraged their flying more, and it certainly wouldn't have lowered the plane's maintenance. But thanks to the efficiency of the Sensenich prop"—the 172's original prop is a McCauley—"the performance increase with the Penn Yan mod is about equal to the Avcon conversion. So I'm going with Penn Yan."

them? Generally, the overhaul price includes the cost of reconditioned-exchange starter, magnetos, harness, carburetor or injector, fuel pumps, and alternator. (Vacuum pumps may or may not be included as well.) Find out for sure whether your carb or injector is to be overhauled, or merely bench-calibrated and yellow-tagged. (Lowball overhaulers generally do not include the cost of a complete Bendix fuel-injector overhaul in their prices.) Who warrants the accessories?

12. Can I have fine-wire spark plugs at no extra cost? Use this as a bargaining chip as shop-selection time draws near.

13. Who does your cylinder chroming? Can I opt for an oversize grind instead? Chroming isn't something that should be entrusted to just anyone. You want a major shop (such as Schneck or ECI) to do any chrome-plating; otherwise you should opt for an oversize grind, if possible. (Unfortunately, this is not an option for some

Lycoming owners; Avco does not allow regrinding of most nitrided jugs.)

14. Will I get to keep my cylinders, or is there a chance they'll be exchanged for somebody else's? To each his own. We prefer to hold onto (and repair) our own cylinders, if possible; we don't want anybody else's recycled junk. (You don't know where it's been.)

15. Will I get a written logbook record indicating compliance with applicable service bulletins by number? The answer better be "yes."

16. Who pays if a cylinder cracks after 100 hours? Answer: They do.

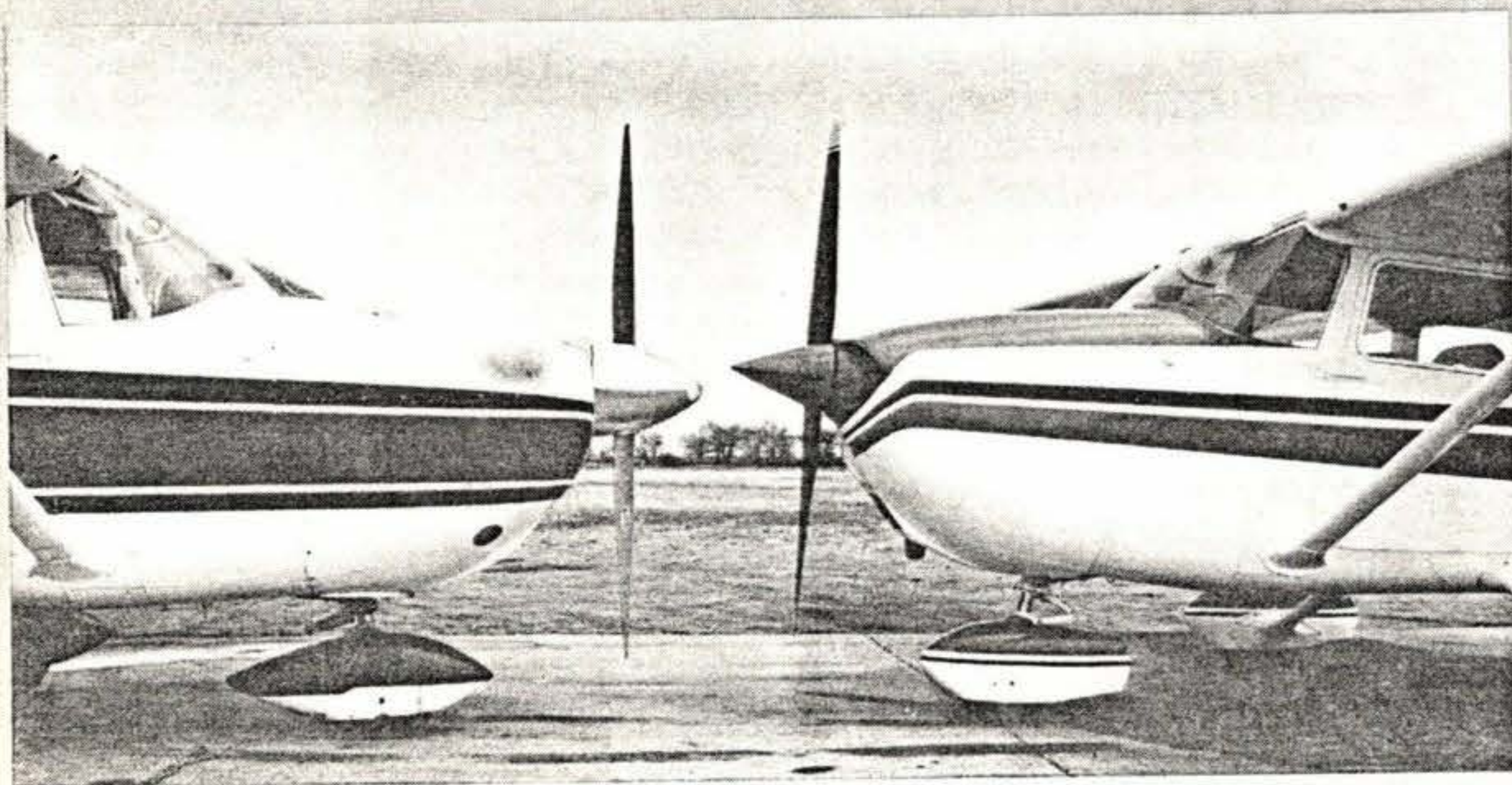
17. Who pays if the crankcase starts leaking oil at a parting line or through-stud? Effective repairs can get hairy; you want some assurance that a leaker will be fixed at no cost to you.

18. How do you run-in your engines, what break-in oil do you use,

and what are your limits for oil consumption? The answers should be: On a fully instrumented test stand per the manufacturer's published run-in procedure; Shell red-can 50-weight or equivalent; and one quart in three hours, tops.

19. What happens if my engine is still using a quart of oil every two or three hours after a 50-hour break-in period? The answer you're looking for is: "We'll do whatever is necessary to correct an oil-consumption problem." That means deglazing defective cylinders free of charge, replacing any that have cracks, and replacing the replacements if *they* don't break in in 50 hours.

20. Is your warranty equivalent to a factory warranty? You want pro-rata protection to TBO, with an initial 6-month, 240-hour non-pro-ratafied satisfaction guarantee. Have them send you a copy of their present written warranty. Read it and see how it compares to the factory's Rare-Metal Medallion warranty; it should stand up pretty well.



Adding 20 horsepower to the 172 is worthwhile if you need ROC performance.

Weiss is based in Santa Monica, CA (on the opposite coast from Penn Yan); he will have Victor Aviation perform the conversion using a Penn Yan STC'd kit. "The kit cost if you supply your own engine is \$2,495," Weiss elaborates, "and that includes a new Sensenich prop along with the STC paperwork. Victor was able to steer me onto a used O-360-A4K"—for which Weiss paid \$4,600—"and I'm going to sell my O-320-D2J through an ad in Trade-A-Plane, or however I can."

After overhauling the O-360, Weiss

expects to have "maybe five grand more" in the total conversion than he would ordinarily have put into a firewall-forward new-limits overhaul of the existing powerplant.

"You hear a lot of people complain about how much the 180-horse conversion costs," Weiss remarks. "But I disagree. You're paying money, but you're getting something in return. You know, a guy'll spend a couple grand to pick up a couple knots of airspeed—you see people putting money into flap gap seals and wheel

pants and stuff—just to gain a knot or two of cruise speed per thousand dollars. That's considered acceptable by a lot of people.

"Me? I'd rather put five grand into a conversion that's going to give me a 150-pound gross weight increase, a four or five thousand foot increase in service ceiling, and a noticeable boost in rate-of-climb, *plus* a knot or two of extra cruise speed. These are all things that I don't have to strain my eyes to see. I end up with *better-than-new* performance, and a plane that's still simple to fly and maintain."

Weiss compares his situation to that of a friend of his on the field, also a Skyhawk owner (until recently): "This guy, rather than upgrade his old 172, bought a used Cessna 210 that—it turns out—needed a lot of work. And in the past year, he's spent bundles of money—money with lots of zeros after it" (laughter) "and now he's in debt, struggling to keep up with the plane."

"I'd rather keep within the concept of the 172," Weiss summarizes, "and continuously refurbish and upgrade a plane that I *know* I can afford to fly. The plane fits my mission, and until or unless the mission changes, I can't see buying anything else."