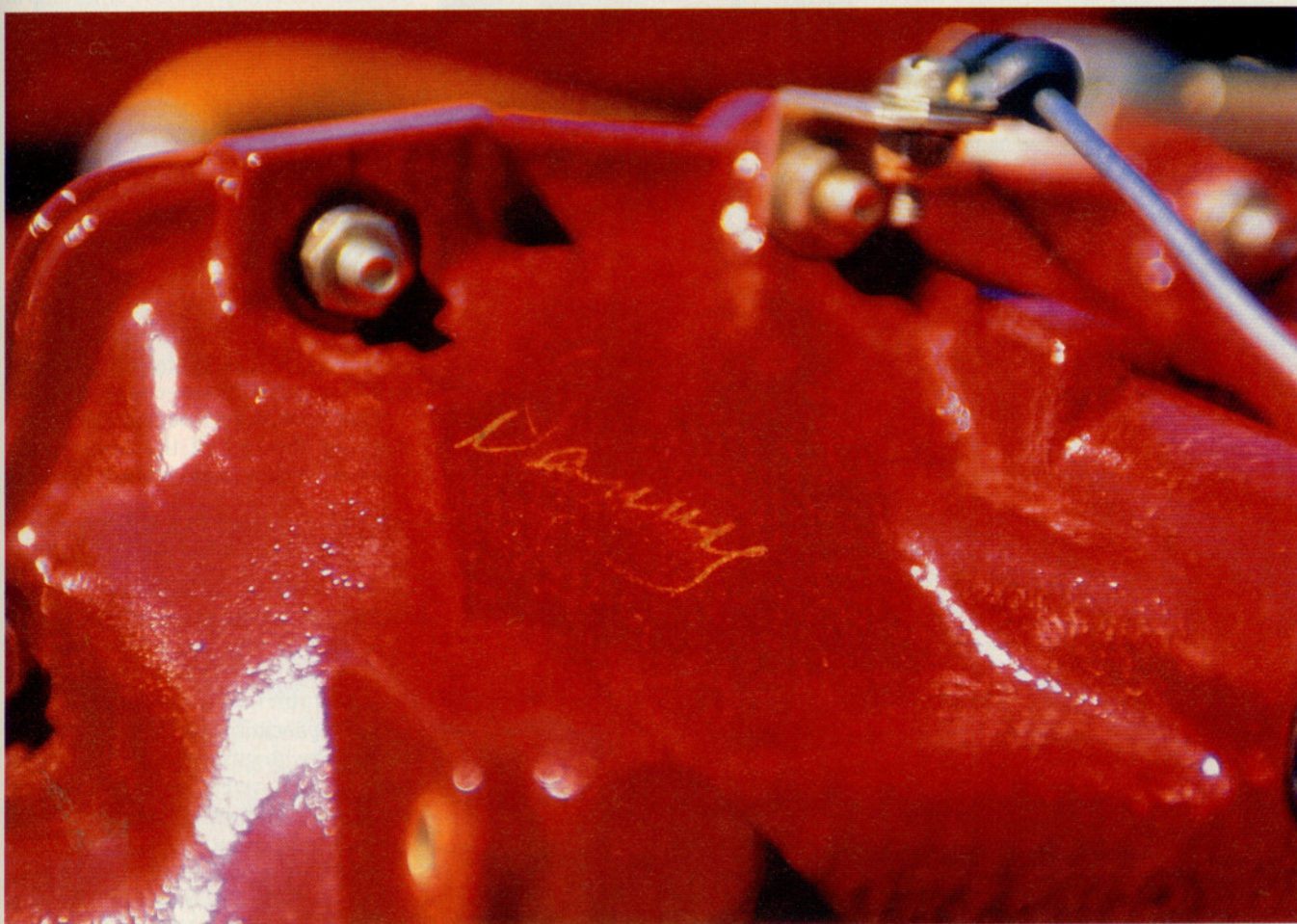


Seeing red

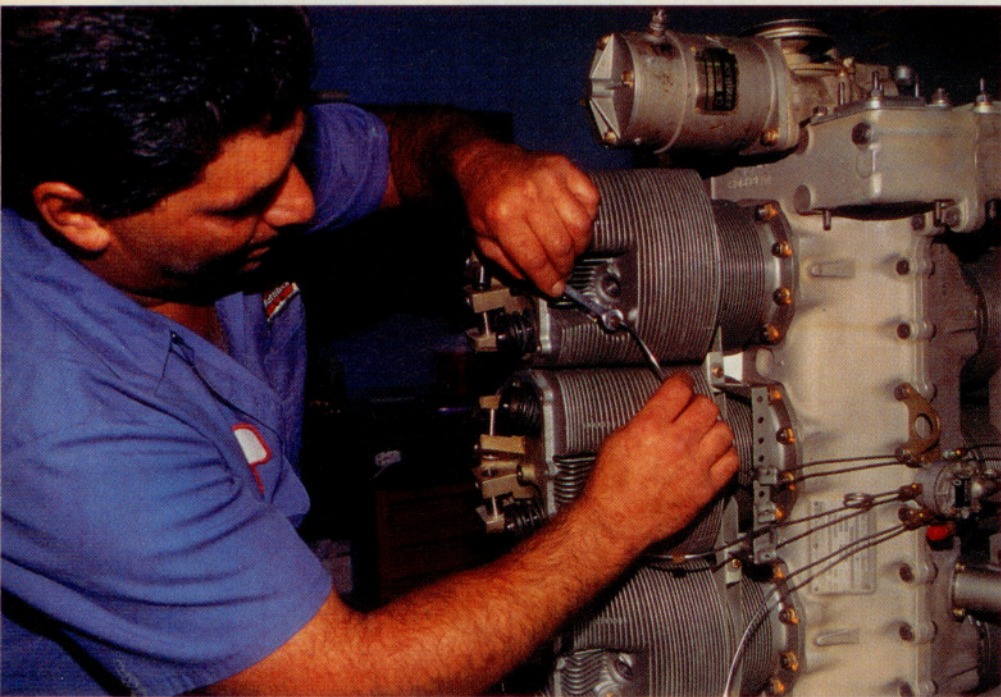
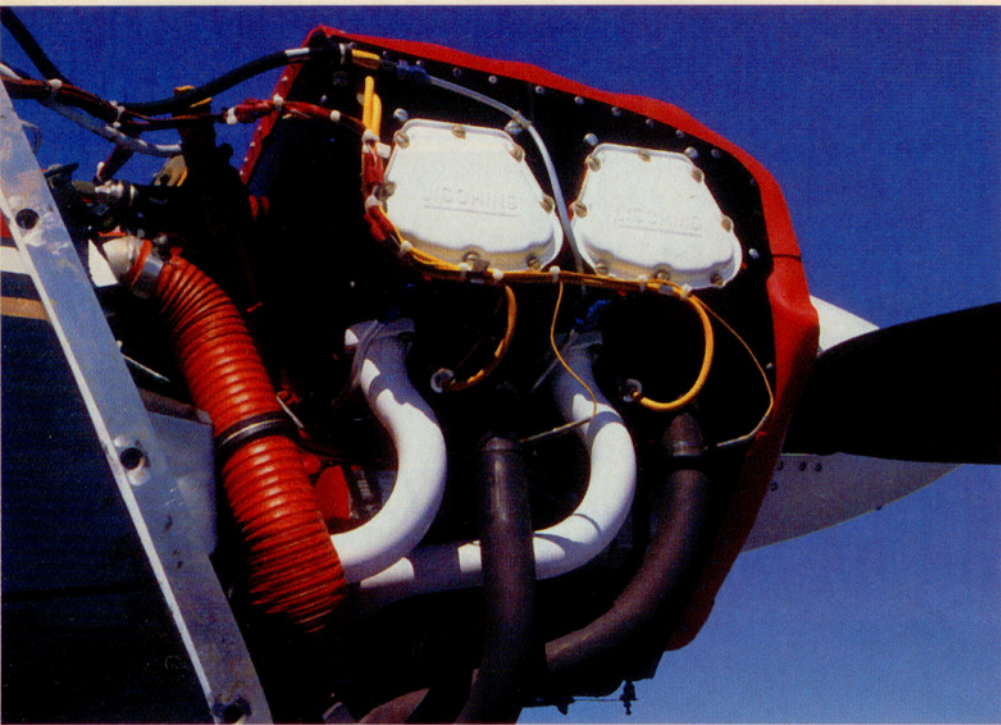
Mattituck's Red Gold overhaul powers the Millennium Mooney



BY MARC E. COOK

Consolidation is a fact of life in business today. And that includes enterprises in the engine-overhaul field, thanks in part to recent "price wars" from the original equipment manufacturers on factory overhauled or remanufactured engines. As the prices come down, and with the promise of off-the-shelf engine availability, life for the smaller engine shops has been getting tougher and tougher. ■ Even well-known and respected shops like Mattituck were subject to these laws of supply and demand, as the

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of electronic engine management.

So Mattituck becomes part of the Teledyne behemoth, and Continental finds itself overhauling Lycoming engines with an eye toward producing powerplant kits that include specially overhauled engines readied for the FADEC (full authority digital engine control) fuel-injection and spark-control systems. In reality, it's been more or less business as usual at what's now called Teledyne Mattituck Aviation. For mainspring Jay Wickham, it's been a great ride. "We're extremely happy with our relationship. Continental understands that we know our end of the business, that we have developed a reputation for excellent customer service, and they've pretty much left us alone."

Ah, but it's not that simple. In fact, there's considerable input from this modest New York shop to the mother ship in Mobile. Coming later this year, TCM and Mattituck will in a way combine technologies with revised top-of-the-line engine packages. Continental's Platinum engine (one of which was installed in our sweepstakes Cessna 206 last year) will gain some minor technologies from Mattituck's Red Gold engines. By the same measure, Mattituck will institute some manufacturing/remufacturing technologies now used in Continental's Platinum series—specifically, slight changes to the way the engine cases are machined to help improve bottom-end oil flow.

That's down the line, but the engine keeping the tail of the Millennium Mooney off the ground is hardly old tech. It's a Red Gold overhauled IO-360 with all the bells and whistles. TCM's hot FADEC was intended to find a home in this airplane and, as the deadline looms to send this M20J into the hands of some lucky AOPA member, our windows of opportunity are starting to close. At press time, TCM had run into some comparatively minor certification issues on the FADEC setup. But with such a comprehensive and sophisticated system, even small sideliners can turn into weeks and even months of waiting for solutions to be approved and papers to receive stamps of approval.

As it is now, and likely to be by the time you see this airplane again this month at AOPA Expo 2000, the Red Gold is in roughly the same configuration as the original installation—Bendix D-3000 dual magneto and mechanical fuel injection and the rest. Still a fine little engine, though, thanks to some clever work done by Mattituck.

Naturally, Mattituck is not Lycoming, so its engines are classified as field overhauled units. (Mattituck is also a Ly-

The Millennium Mooney's Mattituck-overhauled Red Gold Lycoming features an all-new top end, and includes matched cylinder heads and pistons. The mechanic who signed off on the engine gets to sign his name (see previous page). A Mattituck technician puts the finishing touches on an overhaul (above).

general aviation overhaul market headed in the direction of OEM control. And while the independent-overhauler industry remains strong, there are clear signs of its contraction, none perhaps more surprising—and, ultimately, logical—than Teledyne Continental's purchase of Mattituck last year.

What in the world would TCM want with Mattituck, a predominantly Lycom-

ing-based business? It makes more sense than you think when you consider it part of TCM CEO Bryan Lewis' aggressive campaign to get the company's electronic engine controls into the field. With Lycoming engines dominating the 200-hp-and-under category, TCM would clearly need some help to break into the field, particularly with the Unison/Lycoming team working feverishly on its own form



JIM RANCROFT

Own an airplane with a Mattituck overhaul and you stand to realize a higher resale value. The only part likely to be reused from your old engine is the crankshaft. Case halves and other components are made into matched pairs.

coming distributor, so you can buy a new one from the company if you prefer.) In Red Gold configuration, there are a significant number of new parts built by Lycoming. (As Wickham says, "We are owned by the same company as Continental, sure, but we have a great business relationship with Lycoming. It builds parts and we buy them. So far, personal agendas haven't entered the picture, and I don't ever expect them to.")

Red Golds include new cylinder assemblies—which themselves have new pistons, rings, valves, guides, valve springs, and so on—so that everything in the power-producing section of the engine is brand-new. It couldn't really be any other way, because the market has continued to demand new cylinders at overhaul time, and the scrap rate of worn-out jugs is probably at an all-time high. In addition, the Red Gold package includes a new camshaft, lifters, and through bolts. For a Lycoming, with its high-mounted cam and propensity for chewing lobes with disuse, this is another critical but common overhaul tactic. Naturally, using either your original core or one sourced elsewhere for an exchange engine, the remainder of the parts are inspected and repaired as necessary.

In many respects, Mattituck's Red Gold engine is a lot like the Lycoming factory reman without the zero-time logbook. (Fortunately, thanks to Mattituck's excellent reputation, resale value on an air-

plane carrying one of its overhauls is nearly as good as one with a reman.) The main difference is that, depending upon production times and inventory, you might actually get more new parts in a Lycoming factory job, but you'll never know until it's time to get your engine.

In any event, Mattituck goes beyond the Lycoming factory engine in several areas. To start with, the engine has more comprehensive internal balancing. It's important to understand Mattituck's philosophy here. While many custom overhaulers will modify factory or aftermarket parts to achieve balanced components or flow-matched heads, it's Mattituck's belief that the parts should be unaltered. So how does Mattituck achieve its goals? Simple. By using a large inventory of new Lycoming components, it plays matchmaker. By carefully measuring the dimensions and weight of each part, Mattituck is able to group parts into engine kits with closely matching weights and sizes. By working within the normal production tolerances, Mattituck can get astonishingly close in balance and dimension without making a single alteration.

These matched-set dynamic parts all come together at a dynamically balanced crankshaft—normally one of the few parts reused from your engine. This procedure, in itself, should help make for a smoother engine. (Results will vary, of course, depending upon how well balanced your old engine was. Sometimes, a

fortuitous combination of parts will yield a smooth powerplant and you might not notice a dramatic difference.)

Mattituck acknowledges that reciprocating components whose weights are carefully matched will help reduce the inherent primary imbalances in the engine. But there's another factor in an engine's smoothness, and that's the balance of the combustion events. To get all the cylinders producing as close to the same amount of power—which inherently improves an engine's smoothness—Mattituck goes to some fairly outlandish measures.

Here's a simplified version of the underlying theory. If every cylinder has the same combustion-chamber volume, if all the ports and valves flow the same amount of air, and if the piston heights and connecting-rod lengths are all identical (giving the same compression ratio all around), then each cylinder ought to produce the same amount of power. Yes, you're right, there are inherent variations in exhaust- and induction-system designs as well as fuel delivery that Mattituck doesn't address, but the company stresses that it wants to improve the

engines without altering their designs.

By using a procedure similar to that of balancing the reciprocating components, Mattituck groups matched sets of cases, cylinder heads, pistons, and other top-end components to take out as much variation as possible. This means that every cylinder's deck height is checked and that the head's flow rates are checked. The case is measured from the crankshaft centerline to the mounting flange. Again, no changes are made to the parts; they are merely grouped from parts that fall within the normal production tolerances. By the time you get way out to the cylinder head on most engines, the accumulation of small variations isn't so small any more, otherwise known as *tolerance stacking*.

Mattituck's theology isn't dramatically different from those of other high-end overhaul facilities—some do more, some less. But what is unusual is the company's one-man, one-engine construction philosophy. On the OEM assembly line, each engine is built by a group of people, each working in a specific area such as case buildup or piston fitting. At Mattituck, one man handles the vast majority of the engine-building chores. In a way, this is a throwback to the days of one-man engine shops, where the guy who answered the phone and took out the trash also built your engine.

Mattituck explains this procedure as offering the benefits of accountability and ownership of sorts to one person. It also provides him with a working knowledge of the whole package and, presumably, the pride of seeing "his" engine go from a trolley full of parts to a completed piece. Whether that makes this technician the jack of all trades and the master of none is perhaps open to question, but Mattituck continues to have an excellent reputation. Plus he gets to sign his name in gold paint. Such a deal.

When the engine's core is built up, it's put together with some nice goodies, such as overhauled (or new, it's up to you and your accountant) fuel and ignition systems. The Red Gold also comes with fine-wire plugs, new ignition harness, silo-cone rocker cover gaskets, and a balanced and overhauled starter-gear support. Then it's run on what Mattituck calls a thrust-load dynamometer; essentially it's a test cell that runs the engine with a club-bladed prop for load and measures how hard the engine is pulling against the test rig as an indirect measurement of horsepower. Add all that up with a one-year, 480-hour parts and labor warranty and it's a competitive package. (How else

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Balancing and matching and stuff sounds like a bunch of hoo-ha, you think? The Millennium Mooney was still in the break-in process at press time so true performance numbers can't be gathered, but the initial impressions are quite good. For one thing, the engine is really smooth. Mattituck handled the overhaul and engine swap, and the Lord mounts on this 1,600-hour airplane were replaced. (It's such a pain in the Mooney, you might as well do it while the engine's

out.) And until the engine is fully broken in, Mattituck does not recommend dynamically balancing the prop.

But from the start, the IO-360 was as smooth as any large four-cylinder Lycoming we've tried. Better yet, it starts easily—the old engine was a bear when hot—and pushes the Mooney along a bit faster than before. How much? Hard to tell; because of unusually high temperatures on the long cross-country flights we've put on the airplane and the ongoing break-in process, the engine has been running hot, and we've had to fly with the

AOPA would like to thank the following companies that donated or discounted their products and services to refurbish the Millennium Mooney or otherwise assisted in the project.

Engine and major accessory overhaul and installation

Teledyne Mattituck Services Inc.
410 Airway Drive
Mattituck, New York 11952
800/624-6680
631/298-8330
Fax 631/298-8412
www.mattituck.com

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Lord Corporation
111 Lord Drive
Cary, North Carolina 27512-8012
919/468-5979
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www.lord.com

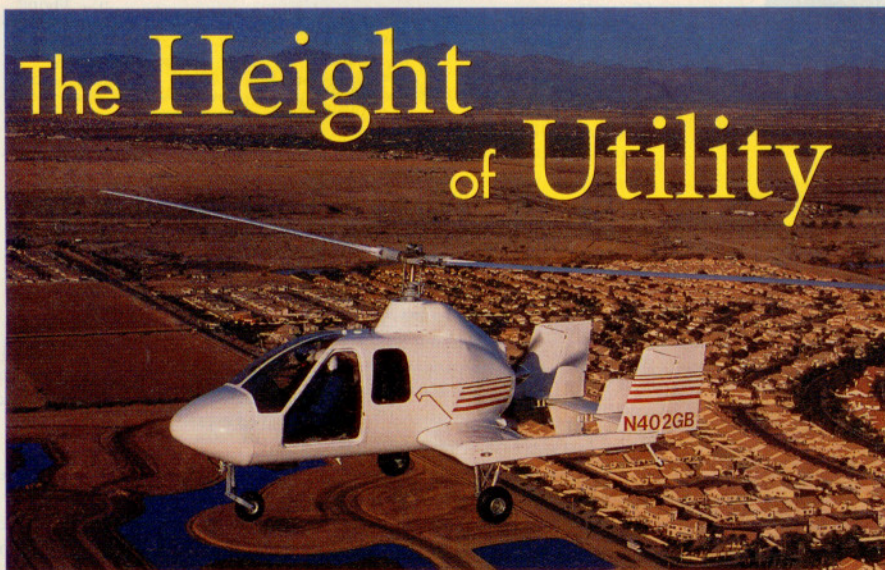
Hoses and connectors

Parker Fluid Connectors
Parker Hannifin Corporation
6035 Parkland Avenue
Cleveland, Ohio 44124
216/896-3000
Fax 216/896-4022
www.parker.com

Propeller

McCauley Propeller Systems
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cowl flaps partially open. Once the engine loosens up a bit, we expect the temps to come down—the worst case was the oil temp going to 215 degrees Fahrenheit in 70-percent-power cruise—and we can go back to flying with the cowl flaps closed. (One benefit found in the later 201s is incrementally adjustable cowl flaps; the 1987 model we're working on has just open, trail, and closed positions.)

It remains to be seen if we can get the TCM FADEC system onto this airplane in time to give it away. The engineers in Mobile and Fairhope, Alabama, are beaver away and eminently hopeful. Yet even if it is not to be for the Millennium Mooney, Mattituck has given us a perky, easy-to-manage little powerplant that will see the winner off in fine style. □

i Links to additional information on the Millennium Mooney may be found on AOPA Online (www.aopa.org/pilot/links/shmtl). E-mail the author at marc.cook@aopa.org