A turbine in every cowling?

Czech this out

BY MICHAEL MAYA CHARLES

PHOTOGRAPHY BY MIKE FIZER

Cheap, reliable propulsion drives airframes to new heights, speeds, and sales. If that engine is a turbine and offers more horsepower—for a lot less money than a comparable piston engine—the combination is compelling. ■ The Walter M601 turboprop, an engine from the Czech Republic, is a free-shaft, 657-shaft-horsepower engine. It was first produced in 1975, and many of the engines that are coming to America previously powered the Let 410, a commuter aircraft that looks a lot like a Beech 1900. With the economic downturn and the diminished travel needs of people in Eastern Europe, the commuters are being parted out to provide needed cash. The Let 410's surplus engines—most about mid-time in their 3,000-hour overhaul cycle—are considered run-out by the engine manufacturer. ■ The company, Walter a.s., is no newcomer to aviation. It began producing air-cooled piston engines for airplanes in 1923; its first jet engines in the 1940s—including the Walter M05, which powered the license-built MiG 15s—and tur-


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turboprop engines in the mid-1970s, with the introduction of the M601A. The Walter M601 design is quite similar to that of the ubiquitous Pratt & Whitney PT6, which powers a world of general aviation airplanes from the Pilatus PC–12 to Beech King Airs, Piper Cheyennes, and many agricultural airplanes. A few years ago Turbine Designs, Inc., a company in DeLand, Florida, began importing and mounting M601 turbines on everything from King Airs and Ag Cats to Helio Couriers and Glasairs. Perhaps this would have escaped notice had it not been for a small white homebuilt airplane that appeared at the Sun 'n Fun EAA Fly-In in April 1998, capturing the attention of many pilots who feel the need for speed.

The homebuilt, called a Turbine Legend, sported one of those surplus Walter turboprops on the end of its graceful, pointy nose. Originally introduced at Oshkosh in 1996 with a 600-hp Chevy V-8, the Legend had experienced a lukewarm market reception because of the uncertainties of the new engine package. The turbine option transformed the macho pocket rocket into a whole new airplane, attracting the attention of buyers who never would have bought a V-8.

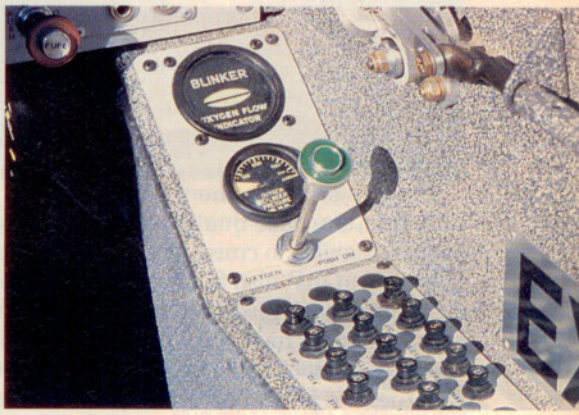
Looking like a miniature military trainer—for less than a tenth of the cost—the homebuilt exhibits a remarkable advertised performance. Can you say 6,500 foot-per-minute rate of climb? How about 350 knots cruise speed at 22,000 feet? Instantly, the kit maker had a winner with the new aircraft; Performance Aircraft simply offered more horsepower for less money—and it was a turbine! At this writing, 26 customer kits are under construction.

Amazingly, the complete firewall-forward turbine engine kit from Turbine Design sells for $45,000, compared to $50,000 to $55,000 for the modified big-block Chevy racing engine that originally powered the prototype. For potential builders, the choice between proven turbine propulsion and a less-well-known V-8 was easy: When Performance Aircraft introduced the turbine option, its V-8 sales ceased. Of its 21 kit buyers to date, all but one have opted for the turbine, including those who previously bought V-8s. It's not hard to understand why.

Fitting turbines into small GA airframes isn't exactly new; there have been many attempts over the years—some successful, others more novel than practical. Currently, you can buy turboprop conversions for the Cessna 210 or Piper Malibu, among others, and over the years there have been turbine conversions on Beech Bonanzas and Cessna 206s—even a Great Lakes biplane. The biggest drawback to these changes is cost; most of the conversions are very expensive because of the price tag of small turbine engines and the cost of certification. O & N Aircraft of Factoryville, Pennsylvania, for example, will put an Allison turboprop on your 210 for $475,000. The conversion includes paint, interior, a new autopilot, and more fuel capacity, too. Major conversions of this kind create a whole list of engineering problems, beginning with the need for more room to stuff fuel for the thirstier turbine into the relatively small airframe .

At the moment, the kit aircraft industry is the primary benefactor of the inexpensive turbine phenomenon, but there is talk of the Czech manufacturer's getting more seriously into the production modification business. At present, Walter makes an M601E-11 turboprop conversion for the King Air and offers engines for the Air Tractor agplane as well. There will probably be more to follow.

It was a rather brisk 30-degree-Fahren-



Here's a military trainer for less than one-tenth the cost.

heit morning when Jeff Ackland, president of Performance Aircraft, and I met on the ramp at Tri-County Airport in Erie, Colorado. In the cold predawn silence, illuminated by my van's headlights, the Turbine Legend looked much larger than it really is.

We mounted up and ran the checklist, and the Turbine Legend started easily. Within 30 seconds of engine light-off, we were ready to fly. Another nice feature of turbines: reliability. Once running, it's hard to make them quit; if you don't exceed max temperatures for start and takeoff, and keep things like ice and birds out of the intake, the darn things just keep happily spinning. Of course, you do have to feed them about twice the fuel flow that you might be used to. One of the advantages of turbine engines is their superior cold-starting abilities. As long as you've got sufficient battery power, the engine really doesn't much care whether it's zero or 100 degrees Fahrenheit.

The Turbine Legend weighs about the

same as my Cessna 185, 3,300 pounds, but the Legend's 657-shp turbine powerplant creates a rather healthy power-to-weight ratio of 5.02 pounds per horsepower. Performance is, predictably, spectacular. Takeoff is more jet-like than many jets that I've flown.

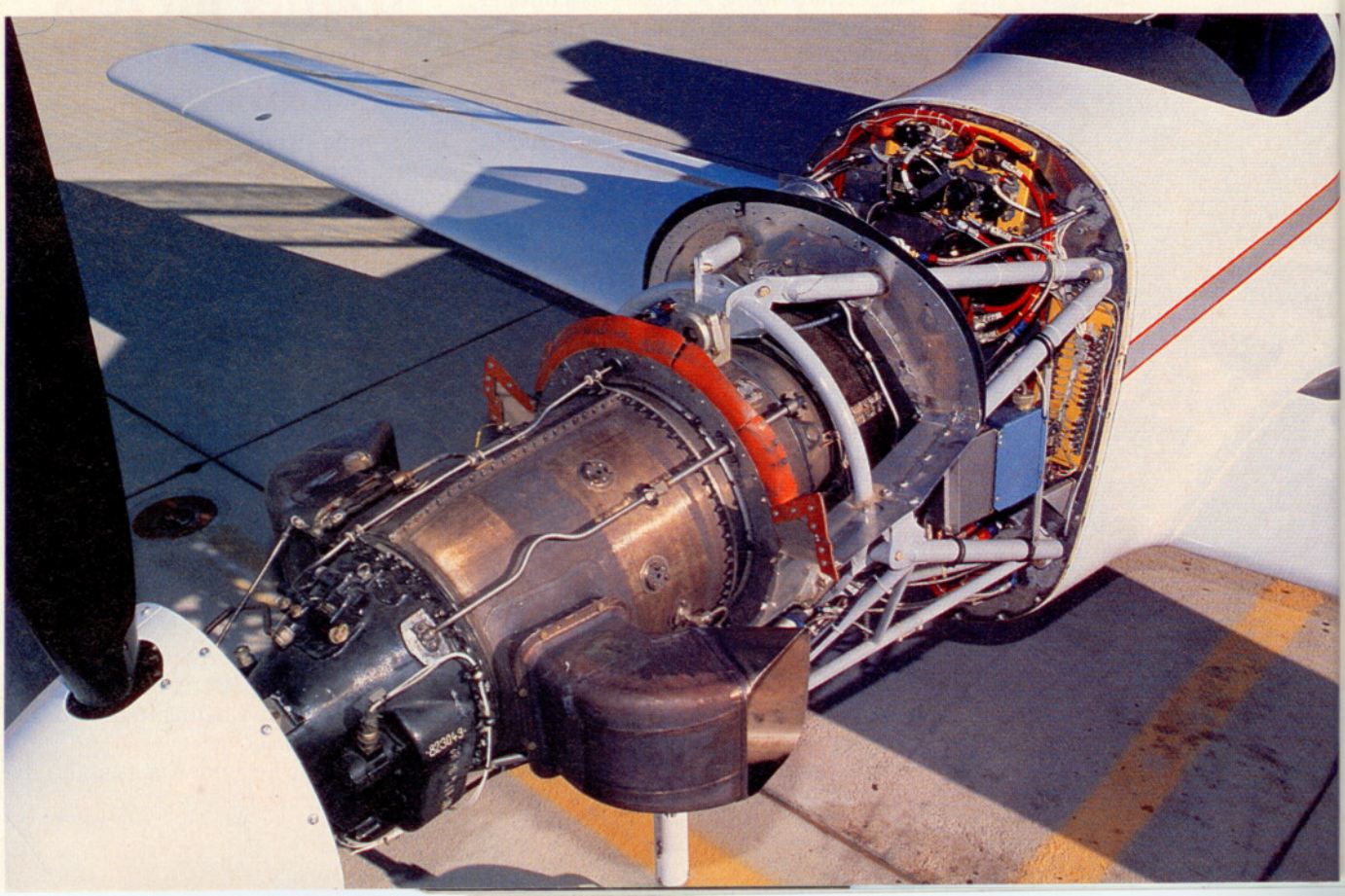
We flew the Legend to 12,500 feet and set the power roughly equivalent to 75 percent, according to Ackland. Fuel flow was in the neighborhood of 35 gallons per hour. Our best guess at a speed computation resulted in an estimated 256 kt true. There is no outside temperature gauge. Performance Aircraft claims 330 kt at 22,000 feet, but we didn't sample high altitudes on our quick evaluation flight. Ackland is optimistic that he can coax another 15 kt out of a new Avia-Hamilton Standard prop under development. The prototype's propeller is optimized for the commuter aircraft from which it came; he feels that there are a few knots left in the airframe, too, which should allow him to reach his target 350-kt cruise speed in the low 20s.

The airplane was smooth and vibration-free, another quality of turbine engines. Stability in cruise tended toward neutral, but that also felt right at these higher operating speeds. Performance Aircraft has done a nice job of tweaking the handling qualities of the Legend; roll rate is 190 degrees per second, which puts it in the same league as a stock Pitts S1S. Elevator forces are about right for an airplane in this speed regime: lightly loaded, but not so light as to make it easy to break something when pulling Gs during aerobatics. The rudder on the prototype, however, needed some work when we flew it in December. Rudder forces are high, and the rudder seems stiff at all speeds. Ackland is aware of the problem and assured me that all production kits are being delivered with new rudder cable routing and pulleys in place of the nylon slide tube in the prototype. These changes are designed to eliminate the high system friction.

In slow flight, the airplane felt solid right up to the light burble a few knots above stall. The break was rather sharp when it came and was accompanied by roll-off in most attempts. This characteristic, while not unexpected in an airplane with this performance band, will need to be thoroughly mastered when new pilots transition to the airplane. Ackland assured me during our flight that Performance Aircraft is evaluating several training companies for familiarization and checkout of all new Legend pilots.

Getting down in a turbine is a pleasure, especially in an unpressurized airplane, since there is no need to carry power to maintain pressurization. In the Turbine Legend you can literally pull the power lever to idle and point the nose earthward without worrying about cowl flaps, cylinder head temps, and rapid engine cooling. This characteristic also allows you to slow to gear and flap speeds easily

The jetlike Turbine Legend boasts a rather healthy power-to-weight ratio of 5.02.



when entering the pattern. We used about 120 to 140 mph on downwind and 100 mph on final; the airplane felt stable, the wing well within its comfort zone. Touchdown was at about 90, and full reverse made the midfield intersection of a 4,700-foot runway easily.

As an exercise, I looked for comparable piston engines to see whether I could make an apples-to-oranges comparison on prices and performance of the Walter turbine. The trouble began immediately. First, there are few 600-horsepower piston engines available. The closest thing that I could find in a certified aircraft engine, after a thorough study of *Trade-A-Plane,* was a freshly overhauled 375-hp Continental GTSIO-520 from a Cessna 421 for just more than $30,000. Add about $6,000 to $8,000 for a prop and spinner; a couple grand more for the harnesses, mount, engine gauges, etc.; and you have spent almost as much as the M601 turbine package for the Legend—and still have only half the horsepower.

How about finding a used Pratt & Whitney PT6, Garrett 331, or Allison T-53 to stuff into the nose? Well, those turbines don't come cheap. A Pratt PT6A-20 (550 lbst) will set you back about $125,000 overhauled—coincidentally about the cost of the complete Turbine Legend kit *and* engine. True, the PT6 would be certified, but if you wish to put one of these engines into your certified airframe, you will still need a supplemental type certificate or field approval. The possibility of that happening would make the project a tough sell. *Cost* is why you don't see more turbines in GA and why the Walter is such a big breakthrough. The availability of the surplus Walter engines would seem to be the best thing to happen to general aviation since, well, turbine engines; they could revolutionize a few segments of the homebuilt industry—at least as long as the supply of surplus engines holds out. And if the idea of a "run-out" turbine engine doesn't allow you to sleep at night, you can buy a factory zero-timed Walter 601D-1 turbine for $78,000, or a new one for $182,000. Walter is talking about setting up an overhaul facility in the United States, which might make these engines even more appealing.

There is a small, cheap jet engine currently under development that might prompt the next wave of new airframes. It's being refined by Dr. Sam Williams and is currently flying on the Williams International V-Jet II, shown at Oshkosh last year. The company is dreaming of offering the FJX-2 engine for less than the cost of a Continental or Lycoming; only time will tell if it can make these dreams come true. In the meantime, there is a sleek composite turbine airplane available right now, begging for a quick climb to the flight levels. □

Links to additional information about turbine engine conversions for general aviation aircraft may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

Performance Aircraft Turbine Legend

Standard kit price	$89,850
Quick-build kit price	$112,150

Specifications

Powerplant	Walter M601D-1, 657 shp (continuous) 724 shp (5 minutes)
Propeller	Avia-Hamilton Standard V508, 88 in dia, reversible, full-feathering
Height	9 ft 4 in
Length	25 ft 7 in
Wingspan	28 ft 5 in
Cockpit width	29.5 in (front) 28.0 in (rear)
Empty weight	1,950 lb
Gross weight	3,300 lb
Wing area	101 sq ft
Wing loading	32.6 lb/hp
G limits	+6, -4 @ 2,700 lb
Baggage capacity	130 lb
Fuel capacity	100 gal standard 125 gal w/opt tip tanks

Performance and Recommended Airspeeds

Max cruise @ 17,500 ft	341 kt
Max cruise @ 25,000 ft	350 kt
Economy cruise @ 17,500 ft	254 kt
Range @ max cruise	962 nm
Range @ economy cruise	1,392 nm
V_{NE} (never exceed)	391 kt
V_{SO} (stall, in landing configuration)	66 kt

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

For more information, contact Performance Aircraft, Inc., 12901 West 151st Street, Suite C, Olathe, Kansas 66062; telephone 913/780-9140, fax 913/780-1774, or visit the Web site (www.performanceaircraft.com). Turbine Designs, Inc. is located at 1335 Saratoga Street, DeLand, Florida 32724; telephone 904/738-0510, fax 904/736-8262, or visit the Web site (www.turbinedesign.com/).