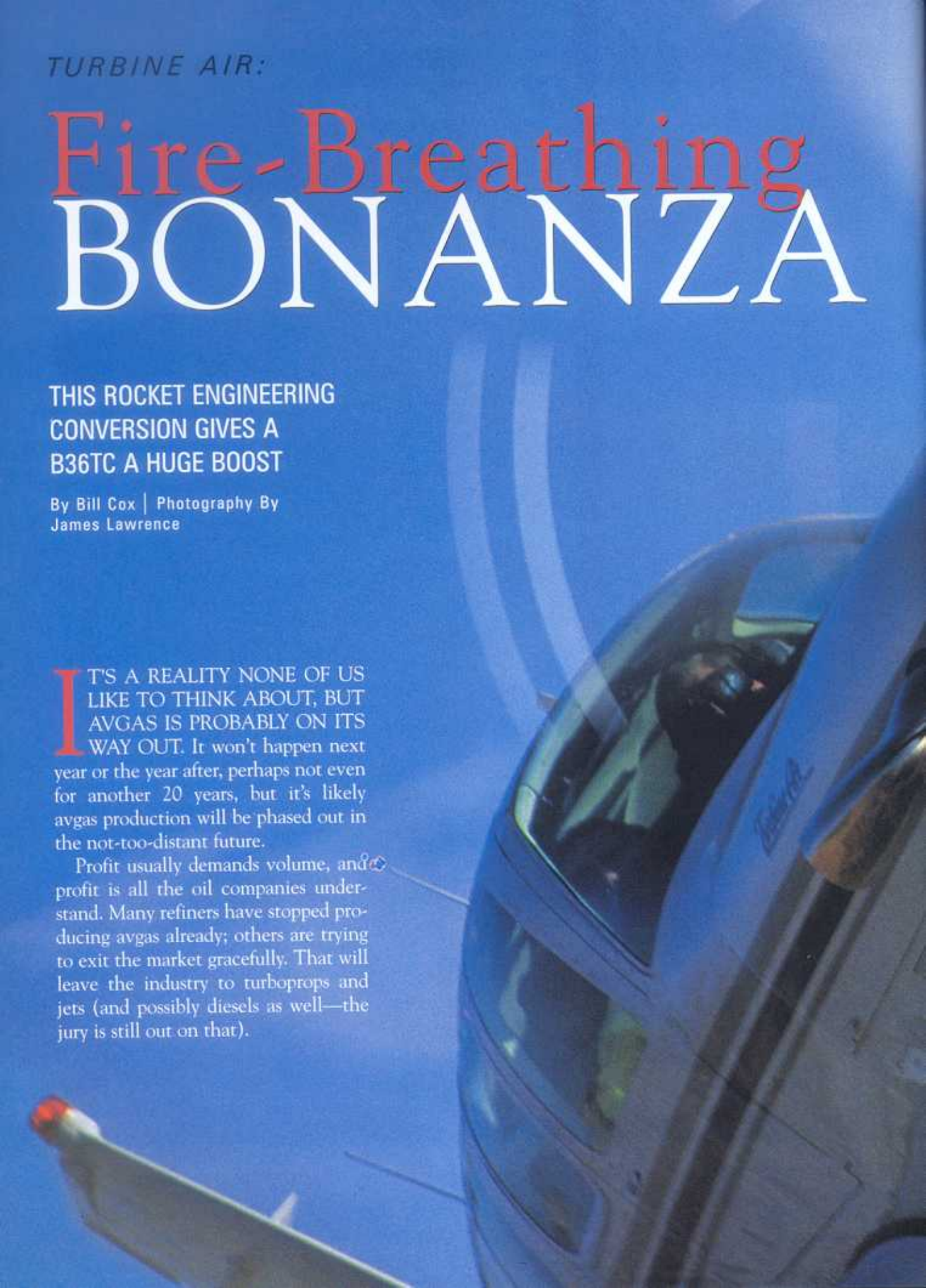
TURBINE AIR:

Fire-Breathing BONANZA

THIS ROCKET ENGINEERING CONVERSION GIVES A B36TC A HUGE BOOST

By Bill Cox | Photography By James Lawrence



IT'S A REALITY NONE OF US LIKE TO THINK ABOUT, BUT AVGAS IS PROBABLY ON ITS WAY OUT. It won't happen next year or the year after, perhaps not even for another 20 years, but it's likely avgas production will be phased out in the not-too-distant future.

Profit usually demands volume, and profit is all the oil companies understand. Many refiners have stopped producing avgas already; others are trying to exit the market gracefully. That will leave the industry to turboprops and jets (and possibly diesels as well—the jury is still out on that).

Availability isn't yet a problem in the U.S., but try to operate a piston plane overseas and you find fewer FBOs willing to carry avgas. Jet fuel may be cheaper, but the volume is huge and only expected to increase.

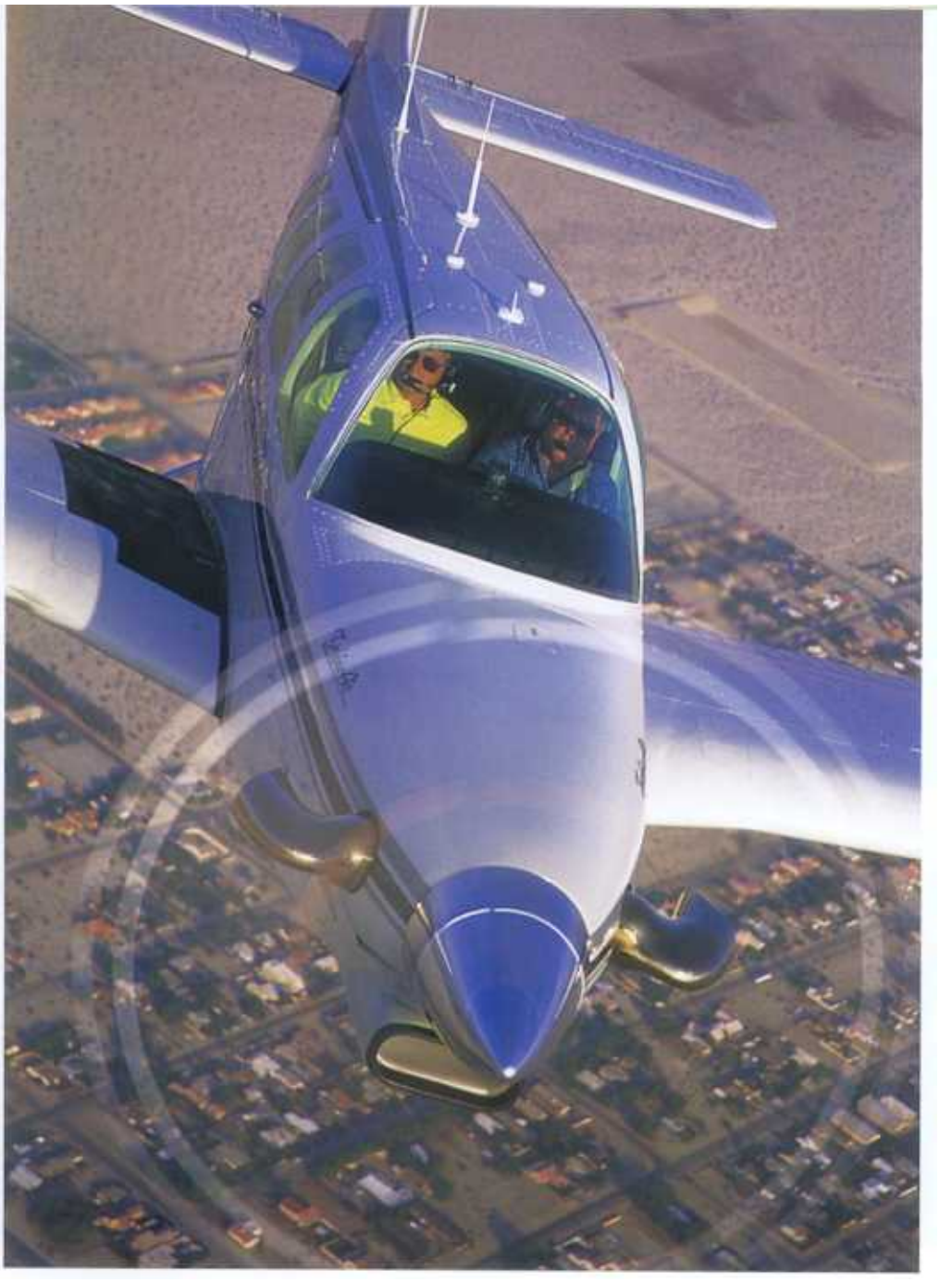
Darwin Conrad and Jeanie Sadler of Rocket Engineering in Spokane, Wash., understand the problem very well. That's why they're redirecting all their efforts at converting piston airplanes to turboprops. Conrad made his reputation in the mod business by converting Mooneys from 200 to 300-plus horsepower, specifically the normally-aspirated Missile and the turbocharged Rocket.

By the mid-'90s, however, Conrad and Sadler recognized that the future was in the far more reliable turbine engines, estimated by some safety statistics to be 50 times more reliable than pistons. For pilots who operate regularly at night, over water or mountains or in IFR conditions, a turboprop makes eminent sense.

Accordingly, Conrad and Sadler turned their attention to the Piper Malibu/Mirage. Conrad is an engineer and test pilot extraordinaire and, in conjunction with entrepreneur Warren Wood, he came up with a 560 shp, Pratt & Whitney PT6A-34 conversion for the popular pressurized Piper.

Since he received certification for his Jetprop STC in 1998, Conrad and company have managed to convert an impressive share of the Piper Malibus and Mirages. By the time you read this, Jetprop LLC will have converted its 110th airplane to turboprop power. Considering that Piper has built only about 950 Malibus in the 20-year model run, and some of those are no longer flying, Jetprop LLC has converted about 12% of all existing Malibus, roughly one of every eight PA-46s still in the sky.

And therein lay the problem. The partners in Rocket Engineering knew the supply of Malibus was limited, few



The Turbine Air's beefed-up features include a pressure fan (right) that filters jet fuel odors overboard and a reduced-weight turbine engine that allows the airplane to climb 17,500 feet in less than 10 minutes (top right). Even its avionics panel includes great gadgets such as the Avidyne FlightMax 450, and a Garmin 530 and 430 (above), making even the most unimpressionable pilot a wide-eyed fan.

COMPARISON CHART

	Turbine Air Bonanza	Beech B36TC Bonanza
Price:	$400,000*	$678,100**
Horsepower:	500	300
Max T.O. Weight (lbs.):	4050	3850
Max Useful Load (lbs.):	1250	1030
Max Climb (fpm):	2500	900
Max Cruise, FL250 (kts.):	250	195
Max Cruise, FL180 (kts.):	225	185
Takeoff Dist. (ft.):	700	1400
Landing Dist. (ft.):	700	1300

* conversion only
** 2002 avg. eqpd. price

By replacing the piston engine with a 500 shp Pratt & Whitney PT6A-21 turbine engine, Rocket Engineering gave a regular Bonanza a whole new lease on life. This boost gave the Turbine Air 225 knots at 18,000 feet with 29 gph, 20% faster than its stock counterpart.

new ones were being produced and new conversions would become progressively tougher to find.

Why not, Conrad and Sadler reasoned, come up with a similar conversion for the Beech B36TC Bonanza? Like the Malibu, the B36TC is almost universally regarded by its owners as an ultimate single. Unlike the normally-aspirated A36, the B36TC uses the longer, stronger Baron wing, better suited for high-altitude flight and designed to support almost a ton more gross weight than the A36.

Rocket Engineering began development of a PT-6-powered Bonanza in early 1999. Calling on his considerable experience with P&W's most famous turbine product, Conrad chose a 500 shp variant, the PT6A-21, a turbine engine similar to the Piper Cheyenne I's PT6A-11. As with the Jetprop, Conrad mounted a header tank to feed the engine, this one placed under the cabin floor and between the wing spar carrythrough structure. The header tank raises total usable fuel from 102 to 112 gallons. Conrad also installed a pressure fan to draft jet fuel odors overboard, a major consideration in unpressurized, turbine-powered planes.

Another change mandated in the switch from piston to turbine was a backup elevator trim tab actuator. To help offset the reduced weight of the P&W engine, Conrad mounted the

THIS PAGE: Rocket Engineering moved the Turbine Air's propeller two feet farther aft to offset the new engine's reduced weight. OPPOSITE PAGE: The Turbine Air seems happiest at high altitudes, especially at 16,500 to 17,500 feet, where speed and convenience make a good compromise.

The finished airplane came out 20 pounds lighter than the original, but was granted 200 pounds more gross weight. In conjunction with the heavier fuel load and other changes, the result was a max fuel payload increase of almost 70 pounds.

spinner almost two feet farther forward, moved the existing battery from under the cowling to the rear of the aircraft and supplemented it with a second battery.

Along the way, there were the inevitable minor changes. The FAA limited airspeed to 171 knots IAS, almost 30 knots slower than the B36TC's limit speed and required installation of an airspeed warning device to sound at five percent over redline.

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Conrad knew there was a certain element of risk in hanging a turbine engine on the nose of an unpressurized airplane. With the possible exception of Cessna's Caravan, the DeHavilland Twin Otter and a few other weight-lifters, there are few unpressurized turboprops on the market.

Because the B36TC isn't inflatable, Conrad knew he needed to somehow adapt the airplane to high altitude, since Bonanza owners are more interested in speed up high than hauling cargo down low. Trouble was, turboprops and jets do their best work at or above 18,000 feet, and without pressurization, altitudes above 14,500 feet demand the nuisance of an oxygen mask or cannula. Operating a turbine engine at low altitude consumes huge amounts of fuel unless you reduce power dramatically and settle for piston airplane speeds, a practice that partially nullifies the benefits of the conversion in the first place.

Conventional cannulas and masks were out of the question. Many pilots regard cannulas as too invasive, and masks almost inevitably chafe after a few hours. Conrad reasoned the kind of pilot who might consider an airplane in this class wouldn't be liable to put up with conventional oxygen delivery systems.

Accordingly, Conrad and Sadler decided to design something better. The result was an ingenious oxygen

stalk that attaches to any Bose headset and rests adjacent to the pilot's nose. The system provides the same effective oxygen flow as a conventional mask but doesn't touch the pilot's face. A pair of strategically placed ports blow strong streams of oxygen directly into the pilot's nostrils.

Contrary to what you might imagine, the system doesn't waste much O_2. Consumption is comparable to a mask, so you can use the charts in the B36TC *POH* to determine oxygen endurance.

Though Conrad has already flight-tested the system to 23,000 feet (with appropriate blood/oxygen level monitoring equipment), the Air Boom Cannula is currently approved to 18,000 feet. He plans to certify it to FL230 sometime down the road. Conrad and Sadler's oxygen unit may soon be available on the aftermarket for "about $399," says Conrad. Transparency was the whole idea behind the oxygen system, and during my flights, I barely knew it was there. Level at 17,500 feet, I could feel the slight flow of oxygen blowing against my nose, but it was hardly obtrusive.

Predictably, substituting 500 shp for the Bonanza's original 300 hp makes the biggest difference in climb. With so much power under your right palm, the airplane jumps off the ground and starts uphill without the need to pause and catch its breath. Plan on an initial 2,300 fpm from sea level with full fuel and two aboard, 2,000 fpm at gross. Such vertical speed means you can reach 17,500 feet in less than 10 minutes, and Conrad's market survey suggests the rare air just below positive control airspace is where most Turbine Air pilots will operate.

"If the weather's good and the winds aren't that strong on the tail up high," says Conrad, "16,500 or 17,500 makes a good compromise between speed and convenience. You can pretty much make your own routes at those altitudes, you're well above the highest terrain in the Southern 48 and there's virtually no traffic to worry about. The airliners are usually well above 25,000 feet and most other general-aviation flights are below 12,000 feet."

At 18,000 feet or slightly below, plan on 225 knots, about 40 knots quicker than the stock B36TC. For those pilots willing to loft to 25,000 feet, the Turbine Air preserves enough thrust to push the Bonanza along at a max 250 knots while pouring 29 gph through the engine. Before you condemn the high fuel burn as too extravagant, consider for a moment that fuel costs 10% to 15% less on the Turbine Air. The standard B36TC Bonanza scores a max cruise of 195 knots at the same height on 18 gph. Work out all the math and the Turbine Air's fuel cost comes out to $.23/mile, while the B36TC runs, guess what, at $.23/mile. The difference is, you'll fly 20% faster with the turbine on the nose with 50 times the reliability.

But everyone knows turboprops cost more to buy and maintain than pistons, despite the fact that they enjoy a TBO typically twice that of most piston powerplants. In the case of the Turbine Air Bonanza, Conrad figures total hourly cost just under $150/hr. You *do* have to buy the conversion first, however, and that will cost you right at $400,000 with a typical mid-time Continental to trade.

It's inevitable that many pilots will compare the new Turbine Air Bonanza with the Jetprop Malibu, but because the Bonanza isn't pressurized, operating practices of the two airplanes are a little different.

When I flew the Turbine Air in conjunction with the 2002 AOPA Convention in Palm Springs, Calif., I had a very definite Jetprop mindset. Though I'm far from an expert on the

turbine-powered Malibu, I've logged perhaps 150 hours in the type, delivering a half-dozen conversions to or from Europe. I've also made another dozen or so deliveries of conventional piston-powered Malibus to Japan, Australia and Europe. That experience has fostered some pressurized habits that are ill-advised in the Turbine Air.

The standard rule in a turboprop is to fly as tall as possible for as long as possible, far up in the high sky where the air is thin, drag is reduced and the engine is most efficient. In a Jetprop, most pilots typically operate at 23,000 or higher on every flight. When it's time to descend, we simply reduce thrust to 600 to 800 pounds, keep the speed near redline (in smooth air) and start downhill at 1,500 to 2,000 fpm. Pressurization takes care of our ears during the descent, and if we time it right, we arrive at the airport at pattern altitude.

It's a little more complicated in the Turbine Air. With no pressurization system to regulate the increasing atmospheric pressure on your ears, descents in excess of 700 to 1,000 fpm can be downright painful. A more casual 500 fpm is better, and that can mean starting down from cruise altitude 30 to 35 minutes out.

As with the Jetprop, there's essentially no downside to the turbine engine in the pattern. Approach speeds can be as you like them, as slow as 80 knots if there's a need. Once on the runway, another benefit of turboprops is reverse thrust, and on the Turbine Air, that means a significantly reduced runway requirement, only about half the asphalt you'd use in a stock B36TC.

The Turbine Air joins the Tradewinds Bonanza in the turbine conversion class. The latter STC uses an Allison 250 B-17F/2 helicopter engine, rated for 450 hp, and the mod costs $495,000.

With the price of the least expensive production turbine single, Piper's Meridian, at well over $1.5 million, Rocket Engineering's turbine conversion can make good sense for owners of B36TCs Bonanzas. It's one way to convert what was already one of the best single-engine airplanes to even more performance and reliability. PJ