A performance **Bonanza**

Hitting the Holy Grail—
go faster, carry more, burn less

BY RICK DURDEN

Kirk Heiser travels. Frequently. As president of an architectural firm based north of San Francisco, he flies a turbocharged single some 350 to 400 hours a year throughout California and Oregon for his business. The nature of his work means he almost invariably must take engineers with him on his trips, which can be as long as 800 nautical miles.

Until recently he used a turbocharged, retractable-gear Cessna 182 because it met his needs for reliability, load carrying, and ability to go high and use high-altitude airports. When the needs of the job evolved to where he had to take three or four engineers with him, rather than one or two, Heiser reluctantly started looking for a larger airplane. The Cessna T210R was the logical step, but the ones that came on the market during his search had not been well maintained and were ruled out. A twin burned too much fuel for the load it carried, so he kept looking at turbocharged singles. A friend suggested the Beech B36TC Bonanza, but the reports of problems with the powerplant installation caused him to reject it—until the first B36TC modified by Tornado Alley Turbo (TAT), in Ada, Oklahoma, N32BL, appeared on the market.

N32BL had started life as one of the few B36TCs built; a promising hybrid airplane that married the model A36 Bonanza fuselage (adding a built-in oxygen system) with a Continental TSIO-520 engine and the longer wing of the Baron, allowing a bump in maximum gross weight and fuel capacity without the use of tip tanks, as the Baron wing does not allow for their installation. Sadly, the B36TC didn't quite live up to its promise, as many owners discovered. N32BL's engine, as with many other stock B36TCs, ran extremely hot, often requiring the previous owner to make step climbs to keep cylinder head temperatures (CHTs) below redline. It would not run smoothly at lean-of-peak power settings, so to keep CHTs

PHOTOGRAPHY BY KEVIN WING


N32BL

even down to the 400-degree Fahrenheit range in cruise it had to be run so far rich-of-peak exhaust gas temperature (EGT) that fuel flows averaged 20 to 23 gph, negating the benefits of the extra fuel on board.

At the same time, the folks at TAT, the same people who had earlier developed the hugely successful GAMIjectors for balanced fuel flow in fuel-injected engines, were besieged with requests from turbocharged Bonanza owners trying to find a way to get their airplanes to run cooler at reasonable fuel flows. George Braly, one of the principals of TAT, and his team reasoned that because the TSIO-520 engine's 7.5-to-1 compression ratio wasn't nearly as thermodynamically efficient as the 8.5-to-1 compression ratio in its slightly larger brother, the IO-550, it would make eminent good sense to turbonormalize the IO-550 and drop it in the B36TC airframe (turbonormalizing does not increase manifold pressure above ambient pressure at sea level as is ordinarily done with turbocharging; it just allows sea-level power to be maintained when well *above* sea level). Increased efficiency would mean there would be less waste heat to deal with; TAT would put in a more sophisticated baffling system to make the cooling airflow go where it should, further reducing the heat problem, and install cowl flaps (the B36TC did not come with them) to give the pilot another tool for controlling the heat in the engine room. TAT hypothesized that CHTs could successfully be dropped well below the 400-degree-F mark that gives those who know the effects of heat on aluminum engines the willies. On top of being able to carry sea-level manifold pressure to more than 20,000 feet, the engineers at TAT figured that the nice, big Baron wing would countenance a further increase in gross weight to the point that the cabin could carry four adults and baggage even with the 109-gallon fuel tanks filled to the brim.

In November 2002, N32BL was delivered to Ada to have a turbonormalized IO-550 with a Hartzell scimitar prop and a few other goodies installed, and to be used for the flight testing needed to get the FAA to issue a supplemental type certificate (STC) for the engine and prop change as well as a gross-weight increase from 3,850 to 4,042 pounds.

The turbonormalization conversion took some time, as the airplane had to go through very nearly a full developmental flight-test program, starting with cooling climbs and ending with noise compliance, in order to satisfy the involved STC process. While TAT has significant experience obtaining STCs and says very good things about the ability and dedication of the FAA personnel with whom it works, the endeavor was still slow.

In October 2003, N32BL emerged from its cocoon, STC in place and, with the new, higher gross weight, the ability to fill the tanks and still carry 798 pounds in the cabin. The FAA-approved pilot's operating handbook (POH) supplement revealed that operation of the IO-550 at recommended lean-of-peak power settings would generate a range of 1,000 nm, with reserves. The gross-weight increase raised the takeoff weight by 192 pounds. The old 3,850-pound gross weight became the maximum landing weight and zero-fuel weight.

In 2004, Kirk Heiser bought N32BL because, with the conversion, it appeared to be able to do everything needed for his business: carry four to six people comfortably, go high, and go fast. After putting 50 hours on the airplane in a matter of weeks, Heiser kindly offered me a chance to fly it. Walking up to the airplane reveals that the ugly-duckling scoop and bumps on the cowling that characterized the stock B36TC are gone, an immediate indication it will be faster. Inside, it's pure Bonanza comfort. Startup and taxi are exactly as thousands of Bonanza pilots have experienced over the past 55 years or so. Takeoff, even at 4,042 pounds, is an exercise in silky acceleration, and with the long wings, it feels like a lightly loaded A36.

Once the gear comes up and climb is established, the workload drops to nearly nothing. The throttle is left full forward, as is the prop, because the engine is rated at 300 continuous horsepower and runs at its best when developing every bit of it. All that the pilot need do is hold a 115-to-120-knot cruise climb, monitor fuel flow, and keep turbine inlet temperatures (TITs) between 1,250 and 1,290 degrees F to make sure that internal combusting continues appropriately. TAT's Braly refers to "parking" the engine at the right fuel flow and TIT so that the engine won't hurt itself as it takes the airplane rapidly to altitude. I saw, and Heiser confirmed, CHTs at about 350 degrees F in the climb as opposed to the 400 to 410 degrees reported on N32BL prior to the conversion. Rate of climb generally runs right at 1,000 fpm. The POH supplement provided by TAT is remarkably detailed and has refreshingly candid and in-depth guidelines for engine operation in all phases of flight. It sets a maximum CHT of 380

The old panel was "unreliable," says the owner. It was completely replaced by Pacific Coast Avionics Corp. (see "A Pilot's Perfect Panel," page 80). The interior is now classic Bonanza, roomy, comfortable, and stylish.


N32BL

A pilot's perfect panel


Kirk Heiser

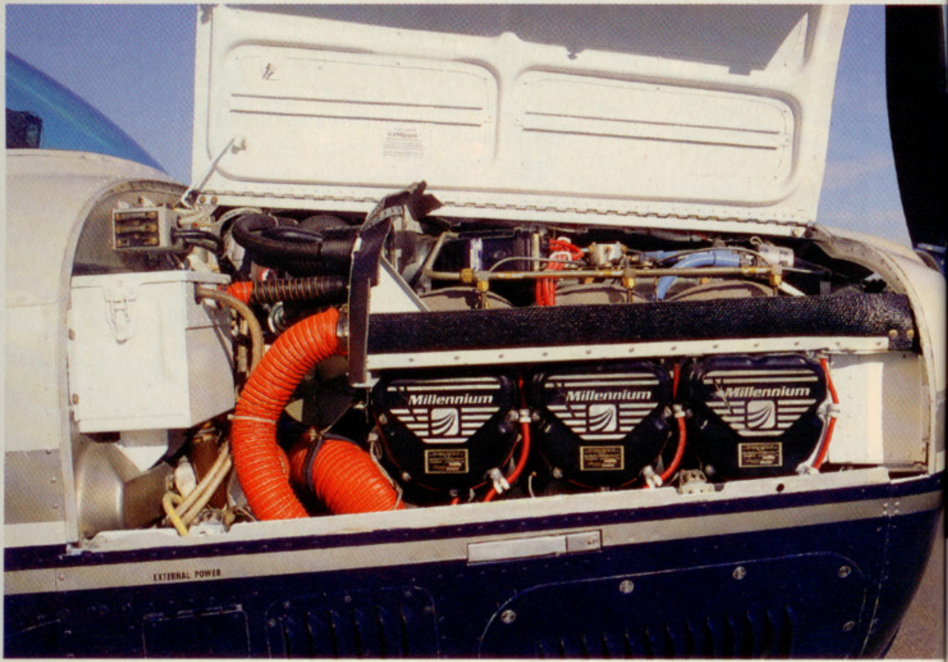
Kirk Heiser's demanding work schedule often forces him to fly in marginal weather. It was immediately apparent that the existing avionics installed in N32BL were unreliable for actual instrument use. "It was as if the Wright brothers had installed the panel," Heiser said wryly.

He carefully selected an avionics shop capable of fabricating a new panel—bringing it up to date to a more modern, ergonomically friendly layout to help reduce pilot workload in instrument conditions. Pacific Coast Avionics Corp., of Aurora, Oregon, installed a new Bendix/King KI 825, a direct replacement for the HSI (horizontal situation indicator). Coupled to the WX-500 Stormscope, it provides lightning detection, and future terrain awareness capability is scheduled to be installed as soon as the system becomes available. A Garmin GNS 530/430 combination and backup localizer and glideslope needle are part of the panel, all coupled to the flight director and autopilot. This allows for an instrument platform aircraft that is capable of providing long-range, high-speed, and great load-carrying capabilities.

Heiser's concern for safety is also apparent, as he recently equipped the airplane with two portable backup emergency oxygen systems that supplement the built-in system. "It's a beautiful panel," Heiser now says. "And now it's as safe as a newer airplane." ***—Julie Summers Walker***

degrees F during climb, much lower than is seen on most big-bore engines, which should do a great deal to maximize engine life.

In cruise, the turbonormalized IO-550 runs very smoothly during recommended lean-of-peak EGT operations. At 17,000 feet true airspeed settles down at 198 to 200 knots with fuel flows at 16.8 to 17.2 gph, not only faster than the unmodified airplane but also at a savings of more than 5 gph from before. The TAT B36TC is fastest at Flight Level 220, where it turns out 212 knots true airspeed; although those who are looking to get the performance benefits without going on oxygen and fly in the 10,000-to-12,000-foot range will see about 192 knots true at 17.2 gph.



For pilots used to turbocharged airplanes almost invariably being slower than their normally aspirated stablemates below about 8,000 feet while sucking more gas, the turbonormalized B36TC provides quite a surprise in that it can efficiently stay low when fighting headwinds; at 3,000 feet it trues out at about 180 knots while only burning a little more than 17 gph. At 6,500 feet with the fuel flow pulled back to 15.5 gph I observed a true airspeed of 173 knots. The TAT B36TC is truly turbocharging for flatland pilots as well as for those who fly in the mountains.

What does one have to pay for extra speed, increased useful load, and more range? Getting any one of the three on a certificated airplane isn't cheap, and getting all three is virtually unheard of, so the base price of about $86,000 for the conversion is not out of line. For that sum, you get the speed, weight, and range increases via an STC that starts with an IO-550 that has undergone a blueprint overhaul with Superior Air parts Millennium cylinders and components to TAT specs; it is turbonormalized

The IO-550 engine now has Superior Air Parts Millennium cylinders and is turbonormalized with GAMIjectors installed (left). A Hartzell scimitar prop was also installed (above).

and GAMIjectors are installed. Once mounted on the airframe, the cowling is reworked to reduce drag, improve cooling airflow, and cowl flaps are added; then the entire assembly is baffled with techniques and materials developed by TAT to optimize cooling. The induction system is cleaned up and a more robust alternate air intake door is added. The gross-weight increase of 192 pounds increases empty weight by less than 50 pounds, much of which is a new, heavier exhaust system. Most owners opt for the change when it's engine overhaul time, so the mod is about 2.5 times the cost of a very good overhaul. Adding the Hartzell scimitar prop increases the cost by about $7,000. There are a few other components that can be installed by TAT, which, along with a complete annual inspection, can drive the cost to $100,000. Those who have had the conversion indicate that getting back an airplane that outruns and outdistances virtually any piston-engine airplane in the world while carrying four adults is worth the money, particularly when there is nothing on the new-airplane market that can come close, even at multiples of the price.

The "perfect" personal transportation airplane has been the stuff of conversation among pilots since Wilbur and Orville built their second airplane. There are those who like large round numbers and thus insist that for an airplane to be in the running for "perfect" it has to be able to go 200 knots for 1,000 nm. There are very few piston-engine airplanes, single- or twin-engine, including homebuilts, capable of clearing that hurdle. Of those, few can carry much of anything in the cabin when doing so. Going to turbine equipment increases the odds of the airplane being capable of meeting the goal, but elevates the cost of entering the contest beyond the wallet of all but a few pilots. However, even that step may not work, because for most turbine singles, which face the problem of much higher specific fuel consumption than that of pistons, the idea of being able to go 1,000 nm is tenuous, and with more than two aboard, out of the question. Tornado Alley has taken a capable airplane and for about $100,000 transforms it to meet the ideal so many have been seeking for so many years. AOPA

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