FIRST LOOK: BEECH

TURBO-BONANZA

Beech Aircraft returned to the single-engine, turbosupercharged aircraft market when it announced the A36TC last fall. From 1966 to 1970, the company produced 132 V-tailed turbo's, the model V35TC.

The powerplants in the two models are related, both in the Continental TSIO-520 series, and the turbosuperchargers remain Garrett AiResearch, but a lot of learning and refinement separate them.

Operators had quite a bit of difficulty with the V35TC's and demand was not great enough to continue development. Turbosupercharging of light aircraft engines wasn't new back then, but there was a necessary learning curve for both manufacturers and operators.

The TSIO-520-UB powerplant of the A36TC reflects improved technology in materials, design and manufacturing and significantly greater operational knowledge.

Steps have been taken to help operators, too. Beech has developed a packaged self-teaching system for the A36TC, which covers the powerplant and its operation, and high-altitude physiology. The operating handbook is well organized and thorough, and contains lots of precise information on proper power management. Careful attention to both is strongly recommended to anyone interested in getting best utilization and getting close to the 1,400-hour TBO.

The 300-hp engine is built to what Beech and Teledyne Continental call the "minimum horsepower concept," which they originally worked out for the 58TC and 58P Baron engines two years ago. The minimum in this case is a minimum guaranteed power. Normally accepted variation in power delivered on any engine series ranges from minus 2% to plus 5%. Minimum horsepower mills have a tolerance of from 0 to plus 5%.

The engine's critical altitude (the altitude on a standard day at which the turbosupercharger wastegate is fully closed and the engine delivers full rated power) is 22,000 feet. Maximum operating altitude is 25,000 feet, where the engine will deliver 80% power. Manifold pressure is automatically regulated by a variable absolute pressure controller. Unlike the fixed wastegate used on many single and light twin turbo systems, the automatic wastegate control will maintain any selected manifold pressure regardless of altitude changes.

Maximum rated power is delivered at 2,700 rpm/36 inches, and there is no time limitation. Pilots in a hurry can maintain full power in climb up to Flight Level 220. Maximum manifold pressure is 39.5 inches and is controlled by an overboost relief valve.

Power management during climb and descent, once power has been set, is based on fuel flow and maximum turbine inlet temperature (TIT) of 1,650°F. Mixture and fuel flow are critical to cylinder head cooling; fuel is as important to maintaining temperatures as air flow. This is true of quite a few turbo installations and results in higher specific fuel consumption. In normal operation fuel is delivered by both the engine-driven fuel pump and the auxiliary electric pump. If the engine-driven pump fails, the emergency pump will not deliver sufficient fuel flow for normal operation above 15,000 feet and temperatures cannot be maintained at normal operating levels at high power settings.

At recommended climb power (2,600/34 inches) fuel flow ranges from 28 gph at 15,000 feet and increases to 30 gph up to critical altitude.

Leaning is recommended during descent. Minimum recommended power setting is 2,200/18, and the mixture should be leaned to peak TIT to maintain adequate temperature and to prevent plug fouling.

The most complicated piece of equipment the pilot controls on the airplane is the electric auxiliary fuel pump system. There are two switches to operate the varying modes: an emergency,

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Improved engine technology, easy handling mark the "reborn" Turbo-Bonanza

high-boost switch located to the left of the flap selector, which is used for priming during engine start and if the engine-driven pump fails; and an off, low and automatic selector next to the throttle, which is usually placed in low or auto for maximum performance climbs and cruise. Engaging the emergency pump with the auxiliary pump in the low or automatic setting will override the latter.

The automatic mode enables the pump to sense fuel pressure demand and switch from low to high boost when necessary. Failure of the pump while in use during cruise, with its resultant reduced fuel flow, will cause TIT to increase, and a power reduction or a descent will be necessary.

The mating of the engine to the airframe was not yet in production form at the time of our evaluation. Product development has taken 18 months from the commitment to go ahead to initial production. Our evaluation aircraft, N36TC, is one of two preproduction test vehicles.

The almost-end product bristles with gills, louvers, lips and air intakes all the way around the lower half of the cowl. A good bit of the development program focused on good cooling flow without using movable cowl flaps. We questioned the need to eliminate them on such an expensive, large and sophisticated single. The basic answer was that this type of cooling drag costs only 1.5 knots at cruise.

The arrangement is able to handle the required demonstration of normal operating temperatures during standard temperature plus 40°C at the airplane's maximum operating altitude.

Edo-Aire Mitchell's new Century IV autopilot, including yaw damper, is installed on N36TC. During certification of the installation, the FAA expressed concern about the effects of runaway trim or other severe pitch upset during high-altitude operation. An accelerometer or G-limiter was installed in the system to automatically sense abrupt pitch changes and disconnect the autopilot's pitch mode.

Base price of the TC is $98,000—$10,800 more than the normally aspirated A36. The higher price includes the turbosupercharged, minimum horsepower concept engine, TIT gauge, three-bladed propeller, a 50-pound-higher gross weight and a redesigned, higher capacity heater to handle the high-altitude chills.

Both versions of the biggest Bonanza incorporate changes introduced for this model year. One shortcoming of the A36 with a full passenger load is the inability to stow baggage out of the cabin. Passengers have had to sit on it, hold it in their laps or put it under their feet. An extended baggage compartment has been added as an available option, which will hold 70 pounds in its 10 cubic feet behind the fifth and sixth seats. It will require additional care in calculating weight and balance, since the compartment is well aft and the A36, like practically all other aircraft, is not a "load whatever it'll hold and go" airplane.

This year, both models have a 15° approach flap setting, which can be selected at airspeeds of up to 152 knots (175 mph), the same as the maximum gear extension speed. It can help to get the airplane down quickly when ATC keeps you high until the last minute.

Two oxygen systems are available options, either 49 or 76 cubic feet capacity. Both are built in. The larger system costs only $100 more and adds a mere 9 pounds to equipped empty weight. It would seem to be the one to buy, since duration for four people at 25,000 feet is 1.5 hours with the smaller system and 2.5 hours with the larger.

If you like flying Bonanzas, you'd enjoy the A36TC. The controls are light, well harmonized and responsive. It doesn't feel like a heavy airplane and airwork is a lot of fun.

One doesn't normally spend well over $100,000 to bore holes in the sky, however. During our brief time with the airplane we concentrated on handling and mission profiles.

All ground and preflight checks are straightforward. Access to the engine and accessories is very good. The top half of the cowl is hinged at the top. Two latches on either side make getting in so simple that it's a sin not to check the engine compartment carefully.

The big engine starts without fuss, and the only addition to the pretakeoff check is an auxiliary fuel pump test, which should be performed before the first flight of the day.

All of our flights were made at or very near gross weight. Average rotation speed was 75 knots, with the aircraft flying by 80. Best-angle-of-climb speed of 85 knots passes quickly and the aircraft accelerates to the best-rate-of-climb speed of 110 knots by the time the gear is up. We used the recommended cruise climb speed, 120 knots, for better visibility and cooling.

The aircraft is stable in slow flight and in the approach configuration and behaves well in moderate turbulence. Stalls in all configurations are preceded by strong buffet. Recovery is quick and without trouble.

We flew the aircraft to 22,000 feet

to check its manners in the thin air. Initial climb speed of 129 knots was reduced to 110 above 12,000 feet. The average climb rate was slightly less than 1,000 fpm and was still 700 fpm at 21,000. The airplane can be made to get up faster, using full power and best-rate-of-climb speed, but temperatures would have to be monitored closely on warm days and the high deck angle makes forward visibility difficult.

During extended climbs, pitch attitude must be carefully maintained as small changes significantly affect climb rate.

The Turbo Bonanza is stable and well behaved at altitude. We set 75% power (2,400/29) once established at FL 220. Indicated airspeed was 139 knots, true was 200 even and fuel flow stabilized at 17.2 gph.

Descent takes about as long as climb, and in this respect the airplane shares a shortcoming with most other turbosupercharged general aviation aircraft: it needs some device to provide faster descent rates without either supercooling the engine or having to drop gear and flaps. There are many times when center or approach want both a high descent rate and good speed.

Some time ago we discussed the problem (at least we consider it a problem) with another airframe manufacturer's representative. His solution was to refuse the clearance, but that doesn't work in today's high-density areas unless you want to waste the day being vectored endlessly—and destroy the whole purpose of operating in that environment.

The equipped price of N36TC is $154,970, $46,565 of which is for the full Collins avionics and Edo-Aire Mitchell autopilot systems. Beech's optional equipment lists are as long as anyone's, although the bulk of the options are avionics.

Buyers can select five "Super Utility" packages for their A36. They range in price from $5,700 to $19,995 and include club seating, soundproofing, large fuel tanks and an autopilot. The various autopilots offered—Bendix, King and Edo-Aire—account for the price differences.

Other available options, aside from avionics, include propeller anti-icing (which is available on all Bonanzas now), exterior and interior lighting systems (very necessary), oxygen (ditto) and such niceties as optional interiors.

That's a lot of money for a single-engine airplane, but the A36TC, as with most Beech products, is practically built-to-order. A maximum of 40 TC's will be built this year, and the factory states that retail orders extend into 1980.

The Turbo-Bonanza is a big, comfortable, good flying airplane. We'd be surprised to see many in a workhorse role. It's more likely they'll see duty as flying Cadillac or Mercedes limousines . . . or station wagons.—E.G.T.

The A36TC bristles with gills, louvers, lips and air intakes to get away from cowl flap drag

BEECH A36TC TURBO-BONANZA

Basic price: $98,800
Price as tested: $154,970

Specifications	
Engine	Teledyne Continental TSIO 520 UB 300 hp at 2,700 rpm
Propeller	McCauley constant speed 3-blade, 6 ft 8 in dia.
Wing span	33 ft 6 in
Length	27 ft 6 in
Height	8 ft 5 in
Wing area	181 sq ft
Wing loading	20.2 lb/sq ft
Power loading	12.2 lb/hp
Passengers and crew	6
Cabin length	12 ft 7 in
Cabin width	3 ft 6 in
Cabin height	4 ft 2 in
Empty weight	2,262 lb
Equipped empty weight (as tested)	2,481 lb
Useful load (basic aircraft)	1,404 lb
Useful load (as tested)	1,388 lb
Payload with full fuel (basic aircraft)	944 lb
Payload with full fuel (as tested)	725 lb
Gross weight	3,650 lb
Ramp weight	3,666 lb
Fuel capacity (standard)	50 gal (44 usable)
Fuel capacity (with optional tanks)	80 gal (74 usable)
Oil capacity	12 qt
Baggage capacity	400 lb (37 cu ft)
Baggage capacity—optional	470 lb (47 cu ft)

Performance	
Takeoff distance (ground roll)	1,176 ft
Takeoff over 50 ft	2,012 ft
Rate of climb (gross weight)	1,165 fpm
Maximum level speed	214 kt (246 mph)
Cruise speed (79% power)	
25,000 ft	199 kt (229 mph)
10,000 ft	180 kt (207 mph)
Cruise speed (75% power)	
25,000 ft	194 kt (223 mph)
10,000 ft	175 kt (202 mph)
Cruise speed (69% power)	
25,000 ft	186 kt (214 mph)
10,000 ft	168 kt (193 mph)
Cruise speed (56% power)	
25,000 ft	170 kt (196 mph)
10,000 ft	155 ft (178 mph)
Range at 75% cruise (with 45-min reserve)	
25,000 ft	672 nm (774 sm)
10,000 ft	635 nm (731 sm)
Range at 69% cruise (with 45 min reserve)	
25,000 ft	694 nm (799 sm)
10,000 ft	670 nm (771 sm)
Maximum operating altitude	25,000 ft
Critical altitude	22,000 ft
Stall speed (clean)	67 kt (77 mph)
Stall speed (gear and flaps down)	57 kt (66 mph)
Landing distance (ground roll)	770 ft
Landing over 50 ft	1,420 ft