TURBINE SINGLES

Three turboprops that make sense

BY EDWARD G. TRIPP

PHOTOGRAPHY BY ART DAVIS

Not all hangar flying is done at ground level. One Sunday morning, three of us were cruising at 16,000 feet on the start of a hopscotch trip around the nation. We were talking about the techniques involved in operating the model of pressurized twin we were flying, including altitude decisions and the maintenance history of the particular aircraft. I asked questions about the amount being banked each flying hour for such things as engine, propeller and turbocharger overhaul and avionics maintenance.

In less than two years of operation, the airplane was more than a third into its recommended time between overhaul, the propellers even closer, and the avionics had been a constant headache and cause for time out of service.

"A turboprop would be better in a lot of ways, but I can't justify one for the company," said the owner/pilot.

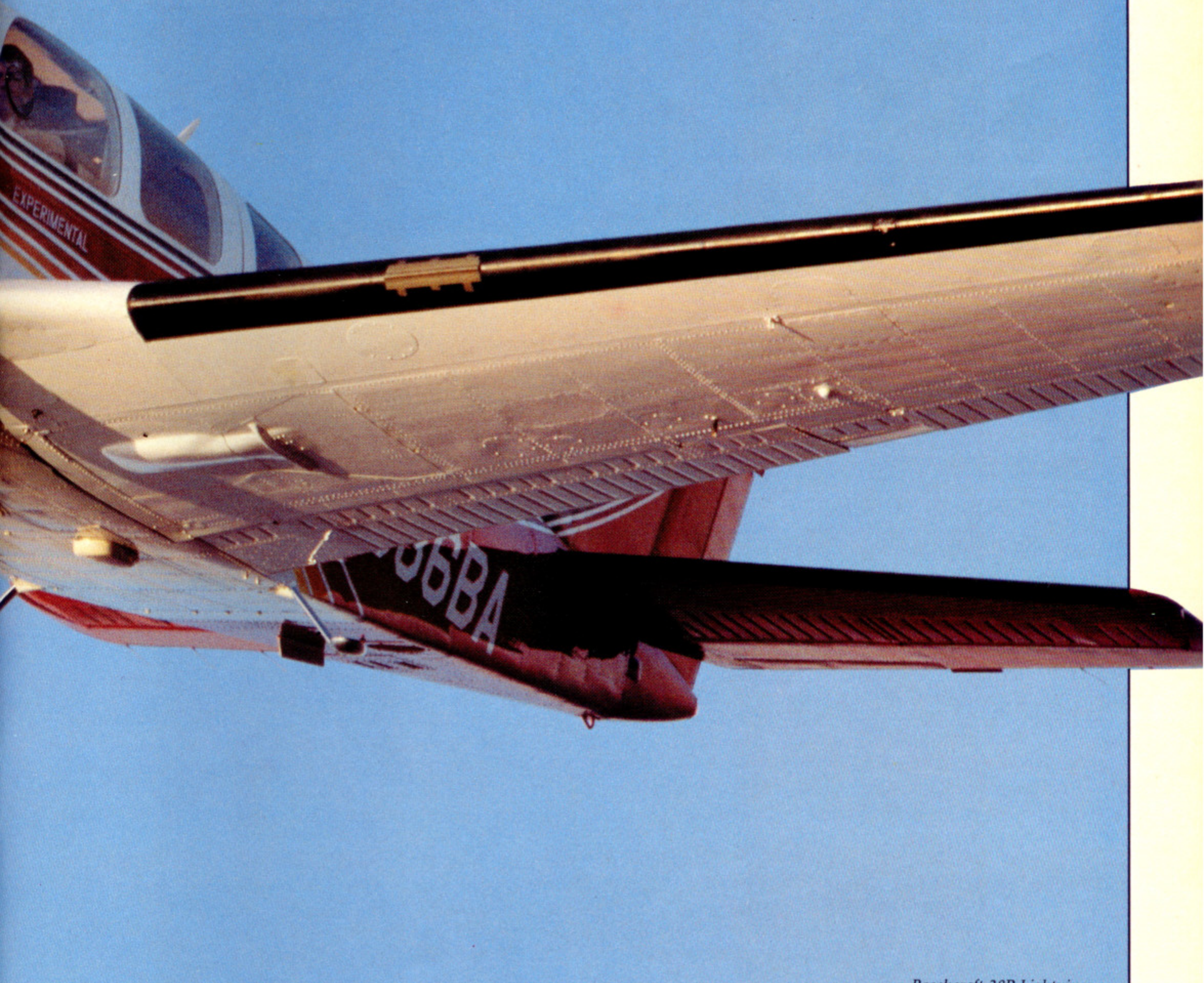
"How about a single-engine turboprop?" I asked.

"Why on earth would I trade these two for just one engine? Besides, it would have to cost every bit as much as this airplane," he said.

"Because of bleed air, to power deice boots, pressurization and environmental systems, for instance; beta range, to save wear and tear on the brakes and to make those winter landings a little less touchy; and perhaps as much as 10 years between engine overhauls if you operate and maintain the powerplant properly. In other words, higher reliability, the possibility of increased safety, greater operational flexibility, simplicity and lower costs over a period of years," I answered.

Beech Aircraft Corporation, Riley Aircraft Manufacturing, Incorporated, and Mike Smith Aero, Incorporated, all had announced and flown their solutions to the concept of single-engine turboprops by the time we made that flight. It was an idea a long time in coming, however, by mid-1982, it had arrived in a rush.

Someone recently suggested it was an idea that was ripe for development. Another disagreed, saying the time for single turboprops had arrived when Pratt & Whitney of Canada started



Beechcraft 38P Lightning

delivering production PT6 engines in 1964 and Garrett the TPE331 in 1965.

Whatever position you take on the history or appropriateness issues, turbine singles have arrived in what amounts to a flood on the scale of general aviation development rates. In addition to the Beech, Riley and Smith projects, there is the 700-shaft-horsepower (shp), Avco Lycoming-powered OMAC-1, a comparatively radical, canard aircraft whose development recently has slowed, and the Composite Aircraft Corporation modification of a Windecker Eagle. The latter, which was to have made its first flight early last fall, is powered by an Allison 250-B17C, flat rated at 360 horsepower.

These are not the first attempts to tie the higher power and operational simplicity—and higher specific fuel consumption, to be sure—of the turbine engine to the single-engine general aviation aircraft. One hybrid was certificated nearly 12 years ago: the Interceptor 400, a development of the Meyers/Rockwell (Aero Commander) 200. It coupled a Garrett TPE331 665-shp engine, derated to 400 hp, to the small and complex Meyers airframe. Pressurization was a mild 2.75 pounds per square inch, and the aircraft had a maximum operating altitude of 24,000 feet. The Interceptor 400 was capable of cruising at 275 knots with a range of 1,000 nautical miles. The initial price was $100,000 in 1971 (that rose to $125,000 in 1973). But no matter. The Interceptor did not make it.

In 1979, I had a chance to fly the Beech T-34C with a PT6 flat rated at 550 shp (see August 1979 *Pilot*, p. 86). I mentioned that it offered ". . .a taste of what might be available in the commercial marketplace in the future." Even at that time, there were several pilots who had asked to purchase one at whatever cost.

Pilots (and, more importantly, aircraft owners) who use airplanes for transportation—and the few to whom the price of a toy is no object—seem to be divided equally on the suitability of single-engine turbines. It is really the single versus twin argument with higher priced chips. Part of it is a matter of preference; part, a matter of available dollars.

There is another line of argument that appears in the few discussions I have had with people about turbine singles: the existence of a market. Some self-appointed experts posit that

At FL310, the Smith Prop-Jet delivered 290 knots on 34.5 gph—and it was still well below maximum power.

a limited sportsman market exists, but certainly not enough to make it worth the while of one company to develop and certificate a turbine single, let alone several.

Back in the dark ages of turbine engines for civil use, a few companies began developing business jets. Some observers became quite concerned at the high number of projects underway in relation to what they considered the total possible market. One expert claimed that the total world market did not exceed 500 buyers. Others limited it to the Fortune 500 and its counterparts abroad. Both groups of pessimists were proven wrong. Business jets and turbofans (with a little help from their turboprop cousins) quickly raised business aviation from the realm of the chairman's airborne yacht to a serious, proven business tool in a few years.

With respect to engines in general, the corollary that two is better than one (and three better than two, and four. . .) is that two is just double trouble. Back when fuel cost less than 20 percent of what it does now, I flew singles by preference. The overriding consideration was economic. A friend whose operation was a regular stop on the way west regularly would lecture me for flying singles at night and over mountains with the graven refrain: "The internal combustion engine is a collection of mutually competing and incompatible parts that constantly work to thrash themselves and their neighbors to pieces. Therefore, you need at least two." I quietly (?) maintained that he had more money and a higher operating budget than I had.

Do pilots want to fly as high as possible, as comfortably as possible? This rhetorical question is pretty well answered by the relative success of the Cessna P210 (see November 1980 and January 1981 *Pilot*, p. 32 and 69, respectively). Nearly 800 have been sold since the model came out less than five years ago. The current equipped price is stretching toward $300,000, which is what a twin turboprop cost not too

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many years ago. The P210 is many things, but it certainly cannot be labeled as something that was designed on a clean piece of paper to explore a new segment of the market. It has been demonstrated to be an imperfect proof of concept airplane. Yet, it certainly has served to both pioneer and prove the concept.

Now both Mooney and Piper have designed aircraft intended from the beginning to be pressurized, all-weather, high-altitude singles. The Piper PA-46 (see "Pilot News," p. 15) will be a production aircraft by this August (70 have been ordered by dealers already). The Mooney M-30 has been delayed nearly two years by the parsimonious investment attitude of Mooney's parent, Republic Steel (if any of you reading this are directors of that troubled firm, please pressure your colleagues to put a few dollars back into a worthwhile project).

Both companies are betting large sums of money that the market that Cessna proved to exist is sufficient to more than repay their investments.

From a personal viewpoint, it is far more satisfying to taxi up to the fuel pump after a long flight at altitude with a small passenger load and take on 80 or 90 gallons rather than 200 or more. It is also a lot less expensive.

In the past 20 years, we have learned a great deal about operating at high altitude—about the physiological, aerodynamic, weather, operational and systems needs. We have learned a great deal about the care and feeding of both piston and turbine engines.

While turbines gulp a great deal more fuel than gas burners, particularly at lower altitudes, turbine fuel is generally less expensive than gasoline, and it has the added advantage of being more readily available around the world (and less likely to be in short supply should another energy crisis occur).

Turbine engines also have been more highly developed than gasoline-powered powerplants. As a result, they have a longer in-service life, so long as they are operated and maintained properly. Several general aviation turboprop engines are now on an on-condition monitoring system that can extend time between overhaul and reduce overall maintenance costs.

The recommended time between overhaul of quite a few sophisticated, high power rated piston engines has been extended to from 1,800 to 2,000 hours. But the TBO on most turboprops has been extended to 3,500 hours, with an even longer in-service life a practical reality now.

Added to this is the systems support that turbines give the rest of the aircraft by bleeding air directly from the powerplant for anti-ice, deice and environmental systems. Two of the weak links in sophisticated piston-powered aircraft are the vacuum system and vacuum pump.

The piston engine is far from finished. The turbine is leading because it has solved several concerns more simply and because it offers some significant reliability advantages.

Without going into much detail of the nature of the two types of powerplants as they have been developed, the turbine has definite advantages in both operational and systems simplicity, while the piston leads in fuel efficiency. Operationally, the turbine powerplant is not as temperature-sensitive as the piston and is more inde-

With a PT6A-40, the 38P should give 275-knot cruise speeds over an IFR range of more than 1,000 miles.

pendent of associated systems or parts.

Simplicity has its cost: initial dollar outlay. So at this stage of development, the cost of a turbine single is going to compete with the cost of a pressurized piston twin.

In parts of the world, an unpressurized turbine single might compete with other aircraft, but that has more to do with availability of fuel and service capability than the operational characteristics and requirements that we in the western world are used to. What we are used to includes comfort, which means pressurization, and economic operation, which means the ability to operate at the highest practical altitude, particularly with the turbine.

Practical altitude, in turn, means not just cabin comfort and weather and weather-avoidance capability. To get relatively low fuel burn in a turbine requires operation at the highest possible altitude. This means not just the environmental atmosphere for the occupants. A high maximum altitude is worthless if it takes a long time—and a lot of fuel—to get there.

As a result, the combination of an aircraft's airframe (especially the aerodynamic surfaces and the occupant protection) and powerplant must be coordinated carefully.

BEECHCRAFT 38P LIGHTNING

The single-engine turboprop that Beech Aircraft Corporation disclosed last year was described by the company as a proof-of-concept and marketing vehicle. The company also said that the configuration, basically a 58P Baron airframe, might change as the program developed.

By September, the concept had been enthusiastically proved by Beech's dealers and a surprising number of customers who were willing to prove it with $20,000 deposits. The test aircraft had changed by then, also. The cowling had been redesigned, anti-ice and deice equipment added and some more work done on the environmental systems. (One problem all developers of turbine singles have to resolve is that of exhaust fumes entering the cabin. Exhaust airflow paths on the ground and in flight and careful location of fresh-air intakes to keep them out of the exhaust flow requires painstaking design and test work.)

Also by September, the company had decided to proceed with the certification of the Lightning with three engine options and to stick with the Model 58P-derived airframe with a redesigned empennage.

The second airframe, which will be the principal certification aircraft, should be constructed by mid-February and should fly by April. It will have the largest engine—a Pratt & Whitney PT6A-40 rated at 500 to 550 shp. (Beech has not set the power rating for any of the engines yet.) Initial goals include a cruise speed of at least 275 knots at 25,000 feet. Range with IFR

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THE HIGH AND THE MIGHTY

Performance always costs, but a turbine single demands more than money. It demands the very best in pilot training.

reserves is estimated to be between 1,000 and 1,100 nm. Pressure differential will remain at the 58P's 3.9 pounds per square inch (psi); cabin altitude at FL220 will be 10,000 feet.

Beech engineers say it is much easier to explore the widest envelope and highest power available and work back to less powerful engines than to work from low power up. If the design performance objectives are met (Beech people smile broadly when they talk about the performance goals, leading me to believe they consider them minimum levels), only the King Air 200 will be faster than the big Lightning.

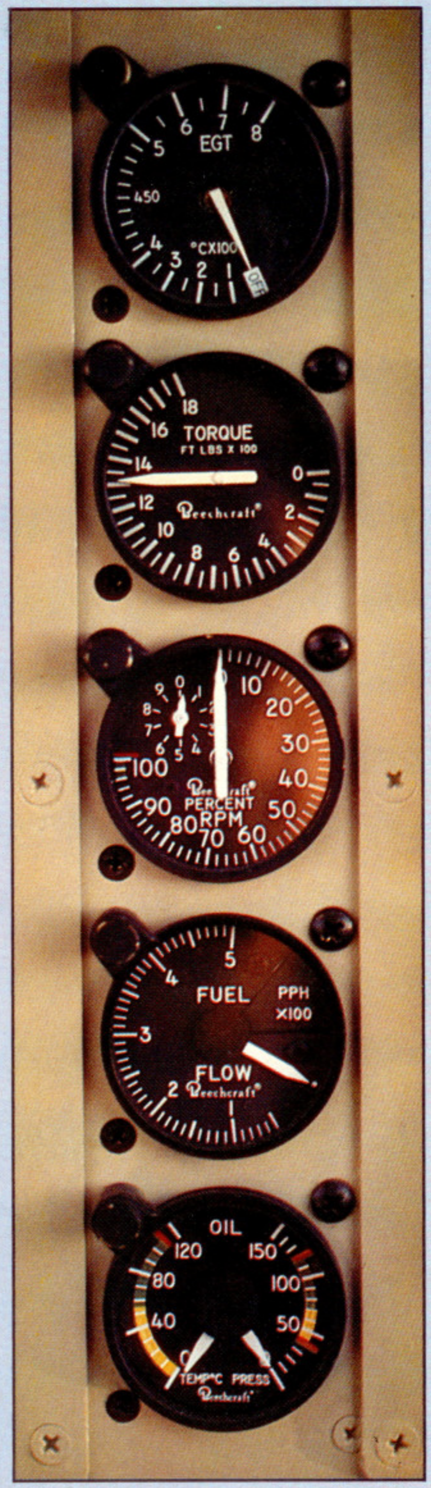
Beech's new president, Linden S. Blue, recently confirmed the company's plan to certificate two lower-powered versions (there was quite a bit of speculation that this would not be done; it is not only unusual, it is expensive). The mid-size Lightning will have a Garrett TPE331-9 rated at an estimated 450 shp; it will have a cruise speed of 235 knots. The lowest-power version will have a PT6A-130 rated around 400 shp and will cruise at 230 knots. Blue said that the most appealing feature of the smaller engine is a purchase price $100,000 lower than the big Lightning's and a 45-knot slower cruise speed at altitude. Base prices range from $495,000 to $595,000 for the three versions.

Anything else said about the Lightning program at this point is speculation. We have requested permission to fly the aircraft several times, but it looks as though the first chance is still at least six months away. Beech is using a proven airframe, so there should be no handling surprises. The company has built a lot of single-engine turboprops (the T-34C, unpressurized) and a lot of pressure vessels, and it has built more turboprop business aircraft than any other company.

The in-flight characteristics probably will be very much like anything else in the Bonanza to Duke product range. This would include the yaw instability in turbulence. If you buy one, be sure to equip it with a good yaw damper to reduce the work load and increase passenger comfort. The trade-off is well-balanced controls and crisp response.

There is little question that the Beech Lightning will be a good airplane. For the types of applications that the Beech Lightning is being designed, this will include good cockpit and systems layout as well as systems redundancy.

Turbine gauges: smaller, but the price of a bad scan can be higher.



The two performance changes I would like to see made are a higher pressure differential to make higher operating altitudes useful and longer endurance (more fuel).

It is worth noting that Beech is working on the inevitable concern about pilot qualification at the same time that the aircraft is being developed. The company plans to have its training program in operation before the first customer delivery in late 1984. It will incorporate what Beech describes as advanced technology training aids that have been developed by a division of its parent company, Raytheon. Beech intends to use a carrot where the FAA might decide to use a stick: An insurance program is in development. Blue says the cost differential will be more than enough to be the only incentive a customer will need to take the training.

Beech also is considering the installation of a torque-limiting device to preclude pilot-induced engine damage. Blue considers over-torquing through inattention to be a greater problem during a cruise descent than during takeoff or over temping during climb.

The company's approach makes a great deal of sense and reflects careful consideration of the operators who are already standing in line with their orders for the Lightning. □

RILEY TURBINE P-210

"Cessna makes some of the best basic airplanes in the world. They give me excellent airplanes to improve," said Jack M. Riley, AOPA 294058, during my recent visit to his facility at Palomar Airport in Carlsbad, California.

Riley has been tweaking Cessna and other aircraft for more than 30 years and is still thinking, calculating and dreaming at a time in life when most people are eagerly going to pasture.

Riley Aircraft Manufacturing is one of the very few—if not the only—aircraft modification firms with delegated authority from the FAA to issue supplemental type certificates. Last year, Riley announced plans to install a Pratt & Whitney PT6A-112 in a Cessna P210 airframe. The initial performance goals included a 3,000 fpm initial climb, 227 knot cruise at 23,000 feet and an IFR range of 750 nm with optional Flint tip tanks installed.

At the time of my visit, the prototype installation was about to undergo some changes with approval still anticipated later this month. If the date is met, it will be the first approved businessman/pilot turbine single on the market. Riley has 18 orders already.

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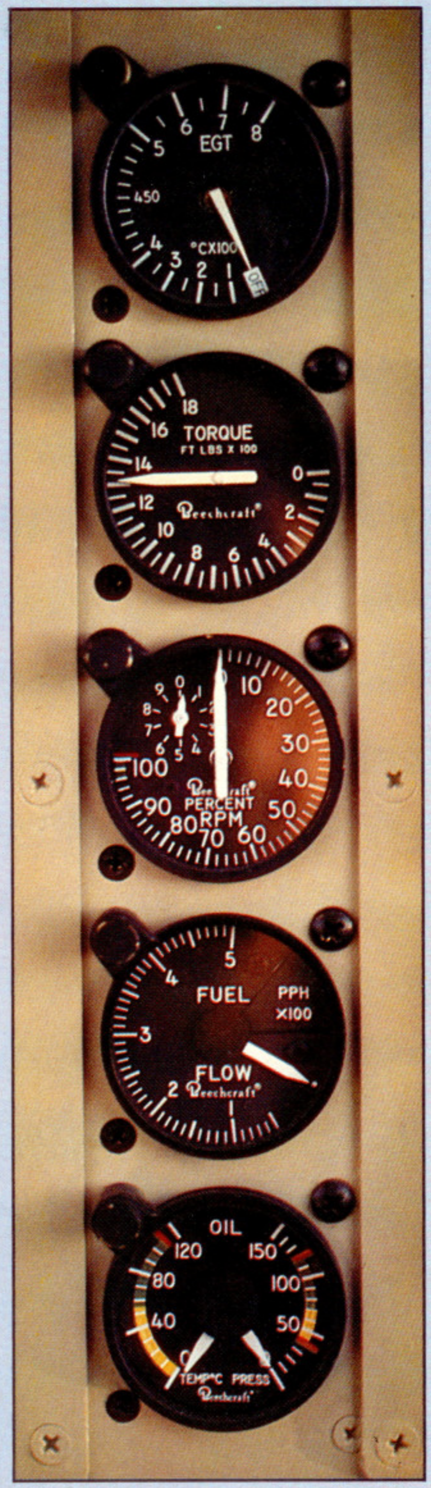

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He has been disappointed by the climb performance, which at best rate speed of 80 KIAS is approximately 2,100 fpm.

The engine has been flat rated down from its maximum of 680 shp to 400; the gearbox is limited to 500 shp. The kit includes a four-blade Hartzell Q-tip, full feathering and reversing propeller (Riley is testing a three-blade version). It and the engine induction system are electrically deiced. There is a Lear Siegler 200 amp starter/generator, a heavy duty Gill lead acid battery, a new 24-volt electrical system, new engine instruments and a fuel computer. The pressurization system is new, with bleed air driving it and the deice boots.

Riley thinks the TBO on this version and power rating of the engine could be extended to 5,000 or 6,000 hours.

Two other changes are being made to the airplane from the configuration it was in when I flew it. The most obvious will be the new cowl, which was just coming out of the mold when I was there. The original cowl has a split intake duct to get around the nose gear, and it is not as clean aerodynamically or aesthetically as it could be. Riley hopes to accomplish both with the redesigned cowl, which should improve airflow, engine efficiency and performance. Unfortunately, the new cowl was not installed in time to be illustrated in this issue.

The engine controls, which will be quite familiar to pilots of Cessna's heavy singles, are being redesigned. During our last conversation, Riley had not yet settled on the configuration, but it is possible that the standard throttle (which becomes the condition control with the PT6 installation) will be changed for a conventional turbine condition lever.

In profile, the Riley conversion has pleasing lines, thanks to the engine slung way out ahead of the rest of the airplane. It also appears as though the extended nose will block forward visibility even more than the standard P210, although this is not so.

Jerry M. Hughes, Riley's chief pilot, walked me through a fairly standard preflight. The interior of the aircraft is much like any P210, despite the different gauges. And the turbine start procedure is standard PT6 (all required switches on, starter engaged, fuel introduced at about 12 percent rpm and fuel lever on, monitor temperature for the chance of a hot start).

Ground operation is pretty much like any other 210 save for the use of ground idle and beta range rather than brakes and throttle for speed control.

I used 10 degrees of flap for takeoff—as though it were any other P210. As we lined up for takeoff, I set partial power to get the prop going (old turbine drivers and sailors call it getting the bit in your teeth) and set torque at 32 pounds to produce 400 shp.

In all respects, the Riley conversion handles and flies just like a P210—with a couple of exceptions. That additional 90 hp feels like a great deal more as the aircraft accelerates down the runway. Climb rate is terrific, even though it is two thirds below Riley's objective. The piston P210's average climb, particularly in hot weather, is disappointing to me (and frequently to ATC). I got an initial climb rate in the turbine of 1,800 fpm at 100 KIAS; and it climbed at 1,500 fpm during a cruise climb at 140 KIAS, a speed at which forward visibility is good.

The interior noise level was lower in all flight regimes, despite the fact that part of the interior and soundproofing were out of the aircraft.

We were going to climb right up to altitude, but we had to stop at 13,000 feet when the pressurization system malfunctioned. From there, I tried both cruise and quick descents. It gets down fast without need for concern about throttle setting or engine temperatures (aside from monitoring the airplane's torque and temperature values). *continued*

Jack M. Riley, president of Riley Aircraft Manufacturing, stands by the prototype P210 turbine conversion. The cowl has been redesigned since this photo was taken, and the craft should receive a three-blade propeller, changes that are expected to improve performance.

Approaches and landings are old home style for pilots used to the basic airplane. There is only one caveat. When you think you have a good flare, flare more (as Hughes coached me); you really have to get that long nose up. When the nose fills your vision, get it higher, because the nose gear is way back relative to the nose.

The P210, the aircraft that proved that a lot of pilots did indeed want a pressurized, theoretically all-weather single, looks like a shoo-in to be the first pressurized, turbine single on the market.

It, too, is a compromise. The relatively mild (3.35 psi) pressurization, the airframe structural speed limitations of the basic airplane plus the limited range/endurance with the PT6 conversion will not make it appealing to everyone in the market.

However, for those flying P210s and for those looking for a relatively inexpensive way into the turbine world, the Riley conversion should have a lot of appeal. The improved performance, increased reliability and that distinct turbine noise (you can be the first at your local airport!) will make sense to quite a few. So should the current 3,500-hour TBO.

Whether the cost will make sense is more a question of mission and cash flow. The conversion price is $250,000, although Riley expects an engine-price increase to add another $14,000 to the total this year. □

SMITH PROP-JET

The first time I saw Mike Smith's turbine single, I did a double take. It was sitting in the grass, in a long line of aircraft, at Oshkosh last August. The double take was part "there's no way he can build and fly it in time to get to Oshkosh, no matter what he claims he can do" and part the visual impact of the big, smooth, gleaming fuselage. It was an impressive sight to see.

Mike Smith is like a lot of us. He is a dreamer. But unlike a lot of us, he puts his money, his ego and his effort where his dreams are. He announced the Prop-Jet project in February 1982 and flew it seven months later. Three months after that, he received approval from the FAA to conduct research and development and market survey operations under both VFR and IFR rules.

Smith started doodling with turbine-single ideas in 1975. His PT6-powered, 750-shp Interceptor first flew in 1978. Unfortunately, the four-place, all-metal design was lost because of that most unlikely event with modern turboprops —an engine flame out led to an off-airport landing in hostile territory.

One concern that must be carefully handled is that turbine exhaust fumes might enter the cabin either on the ground or in flight. The exhaust stacks on the Garrett TPE331 (shown . . .

It is obvious that the idea still appealed to him. While concentrating on the development, production and installation of his speed conversions for Bonanzas and Barons, he continued to dream and doodle about a bigger, faster, plastic turbine single.

After the Prop-Jet's initial showing at Oshkosh, Smith attended both the National Business Aircraft Association meeting in St. Louis in September and the AOPA convention in Las Vegas in October.

The next time I saw the Smith Prop-Jet was the best, however: I got to fly it. I was lucky in more ways than one, because in October the aircraft had an incident that could have been disastrous for the project. Part of the nosegear mechanism jammed, preventing extension. A very expensive no-nosewheel landing was avoided when Smith worked out a plan with a couple of his employees. Two motorcycles raced down the runway, each with two men up. After some practice approach-and-chases (originally with pickup trucks, which didn't work), the men in the buddy seats of the two bikes grabbed the tail section of the aircraft while Smith secured the engine. That resourceful act saved the project at least a one-year delay, not to mention a very large repair bill.

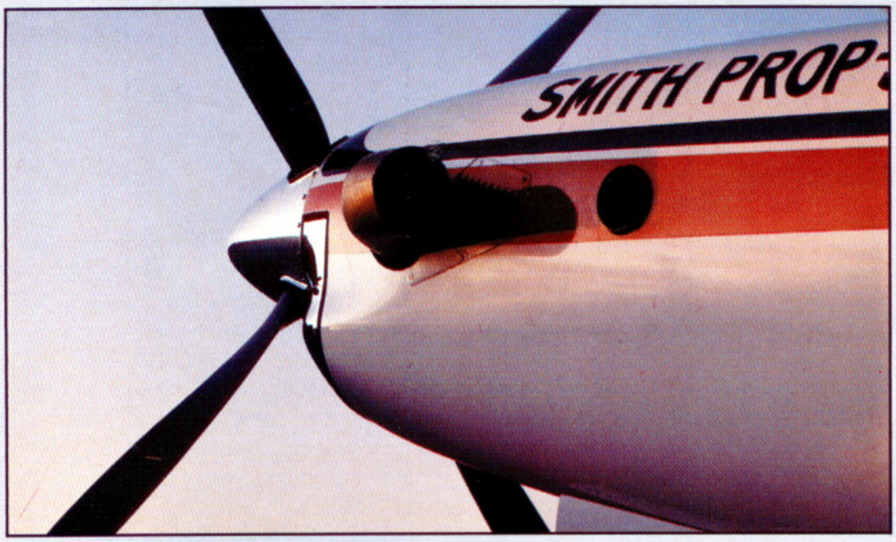
Since the first flight, Smith has added a six-place interior, rudder trim, a Century III autopilot ("To give me some relief during long cross countries," Smith said) and has changed control linkage and the air inlet ducts.

The prototype is fitted with a PT6A-41 flat rated at 550 shp (if the project succeeds, Smith also plans to certificate a TPE331 and to upgrade the Pratt & Whitney to a PT6A-42). The fuselage is fabricated in two halves with Klegecell foam core sandwiched between layers of carbon fiber. The empennage is foam covered with Kevlar cloth.

It is not pressurized, but Smith hopes to build a second aircraft that would be. He also plans to build a composite wing. The current wing is from a Beech 58 Baron, a step that Smith claims saved a year and $200,000 in getting the project started.

Two distinctive features of the aircraft are the anhedral, horizontal tail design and the very deep fuselage. The tail design combines getting the surfaces up out of the propeller wash, minimizing pitch changes with power and configuration changes and is an effective anti-flutter design, says Smith.

The accompanying photographs can describe the appearance of the Prop-Jet much more effectively—and quickly—than I can. The interior is quite attractive, and certainly much more finely finished than your standard pre-production prototype. It also is very familiar to anyone used to flying Beechcraft. It even has the center-mounted control column (which Smith says will change to conventional columns in the second and subsequent aircraft).



... on the Beech Lightning, left) do not present as much of a problem as the side-mounted exhaust of the PT6 (shown on the Smith Prop-Jet, above). Attention should be paid to engine accessibility, too.

Design objectives for the Prop-Jet include an initial climb rate of 3,500 fpm (better than any other propeller-driven aircraft) at the planned gross weight of 5,186 pounds and a cruise speed of 304 knots at 31,000 feet. Cabin pressurization would be 6 psi and would provide a cabin altitude of 12,000 feet at FL310. Standard fuel would be 190 gallons, with 220 optional for a planned IFR range of 1,140 and 1,355 nm, respectively. Fuel consumption at cruise is expected to be 35 gph.

Smith has 19 of the 50 orders he needs to proceed with the second prototype and certification. The currently quoted price, with basic IFR instrumentation and avionics, is $670,200. He thinks about 800 flight hours of testing and proving will be required before certification. If he had the funds now, Smith estimates certification could be obtained in late 1984 with the first customer delivery in 1985.

The day I flew the first prototype, it had just over 60 hours total flying time. Smith pointed out that there are many points of the flight envelope still to be explored. Even though he has many hours in crop dusters as well as high-performance military aircraft, such as the P-51s and the Bell P-39 that he raced, he has decided he would rather turn over that part of the project to a flight-test engineer while he concentrates on running the business.

We discussed the flight profile I wanted to fly: initial climb directly—with ATC's blessing—to FL310, quick descent to 230, further descent to 12,000 for some handling, slow speed and simulated balked landings, then down for some approaches and landings. Smith briefed me on the characteristics of the airplane, some cautions about its current configuration, including the oxygen system, communications considerations since we did not have a working intercom, and our procedure should any incident or emergency occur.

Then we strapped into our parachutes. I had to wear a backpack which did not allow me to fit into the upholstered pilot seat terribly well. I thought the lack of moving room and comfort would add an interesting test to the aircraft behavior.

Start was swift, conventional for the PT6 and simple. When clearance was received and preflight and takeoff checks had been completed, I lined up on the centerline at Johnson County Industrial in Kansas. With power stabilized and brakes released, the aircraft rushed down the runway as I raised the torque value to 47 pounds to produce 550 shp. It was time to fly before I had it all in. Gear up, and with cruise climb speed of 156 KIAS established (thinking, "This is faster than most of our aircraft can cruise straight and level,") I did a series of gentle left and right turns and fooled with the rudder and pitch to get a feel for the aircraft.

The noise was not as bad as Smith had predicted, although he was in a helmet and I had installed earplugs.

We were through 10,000 feet from the field elevation of 2,400 in nothing flat, it seemed, and I made a big scene of doing a mock pressurization check. Then we got the oxygen masks on and verified the flow.

Passing through FL240, the strap on my mask broke, so I had to fly with one hand and hold the mask with my other. We were encountering some light chop, but the aircraft did not seem to mind my predicament or other conditions. It just whooshed on up at what later worked out to be an average climb of 1,903 fpm at the cruise climb speed of 156 knots.

Established at cruise, I engaged the autopilot while we set power at 1,600 rpm and 45 torque pounds and recorded the numbers. We trued out at 290 knots, the fastest the aircraft had gone. But we later calculated that we were pulling 420 shp, below max cruise power at 1,600 rpm and 45 torque pounds. Fuel flow was 34.5 gph. We did another cruise check at 16,000 feet as I flew with one hand and held the mask with the other. At 2,000 rpm and 28 pounds of torque in the relatively warm (+3°C) air, the aircraft trued at 219 knots, burning 34.8 gph.

Visibility out of the airplane is excellent. Approaches are smooth, stable and secure, and landings are fun. With the help of the condition lever, you can try for silky greasers or put the airplane on the runway and get it stopped almost at will.

Before our flight, Smith had said he considered the Prop-Jet pitch sensitive. My reaction to the in-flight manners were all very productive. I did not find the aircraft particularly pitch-sensitive, and overall feel and control harmony was good and smooth. Aside from the novelty and basic pleasure of flying a turbine single, which I knew would color my reaction to the airplane, it was delightful to fly.

Desire, commitment and proof are not enough to start an aircraft manufacturing company. Smith feels the certification effort and initial manufacturing will require at least $25 million. He is going against large companies with proven performance and large resources. Then, too, there have been a lot of other aircraft ideas out looking for investors that might make some potential purchasers a little skeptical.

The next few months will probably be the toughest in Smith's attempt to proceed with the Prop-Jet. But if first impressions are any use and if Smith succeeds, the aviation market will be enriched with a distinctive, elegant composite airplane that promises to go to the head of the performance line. □

THE FAST LANE

The realm of airspace above Flight Level 250 is rare and hostile. The higher you go, the more stringent the Federal Aviation Regulations are that control certification and govern operation. Windshields and windows must provide more margin. Loss of cabin pressure, because of the time of useful consciousness, becomes a far more serious consideration. For instance, oxygen must be available to each occupant immediately; above FL300, it must deploy automatically before cabin altitude exceeds 15,000 feet, and the crew must be able to provide oxygen to each occupant if the automatic system fails. Pressure oxygen systems, quite different from the demand systems that many pilots are familiar with, are required for the flight crew at the higher (above FL300) altitudes.

What is an inconvenience at the middle altitudes quickly becomes an emergency as the operating altitude increases.

For a variety of reasons, the Federal Aviation Administration probably will become involved more deeply both from the certification and operational (including pilot qualification) concerns with the turbine singles. There is yet another area that some of the designers of both piston and turbine aircraft would like to see receive more concern by the FAA. The current certification rules treat all single-engine aircraft the same. A Beech B36TC or a Cessna P210 or a Mooney 231 must meet the same stall speed requirements in the landing configuration as many of our basic trainers: 61 knots. Quite a few designers and engineers are convinced that they can increase performance, reduce weight and construction complexity (and, just possibly, cost) if the FAA will develop a separate category for high-performance aircraft. The FAA is studying the idea, but it has stated already that the trade will be a more stringent set of demonstrated competence requirements for the pilots of such aircraft.

Landings for the turbine pilot are made easier with beta range, which can save tires, brakes and nerves.

Do turbine singles have a future? High-performance, high-altitude singles have proven already that the market exists to some degree. Beech now has more than 60 orders for its turbine project; Riley has 18 for his converted P210; and Smith has 18 deposits for his concept. Cessna is close to 800 sales of the P210; Piper has more than 70 orders for the PA-46. Mooney has been unwilling to accept orders for the M30, in part as a result of the bind the older management got into from early position sales of the M22.

If you want a cruise speed of close to 300 knots, the current products (twin turboprops) will cost around $2 million. If you have the need, wouldn't a price tag of about $600,000 make you stop to consider?

Well, turbine singles have been around for a long time—as concepts, as dreams and as failed attempts. There aren't any here just yet, but the current flurry of activity, given the flexibility and forward thinking that the FAA could exhibit, indicates that they will be on the market this year.

In the current batch of candidates, Beech Aircraft certainly appears to be the one most likely to succeed. At this writing, Riley appears to be the company that will have something on the market first. If Mike Smith can convince a substantial number of dreamers to put up their money, he will follow with an aircraft designed almost from scratch to be a turbine single.

If you agree that the concept has been accepted in the market, and if you agree that the first generation products are on the way, can other manufacturers be far behind?

I think they will have to be there. Because the idea makes sense. □