SILVER EAGLE

Bringing turbine advantages to the Cessna P210

BY RICHARD L. COLLINS

When one of the modification companies does something to "your" airplane, it becomes especially interesting. Myron Olson of O&N Aircraft Modifications, Incorporated, in Factoryville, Pennsylvania, showed me work on an Allison turboprop-powered P210N when I was there for a baggage-compartment fuel tank installation for my P210 a few years ago. My interest was piqued. He showed it to me again when I was there for a Riley intercooler a year or so ago—more interest. And he showed it to me with a fresh supplemental type certificate in hand

PHOTOGRAPHY BY MIKE FIZER

early this fall. It has a name, Silver Eagle, and I got to fly it shortly after seeing it in completed form. It is truly an interesting airplane, one that has gone through a long and thorough approval process. It is significant that Cessna once flew a P210 with the same engine (as well as one with an Allison dual-pack in the nose) and may well have offered it had the company not opted out of this market segment.

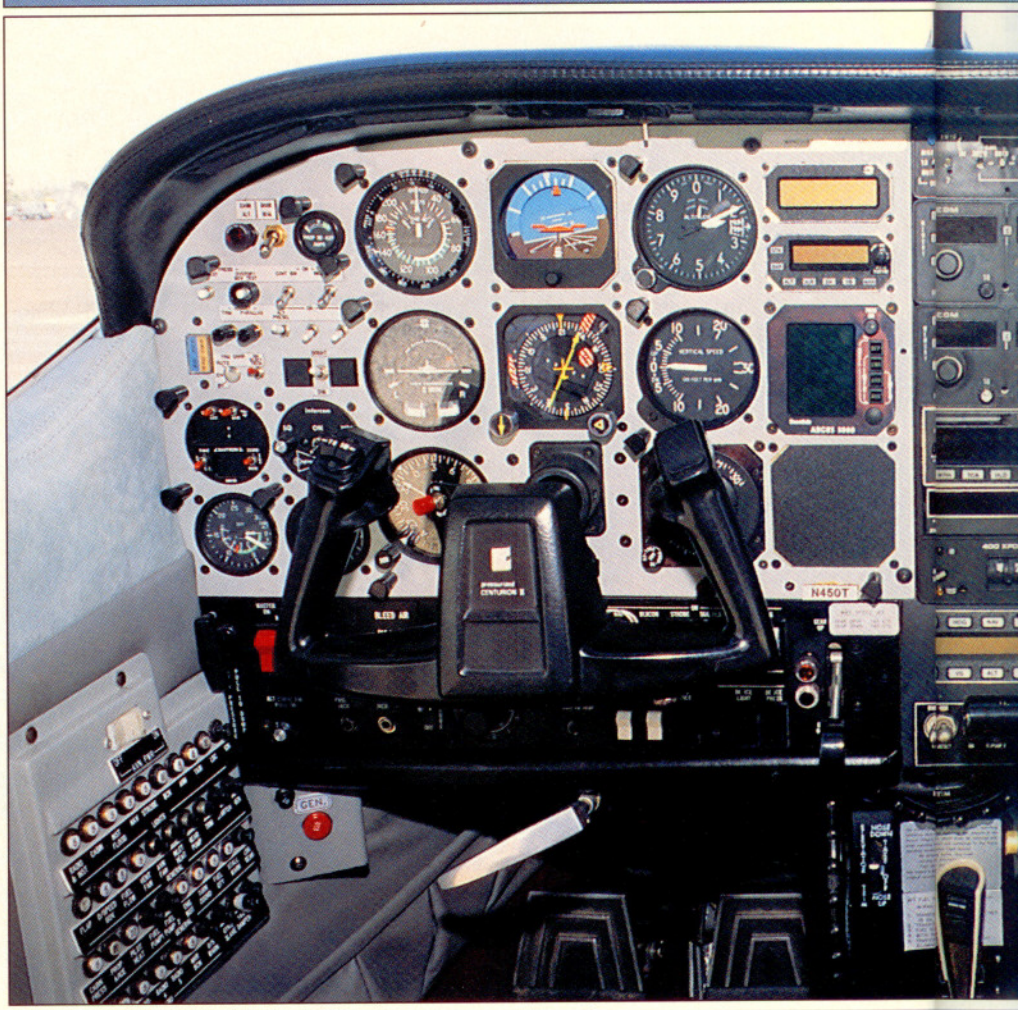
The engine is the Allison 250-B17F, which has a thermodynamic rating of 495 shaft horsepower and a flat rating of 450 shp, with a five-minute limit on 450 for takeoff and initial climb. Maximum continuous power is 380 shp. It replaces a turbocharged piston engine rated at 310 hp for takeoff and 285 maximum continuous. The maximum takeoff weight is the same, so you can draw some conclusions on rate of climb from that increase in power.

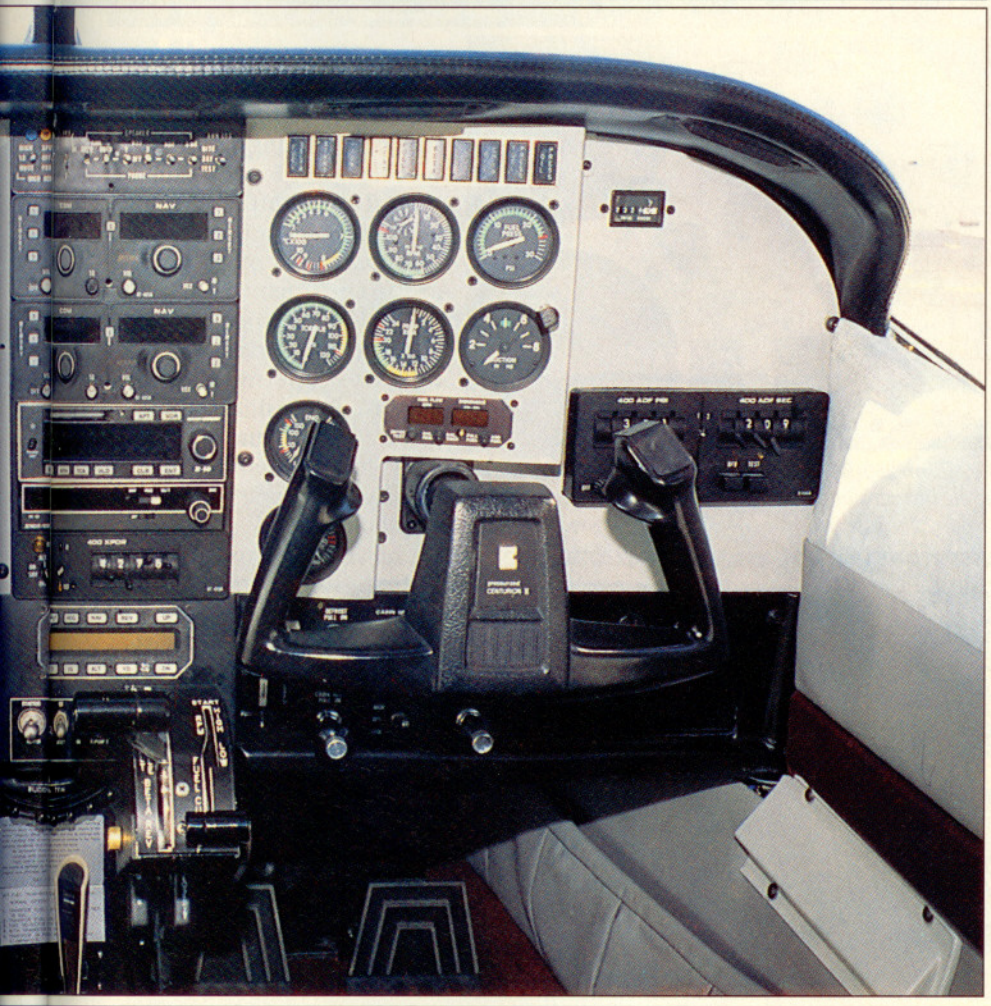
This conversion will inevitably be compared with one done by Advanced Aircraft. Advanced fitted a 720-shp Pratt & Whitney PT6 to a P210 and flat-rated it to 450 shp. It was a bit strange looking, with what appeared

Cessna once flew an Allison-powered P210 but dropped the project.

to be a King Air cowling mated to the front of a P210. Though the conversion won Federal Aviation Administration certification, the airplane was very heavy and had little useful load. It burned a lot of gas and failed to achieve the performance potential, probably because of a terribly inefficient propeller. It also had serious tail cracking problems early in its life.

All these problems have been addressed in the Silver Eagle. The airplane may look different than the stock P210, but it is pretty. The weight has been managed well, and the lighter turbine engine should offer some empty-weight advantage over the piston airplanes, most of which have a 1,300- to 1,500-pound useful load. The fuel flows are within reason, especially at altitude. Climb performance is spectacular and the cruise as





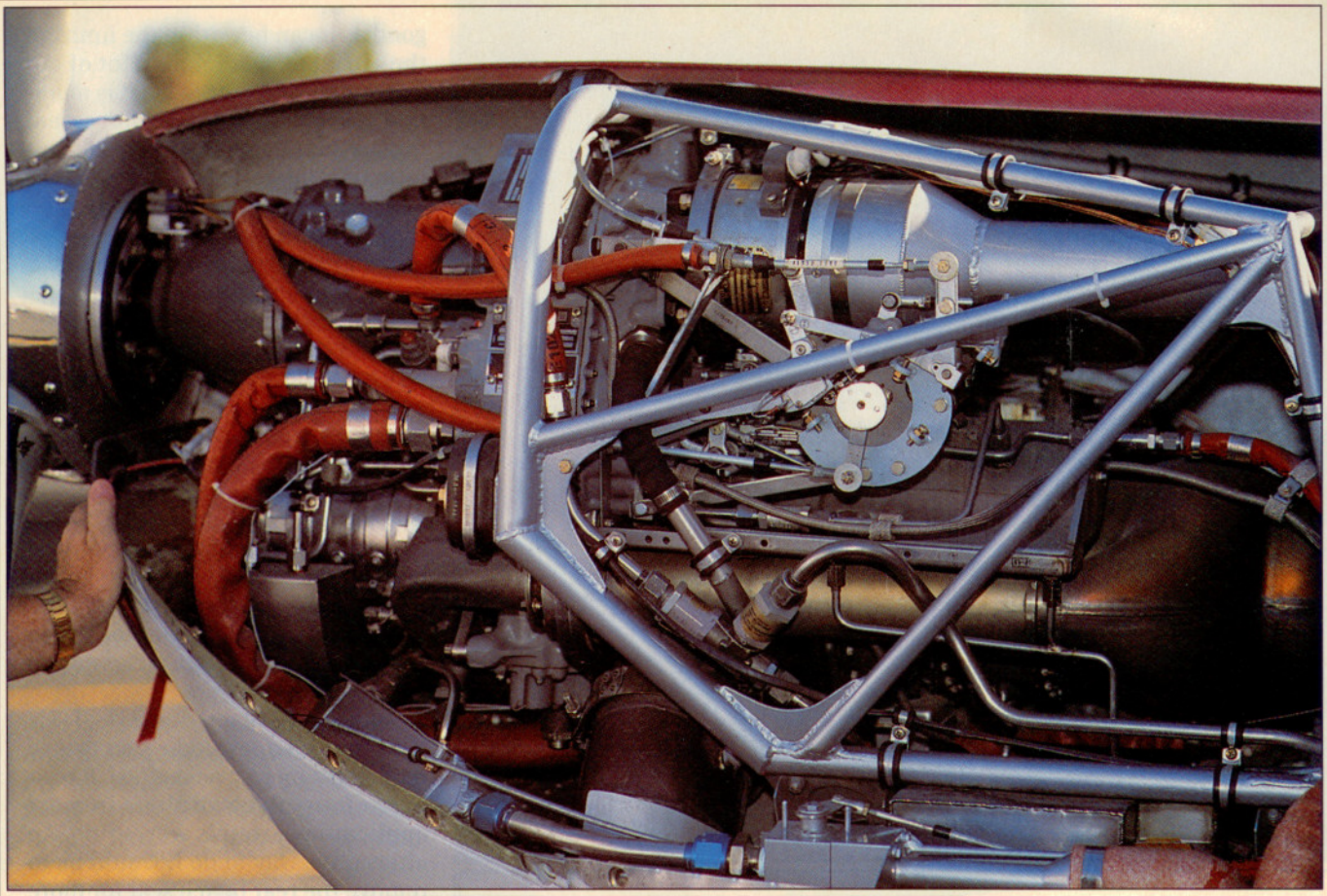
good as it can be within the limits of the airframe. O&N does a lot of tail work on the airplane when it is modified, so that question is addressed. Cessna has issued a lot of service bulletins on the tails of all 210s, all of which are complied with during the modification, and these suggest an area of the airplane to watch like a hawk regardless of the engine.

The workmanship in the Silver Eagle is excellent. The interior is as nice as they come, and the instrument panel is redone in good taste. Some avionics would have to be located on the right side of the panel, but the primary necessities, including radar, will fit in the center stack. An S-Tec autopilot is currently being approved in the airplane. The airplane shown, the first one, will soon get a complement of Bendix/King avionics to replace the set of Cessna radios now in the stack.

As many P210 operators do, O&N has removed one middle seat to give the cabin a more spacious feel. It really is a four-place airplane in most applications, so this works fine. An alternative way to do it would be to remove the rear bench seat for more baggage area and use the four individual seats.

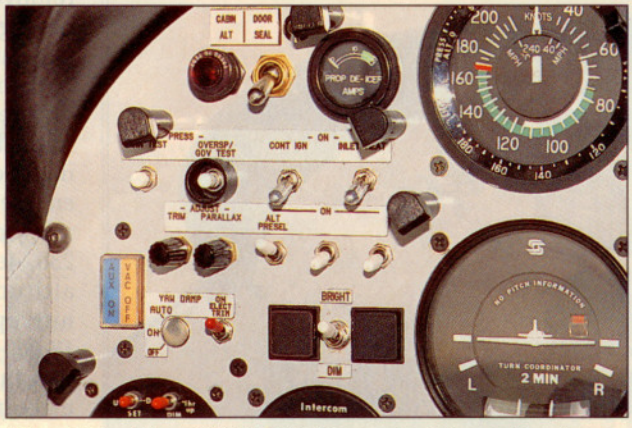
Before flying, consider some of the differences between turboprop and turbocharged engines. If everything is in good condition, the turbocharged engine used in the P210 will maintain as much as 240 hp up to Flight Level 230, depending on temperature. The altitude for maximum continuous horsepower, 285, would be about 17,000 feet, again depending on temperature. The turboprop engine will make its maximum takeoff power, 450, up to about 3,000 feet on a standard day and its maximum continuous power, 380, to about 4,500 feet on a standard day. Above those levels, temperature takes over from torque as the limiting factor on power, and the horsepower drops off as the airplane climbs. At 12,000 feet, for example, about 300 shp is available on a standard day. There are a lot of variables, but the turbocharged piston engine in the P210 and the turboprop in the Silver Eagle would likely reach parity somewhere close to FL230, the maximum operating altitude of the aircraft regardless of the engine.

What all this tells us is that, when speed alone is considered, the Silver



Eagle will like to be operated at a somewhat lower altitude than a regular P210 because it will have a big horsepower advantage. The choice of altitude for fast cruise depends on outside air temperature. It was suggested that 17,000 is a good benchmark maximum cruise level, with 1,000 feet added or subtracted for each 10 degrees Celsius below or above standard temperature. If a pilot doesn't want to bother with that, just fly at 15,000 in the summer, 17,000 in the spring and fall, and FL190 in the winter.

For fuel, it has the standard 89 gallons in the wings, plus a fuselage tank rated at 26.8 gallons, for a total of 115.8. The fuselage tank consumes less than half the baggage compartment. Turbine fuel weighs 6.7 pounds per gallon (compared to 6 pounds for avgas), so an average equipped airplane would have a full fuel payload of between 650 and 700 pounds.



Though the Allison 250-B17F turbine engine is housed in a longer nose, the installation is actually lighter than its piston counterpart. The instrument panel is redone in good taste.

Fuel flows can be lower up high, but were I putting a Silver Eagle in service, I would start off assuming an average fuel flow of 25 gallons per hour. Take 10 off for takeoff and climb, and you have just over four hours of total fuel, or three hours with that magic hour to spare. Those should be conservative numbers, and experience might increase the endurance with reserve to 3.5 hours, which is just a bit less than what the standard airplane will do on 89 gallons at high cruise.

The starting procedure is turbine-simple, and because there is a little less weight on the nosewheel, the airplane is easier to handle on the ground than the piston version. Ground idle results in fast taxiing, so the Beta range is used a lot in taxi, which gets the attention of the airport crew. A 210 making noises like that, instead of the usual John Deere sounds, draws a crowd.

Ready for takeoff after a

rather simple check list, the admonition is to put in plenty of right rudder trim and not cob the power too rapidly on takeoff.

Flaps, which are used on the regular P210, are best left up on the Silver Eagle for two reasons. One, a little more speed at liftoff results in better controllability. Two, you don't need them because the airplane accelerates so rapidly. The requirement for right rudder was somewhat less than I expected, and the airplane was soon off and blowing through the normal climb speeds for the piston airplane. To put on a show for the throng that gathered, 100 knots in the climb looks like a fierce zoom off the runway—and is: better than 3,000 feet per minute in initial climb. I liked 140 better, for the view. The rate of climb at that was more than 2,000 fpm—still.

The clearance to climb on the beautiful fall day came a few thousand feet at a time because of the constant flow of airplanes into the Baltimore-Washington area. The departures have to go out under the arrivals, so it was awhile before a cooperative controller vectored us toward an area where there were no arrivals and cleared the Silver Eagle to FL220.

Through 13,000 feet, we were still climbing 1,000 fpm at 140 knots indicated, maintaining the power at the temperature limit. At FL180, the Silver Eagle was starting to behave more like a piston-powered P210, with 700 fpm at 125 knots. The temperature was about 10°C above standard, and we were actually above the best altitude for cruise at this point.

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The climb is an important advantage found in the Silver Eagle. It will reach any cruising level in the mid-teens to the low flight levels in less than half the time it takes in the regular P210. This translates into less time flown at the higher fuel flow in a climb, as well as reaching the comfort level more quickly.

Because of the decreasing power output, there is less bleed air available for pressurization, and at FL200, it appeared that the differential would be difficult to maintain as we climbed higher, so we settled in to check the cruise at that level. The temperature was -17°C, eight above standard, and my whiz wheel says that is 200 knots true, or Mach 0.325. The fuel flow was 22 gph. For comparison, I found a record of my airplane for FL200 at but 2° less OAT and found that it had trued 184 on 16.7 gph. Mine would have looked better with pounds considered (100 pounds per hour for mine versus 147.4 for the Silver Eagle), and while we buy fuel by the gallon, we have to lift it by the pound. Even in the flight levels, it seems the Silver Eagle offers good advantage.

When it came time to descend, the pressurization had to have tender loving care. The indicated airspeed at cruise was within 20 knots of the top of the green, and any power reduction resulted in a loss of pressure differential. The descent was thus not very rapid. Had we needed to descend more rapidly, the landing gear could have been extended, or speed brakes are available for the airplane. The relationship between the turboprop engine and the pressurization system is different than the piston, but it is a perfectly usable system. This is the first pressurized airplane to fly with an Allison 250, and the match can probably be tweaked through the careful elimination of cabin leaks and per-

haps some minor changes in the bleed air system.

We leveled at 15,000 feet for a cruise check and found a true of 210 knots on a fuel flow of 24.7 gph. At the same temperature, I have a record of mine showing a true of 180 on 16.7 gph. Weight would affect any of these comparisons, as a 210 does almost a knot better for each 100 pounds less weight. Also, my airplane has deicing boots and a radar pod, which, when installed on the Silver Eagle, will cost it a few knots, too.

The sound of the turbine engine is wonderful, and the cabin noise level is relatively low. It is said to be a number of decibels lower than the piston airplane, but, to me, the noise levels seemed about the same, with the turbine holding a commanding edge in smoothness.

Pilot work load is where the turbine really shines. The turbocharged 210 requires constant attention.

Pilot work load is an area where the turbine really shines. The turbocharged engine in the P210 requires continuous attention to mixture and manifold pressure and turbine inlet, exhaust gas, and cylinder head temperatures, to name a few things. With the Allison, it's one lever and one power indicator, torque or temperature. The primary phase of flight where the increase in power will require special pilot technique would be in a go-around or missed approach. Because power is destabilizing, it would be best in one of those conditions to use power as necessary to transition to a climb and maintain a safe airspeed rather than going for maximum power.

On approach, the turboprop response to power is livelier, so there might be some overcontrolling. Just find the power setting that works and fine-tune from there. Also, there is greater drag in the flare when ground idle is selected. Other than that, it is like any 210 in the landing approach and the actual landing. The reverse is powerful, and the airplane will land as short as it will take off, perhaps shorter. This is a nice feature, but except for special needs, an operator would likely refrain from a lot of reverse to minimize wear on the tail. It does shake a little in a maximum-effort stop.

The P210 was and is a good airplane, but from the beginning, there has been interest in a different powerplant for the airplane, both from Cessna and others. I have flown the P210N with five different engines in it: the Teledyne Continental TSIO-520 that it came with, a GTSIO-520 of 375 hp that Cessna put into one, a Lycoming TIO-540 of 350 hp, the PT6, and now the Allison 250.

The Silver Eagle is by far the best effort of all. It really creates a new-class airplane. The conversion runs $380,000 and includes a complete nose-to-tail refurbishment of the airframe and interior, a new panel, air conditioning, the S-Tec autopilot with altitude preselect, and the fuselage tank. Other avionics and deicing are options. When the total investment is considered, including a low-time airframe, the tab will be about $500,000 for something as near to new as you can get without building an airframe from scratch. The product is a spiffy four-place turboprop that offers a good balance of climb, speed, range, and comfort, along with airfield performance that can't be beat. O&N has sold five of the conversions, and it is taking orders at 717/945-3769. □