PIAGGIO *Avanti* P180

Jet speeds at turboprop operating costs

BY RICHARD L. COLLINS

Totally new shapes are the exception rather than the rule in aviation, and the Piaggio Avanti P180 is one of the most interesting exceptions ever. Parked on the ramp, the airplane is beautiful but not imposing. It will always draw a crowd, and after everyone expresses wonderment at the exterior and

PHOTOGRAPHY BY MIKE FIZER

used to "manage" steering. Starting with the three-position button untouched, there is no nosewheel steering. Depress it to the first resistance, and you have taxi steering. Push it all the way down, and you have takeoff steering. Press the little red button, and you go back to no steering. The taxi steering is precise and sensitive. If you want to turn sharply, it will do that. However, with only two people in the airplane, the weight on the nosewheel isn't great, and when you turn, one of the nose tires actually lifts off the ground. (More passengers make it heavier on the nose; everything that goes into the cabin moves the CG forward.) The drill for sharp turns is to keep rolling because there is not much tire surface on the tarmac.

For takeoff, the steering procedure is to select takeoff steering, leave it selected to 60 knots on the roll, then punch it off. The landing is a bit more complex. At 60 knots in the deceleration, you select takeoff steering, but you absolutely, positively must have the rudder pedals centered when so doing. Otherwise, the airplane will dart for the ditch. I didn't get to try a crosswind landing, so I can only imagine the challenge. The nose steering works; it is something you can get used to, but it is also something that could probably be designed to be a lot simpler and still be usable.

When an airplane looks as different as the Avanti, it is just natural to feel that it will fly differently. That is not the case. Like most airplanes, the Avanti tells you about most of its airborne personality as you examine it on the ground. It has a long wheelbase, so the rotation for takeoff takes a good tug and then requires a reduction in pitch force as the desired attitude is reached. It is a relatively large airplane with a small wing, so flying it a bit on the slow side will result in a high rate of sink. Being a pusher with a T-tail means that the reduction in power for landing will result in a nose-up pitching moment. Armed with all this, you are ready to go flying.

Being a little gun-shy on the steering makes the takeoff work a lot better. Actually, on the second takeoff I made, I was able to track smoothly down the centerline of the runway, so the sensitivity of the system and the button pushing is something that can be accommodated in a relatively short period of time.

The recommended rotation speed for takeoff is 101 knots. That is right at the stalling speed in the takeoff configuration, and immediately after liftoff, the airplane feels a touch sloppy. It accelerates rapidly, though, and is soon at the recommended 200-knot climb speed. The power-limiting factor on takeoff is torque because the engine is heavily flat-rated—meaning it is capable of producing a lot more power than allowed at sea level in order to achieve better altitude performance. You shoot for a little shy of the 2,200-foot-pound maximum in setting the power, because it will increase a bit as speed increases.

The airplane offers a comfortable cabin in terms of room, quiet, and vibration—midsize-jet amenities.

After a photo session in the Avanti, the mission was to fly the "average" turbine airplane trip. This one was 344 nautical miles in one of the busier areas of the country and in some challenging weather.

The departure from Frederick, Maryland, was with full tanks: 2,630 pounds of fuel. In doing the preflight calculations, I came to the conclusion that this is not a lot of fuel for an airplane with two engines flat-rated to 850 shaft horsepower. (It is roughly the same amount of fuel as is carried by a Cessna 425, which has two 450-shp Pratts.) In the fast-forward mode, the Avanti's strong suit, the fuel is good for about 3.3 hours to dry tanks, or 2.3 hours for a landing with an hour in reserve. With full fuel and the current maximum takeoff weight, the allowable cabin load would be 630 pounds, or a pilot and two passengers plus baggage. With the increased takeoff weight, that will improve to a pilot and three and a half passengers and baggage. For longer range trips at altitudes higher than for best speed, the Avanti's absolute endurance increases to about 5.7 hours.

When westbound from Frederick, there is no such thing as an optimum IFR climb. The simple fact is that all the inbounds to the Baltimore-Washington area are overhead, so you can't climb high until well to the west. The result was that we were busting through showers and cumulus clouds for a while. It was a little bumpy in there, and I was having a hard time holding altitude precisely. For the life of me, I could not figure out why, except that I was flying an airplane with which I wasn't familiar. I never seemed to be able to get it trimmed and wondered how this could be happening in an airplane that I had just flown for an hour in formation.

The answer is aerodynamic. When the natural laminar flow over the forward wing is degraded by moisture, as in rain or clouds with large-size droplets, the airplane pitches nose down. When the laminar flow is restored, as when you fly out of the rain or big cloud drops, the airplane pitches nose up. According to Piaggio figures, this degradation of laminar flow results in a speed reduction of 5 percent. As best I could estimate, the pitch change requires an elevator control input of between 5 and 10 pounds of force to compensate. The loss of laminar flow is abrupt, so the pitch up or down is sudden. It feels like something has affected the pitch control system. The demo pilot said that it


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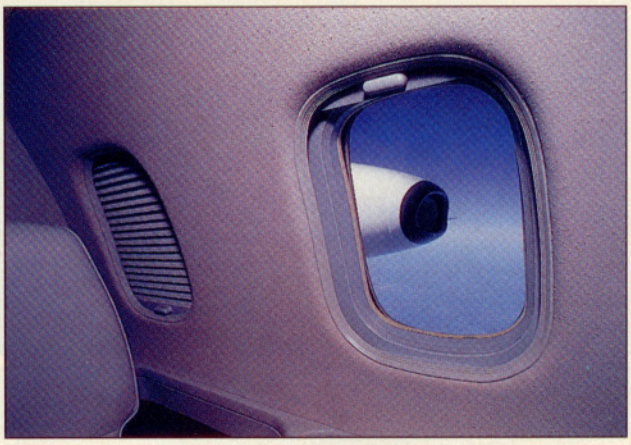
doesn't bother the autopilot, but I have yet to figure out how to transfer the responsibility for a flight to an autopilot. The question is whether it is worth losing 5 percent of the big cruising speed number 100 percent of the time to fix this.

Otherwise, the Avanti's flight characteristics are impeccable, as is the airplane's performance. When we were finally cleared to Flight Level 280, the airplane climbed smartly to that altitude and turned in a true airspeed of 360 knots on a fuel flow of 670 pounds per hour. That is real jet speed with a turboprop fuel flow. The engines reached their temperature limit at FL200 on the ISA +14 day, which is a lower altitude than suggested in the performance charts; as a result, the speed was 10 knots shy of that predicted. We were flying in an area with considerable thunderstorm activity, so large-scale subsidence could have been responsible for a speed slightly below that on the chart.

The maximum cruise speed of the airplane in standard conditions at a mid-cruise weight is shown as 321 knots true at 15,000 feet; it peaks at 392 knots at 28,000 and is 325 at the airplane's 41,000-foot maximum operating altitude. Those numbers are truly remarkable for a turboprop.

Because the Avanti is so clean, descent and speed reduction for an arrival require a plan. At the maximum allowable indicated speed (260 knots, or Mach 0.67) and flight idle on the power, the airplane comes down well by piston standards but not rapidly by turbine standards. After a level-off, deceleration to the 175-KIAS maximum allowable gear and approach flaps extension speed is not rapid.



The Avanti's fuselage and wings have a silky-smooth look, which comes from attention to detail in metal work.

I was pleased that the weather at the destination, Clermont County Airport at Batavia, Ohio, was fairly close to minimums for the VOR approach. A neat way to learn the manners of the airplane with which you are shaking hands is an approach in scuz, and Mother Nature was cooperating. It was a circling approach to Runway 22, which added spice.

With the approach all set up and displayed on the electronic flight instrumentation system, maneuvering and configuring the Avanti for the approach was a snap. The circle to the 3,732-foot-long runway was made easier by the exceptional visibility from the flight deck. It was a left circle, so the runway was on my side. The V_{REF} speed is 117 knots. Fly at about 125 on final, slowing to 117 over the threshold. If the speed gets a touch low, a high rate of sink can develop. On the other hand, if the speed is 10 knots fast, the airplane decelerates rapidly in the landing configuration.

The Avanti landing can only be called as neat as they get. The airplane is literally landed with the power levers. If the speed is anywhere near correct, as you start pulling power back at the threshold, there is a natural nose-up pitching moment caused

by the reduction in power. This puts the airplane in a perfect landing attitude. The deceleration is rapid, and it lands at the point where you get the power all the way back. I used about half of the available reverse and virtually no braking in stopping in about two thirds of the runway. The demo pilot was cautious about using too much reverse, which may be attributed to the fact that this airplane had an engine changed early in life because of foreign object damage.

This typical mission took 1 hour 17 minutes. Neither the climb nor the descent was anywhere near optimum, and there was some off-course vectoring on the climb, vectors for the approach, and the circle to land. To put this in context, a Citation S/II flying westbound between the two points averaged one minute longer than the Avanti's time and used substantially more fuel in flying its smaller cabin along the way.

The Avanti is a remarkable airplane in a lot of ways. It offers a cabin that is more comfortable than any of the light jets in terms of room, quiet, and vibration. It really offers all the amenities of a midsize jet. The 9.0-psi cabin differential means that on most trips the cabin won't go over 5,000 feet. It'll be at 6,600 at the FL410 maximum operating altitude. The speed and fuel economy is exceptional, and the airplane can either go very fast over average distances or go faster than other turboprops over long distances. The airfield performance is good, though if balanced field length is considered, it isn't as good as some of the light jets. Finally, except for the nose steering and the pitching moment when you get it wet, the flying qualities are as nice as they come. □

Piaggio Avanti P180
Price: $4.13 million

Specifications

Powerplants	Two Pratt & Whitney PT6A-66, flat-rated at 850 shp
Recommended TBO	3,000 hr
Propellers	Hartzell 85-in diameter, five-blade, metal, full-feathering
Length	47.3 ft
Height	13 ft
Wingspan	45.6 ft
Wing area	172.22 ft
Wing loading	63.29 lb ft
Power loading	6.41 lb/shp
Seats	8
Cabin length	14.58 ft
Cabin width	73 in
Cabin height	69 in
Empty weight	7,640 lb
Max ramp weight	10,900 lb
Max takeoff weight	10,810 lb (to be increased to 11,200 lb)
Useful load	3,260 lb
Payload w/full fuel	630 lb
Max zero fuel weight	9,500 lb
Max landing weight	10,595 lb
Fuel capacity	2,630 lb
Baggage capacity	44 cu ft

Performance

Takeoff distance over 50-ft obstacle	2,800 ft
Rate of climb, sea level	2,870 fpm
Rate of climb, engine out	810 fpm
Max cruise, 10,000 lb, FL280	392 kt
Fuel flow	781 pph
Endurance, no reserve	3.3 hr
Normal cruise, 10,000 lb, FL390	332 kt
Fuel flow	440 pph
Endurance, no reserve	5.7 hr
Certified ceiling	41,000 ft
Landing distance over 50-ft obstacle	2,726 ft

For more information, contact Piaggio Aviation, Incorporated, 1802 West 2nd Street, Wichita, Kansas 67203; telephone 316/262-3636.

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted. □