Flexible Flyer

White-collar transport or blue-collar hauler, this airplane is up to the task

BY THOMAS A. HORNE

All airplanes have their unique combinations of attributes, but among turboprop singles the Pilatus PC–12 may represent the best realization of several important design goals. Under ordinary circumstances, an emphasis on one design objective would exact strong performance penalties from another. The PC–12 seems to contradict this informal rule. ◆ Its physical size and mass are greater than those of many turboprop twins, but its approach speeds are those of a light piston single. At a high-speed cruise setting, the PC–12 can cover ground at up to 272 knots (at FL240, 20 degrees Celsius colder than standard, a torque setting of 32.1 pounds

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per square inch, and a fuel burn of 444 pounds per hour). Endurances with IFR reserves at higher power settings usually run around 5.5 to 6 hours.

Dial the torque back to 9.27 psi under those same conditions and true airspeed and fuel burn drop to 164 knots and 192 pph, respectively. That reduced fuel burn can make full-fuel, ferry-type endurances with IFR reserves as long as 12 hours, and still-air ranges of some 2,000 nautical miles. So the airplane is equally suited for short-legged, fast dashes or long hauls.

Mission flexibility If you had to pick one word to describe the PC–12, it would have to be *versatile*. It can be an executive luxo barge, a high-density commuter, or a pure cargo hauler. The new FARs permitting single-engine Part 135 operations help to greatly expand this airplane's potential as an economical commuter and charter platform.

The comfort and luxury of the executive interior are undeniable, and its impact on the PC–12's payload is minimal.

Angle-of-attack probes—one on each wing—send information to the stick shaker-pusher system. Probe anti-ice must be on for every flight. The probe, AOA vane, and mounting plate are all heated.

The PC–12 can be ordered in one of three interior configurations. The executive version is by far the most popular. It has six swiveling and reclining leather chairs in a club seating arrangement. New for 1998 are pleated leather seats, and footrests for the two aftmost chairs. The executive interior is a $139,000 option and includes a forward lavatory and refreshment center.

Air conditioning is a popular option; it costs $28,200 and adds 87 pounds to the airplane's empty weight. All manner of other interior options are available. The most lavishly outfitted PC–12 now lives in England. It has a galley, complete with a refrigerator.

The comfort and luxury of the executive interior are undeniable. But its impact on payload isn't severe at all. All new PC–12s have maximum ramp weights of 9,965 pounds. Before 1997 this weight specification was an option; standard maximum ramp weights were 9,085 pounds. The extra 900 pounds makes newer PC–12s basically a fill-the-cabin, fill-the-tanks airplane.

A very well-equipped executive-style PC–12 will tip the empty-weight scales at 6,100 pounds or so. Fill the cabin with six 190-pounders and 500 pounds of baggage and there's still room for 2,225 pounds (about 333 gallons) of fuel. Maximum fuel capacity is 2,704 pounds (about 402 gallons.)

Using a PC–12 rule of thumb for fuel burn—500 pounds the first hour, 400 pph for every hour thereafter—the airplane just described could fly at FL240 (under ISA conditions) for about four-and-a-half hours at about 265 knots and cover almost 1,200 nautical miles.

Commuter versions of the PC–12 weigh about 800 pounds less than executive models and have nine rather Spartan cabin seats. Fill all of them with FAA-standard 170-pounders and there's still room for 2,300 pounds of fuel—enough for five hours' worth of flying.

In its cargo-hauling setup, operators can take full advantage of the airplane's huge aft cargo door. True to the PC–12's Swiss origin, the cargo door is built with fittings and locking mechanisms that could easily serve on a bank vault. Once opened, a gas-filled piston lets the door rise slowly. To close it, push a button on the side of the fuselage and an electric motor lowers it to the locking position.

Some operators, like Frank Kelner of Kelner Airways, in Goose Bay, Labrador, use their PC–12s as commuters by day and freighters by night. Kelner serves a number of remote towns in Labrador, Quebec, and Newfoundland—some of them Inuit villages with unimproved airstrips. After the last passenger flight of the day, Kelner's PC–12 seats are removed and up to 3,000 pounds of cargo is lashed down and sent on its way around the provinces. Oil drilling motors, motorcycles, and snowmobiles are just some of the kinds of heavy, bulky objects that a PC–12 can swallow with ease.

The Royal Flying Doctors use PC–12s


N192PC
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to minister to remote villages with unimproved airstrips in Australia. Alpha Flying of Norwood, Massachusetts, uses PC–12s in a fractional ownership setup.

Systems For the most part, the PC–12's systems are like those of a conventional twin-engine turboprop. However, there are some exceptions.

One is the manual override (MOR) system, which lets you control engine torque in the event of a loss of compressor (N_G) output or a compressor governor failure. These types of failures can be caused by a leak in the bleed air lines that feed the governor. Since a governor failure renders the thrust lever inoperative, the MOR lever is there to let you control engine torque (and fuel flow) via a direct linkage to the fuel metering valve portion of the N_G governor. The Socata TBM 700 uses an identical system.

It can be a high-density commuter, an executive luxo barge, or a pure cargo hauler.

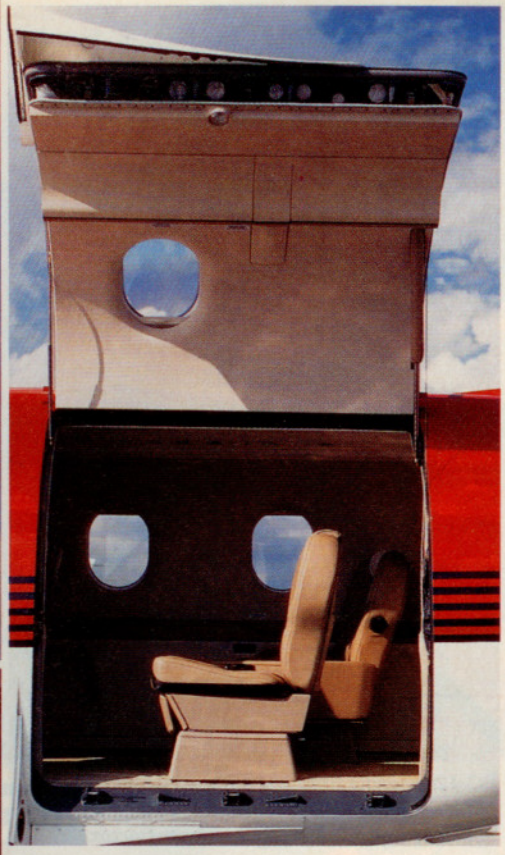
Another departure from the conventional is the absence of a propeller control lever in the PC–12. Overspeed and underspeed governors keep the four-blade Hartzell propeller at a constant 1,700 rpm. With the 1,600-shaft-horsepower (derated to 1,200 shp) Pratt & Whitney PT6A-67B, Pilatus figures that the airplane has more than enough power to modulate airspeed, that 1,700 rpm is an optimum setting, and that the pilot is spared the work load of dealing with yet another lever. To feather the propeller, the condition lever is moved to the Cut-Off Feather position.

By the way, this is the only remedy for dealing with a full-blown propeller overspeed or underspeed. That—and, in this case, a 114-knot glide speed—is the price you pay for single-engine turboprop flying.

The 28-volt DC electrical system is powered by two generators and a nicad battery. In addition, two sources of inverter power feed the AC needed to drive the two-tube EFIS. An emergency-power system is a $15,849 option that will drive a standby attitude indicator and number-one nav/com in the event of an otherwise-complete loss of electrical power.

The primary generator (generator one) puts out a continuous 300 amps (450 amps for a maximum of two min-

The executive interior (above) carries six in great comfort. The commuter version's interior (below) includes nine seats. A forward lavatory is an option.



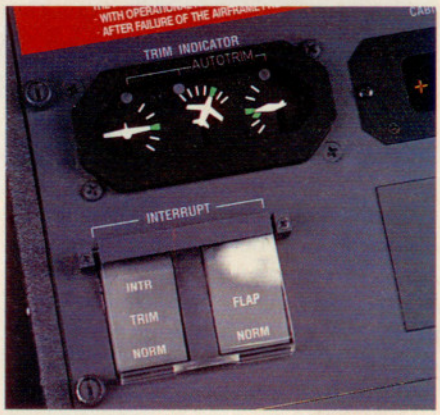
The Caution and Warning System (CAWS) panel includes annunciators for Pusher Ice Mode and other system alerts (left). With the EFS 40/50 (below, shown with a localizer frequency as primary navigation) plus a mechanical RMI, there are plenty of ways to navigate. The AOA indicator is at left edge of the EADI. A pictorial "runway" shows your position in the EADI's localizer mode.

The Engine Information System (EIS) is an LCD that shows engine parameters, generator and battery status; it also has a fuel totalizer function (below).

utes per hour), and also serves as the airplane's starter motor. Generator two is a 130-amp, belt-driven unit. If generator one conks out, the nonessential bus automatically drops off-line to shed electrical loads.

If generator two dies, it's not such a big deal. Generator one can handle just about all the electrical load that the airplane can produce.

The kicker here is that if either generator quits, the pilot is warned not to fly in icing conditions. The level of anti-ice protection on the PC–12 (pitot tube and static ports, two angle-of-attack [AOA] probes, propeller anti-ice, and two levels of windshield heat to each windshield) create quite a current draw. Generator two can't handle all that load. Even though generator one can, Pilatus apparently doesn't want pilots challenging the airplane's lone primary source of electrical power.



Trim position indicators must line up with the green reference marks for takeoff (above). It takes a lot of rudder trim to handle the torque of 1,200 shp.

In full-flap stalls during flight test, the PC–12 demonstrated some wing-dropping tendencies that Pilatus didn't like. That's how the airplane came to have a stick-shaker and -pusher system. At eight to 10 knots above stall speed, the shaker will physically vibrate the control yoke and a warning tone will sound. Ignore this and the pusher kicks in with a 50-pound, nose-down force applied to the elevators. You can overpower the pusher by pulling with 60 pounds of force or hitting a yoke-mounted Pusher Interrupt pushbutton. You might want to do that in a dire, low-altitude situation—but, as always, the best way to avoid the shaker-pusher is to cultivate keen airspeed control and keep an eye on the AOA fast-slow depiction on the PC–12's AlliedSignal Bendix/King EFS 40/50's electronic attitude direction indicator (EADI).

Flying First off, let's just say that it takes

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PC–12s nearing final assembly at the Pilatus plant in Switzerland. Wings and fuselage are built by Ogma, a Portugese subcontractor.

a fairly strong arm to hand-fly the PC–12. Nearly everything on the airplane is overbuilt, and that goes for the control rods and other flight control hardware, too. There's an aileron-rudder interconnect, and that adds to the heavy feel of the flight controls—especially at flap settings greater than 15 degrees (the first flap deflection increment, and the one used for takeoff). The heaviest strong-arming comes when performing a crosswind landing with the full 40-degree flap setting.

It takes a strong arm to hand-fly a PC–12. An aileron-rudder interconnect requires considerable effort on crosswind landings.

Starting is semi-automatic. Push and then release a Start switch and the start sequence begins. Between 13 and 18 percent N_G, move the condition lever to ground idle to introduce fuel to the combustion chamber, then wait for the interturbine temperature (ITT) to rise. Be ready to snatch the condition lever back to Cut-Off Feather if the ITT rises too high and watch the rest of the start progress. The igniters automatically shut down once the ITT reaches 500 degrees Celsius, and then you're ready for the taxi and pretakeoff checklists.

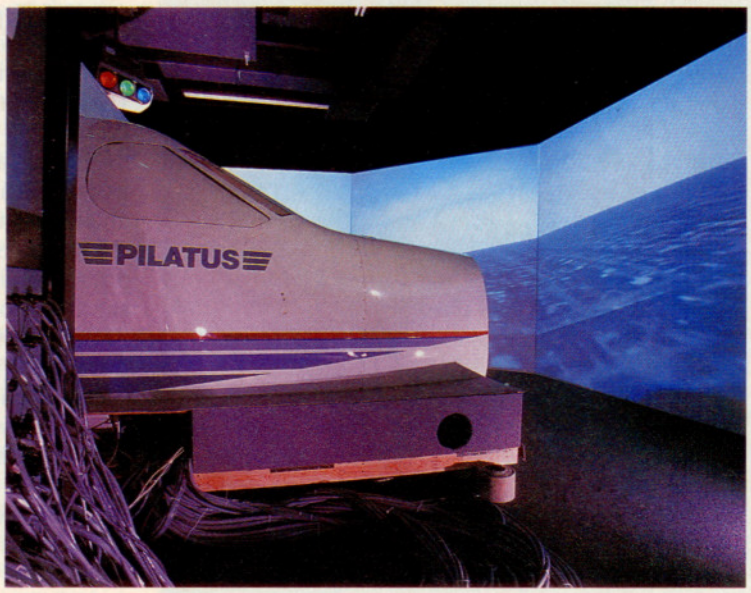
The pusher, annunciator panel, and engine information system (EIS) panel have to be checked before every flight, and so does the windshield heat. Pilatus requires the use of windshield heat on every flight, not just those when icing is anticipated. This is a bird-strike damage prevention measure. The windshield is more flexible when heated and better able to stay in one piece if struck.

There's a torque limiter that should prevent you from inadvertently over-torquing the propeller gearbox, but torque should be monitored nonetheless when charging down the runway. Rotate at 80 knots (at maximum gross takeoff weight), confirm a positive rate of climb, retract the gear, punch on the yaw damper, and you're on your way. Use 160 knots for a cruise climb and you'll be well above 20,000 feet in about 21 minutes or so.

In icing conditions, an inertial separator door at the engine air intake should be opened to let ice and precipitation drop from the air flowing into the PT6's annular intake chamber. With windshield heat set at the Light position, practically the entire windshield is heated via heating elements embedded in the glass. Select the Heavy setting and a small, central square receives a big dose of heat—for those times when dense icing takes hold.

Target airspeeds for approach are 90 to 100 knots on downwind and 80 knots crossing the fence—assuming full flaps. To fly the ILS, a good ballpark setup is 12 to 13 psi of torque (Pilatus measures torque in terms of gearbox oil pressure, rather than foot-pounds) with 15 degrees of flaps and landing gear down at one dot high on the glideslope. This should produce an airspeed of 120 knots and a descent rate of approximately 600 fpm.

Short-field landings are the most fun. Here, the best technique is to fly down final with full flaps while monitoring the AOA indicator and employing power to control airspeed



SimCom's week-long pilot initial training includes generous helpings of class work, simulator time, and flight instruction in the owner's airplane. SimCom's simulators are distinguished by their expansive visual displays.

and altitude. A glance at the airspeed indicator on such an approach may show values as low as 70 knots! After touchdown, get on the brakes, squeeze the thrust lever's Beta gate open (by pulling up on two triggers), and yank the thrust lever back into full reverse. Your ground roll can be as short as 800 feet—a pretty good feat for a 9,900-pound airplane.

The PC–12's trailing-link landing gear lets you perform quite smooth touchdowns from the start of training.

For all this short-field talk, there are two stern warnings to keep in mind. A shaker activation at low altitude requires an immediate go-around. You certainly don't want to fly so slowly that you enter pusher territory, and so to prevent any shaking or pushing, it's a good rule of thumb to never let your AOA fast-slow indicator drop any further than one dot slow.

As for maintenance, Pilatus mandates 100-hour inspections in addition to annuals, plus adherence to phase checks—an ongoing set of maintenance and inspection procedures covering various systems and components at prescribed intervals.

Avionics PC–12s use an AlliedSignal Bendix/King avionics suite. This includes a KLN90B IFR-approved GPS, a KFC325 autopilot, a two-tube EFS 40/50 EADI and EHSI, and a single AHRS (attitude and heading reference system) box. The AHRS uses a ring laser gyro to determine the airplane's attitude and rates of movement. This is accomplished by sending laser beams around a triangular circuit. The AHRS then measures the amount of time it takes for the lasers to make their rounds, and thus calculates the airplane's attitude and heading. There are no vacuum pumps on a PC–12.

From there, a wide range of options is available. A copilot EFIS display ($98,500) is one. A second AHRS ($38,325) is another. Other popular options include a

Reverse thrust from the PC–12's PT6A can cut the ground roll to just 800 feet.

Pilatus PC–12

Base price: $2,443,250

Price as tested (with executive interior): $2,981,391

Specifications

Powerplant	Pratt & Whitney Canada PT6A-67B, 1,200-shp
Recommended TBO	3,500 hr
Propeller	Hartzell four-blade, constant speed, full-feathering and reversible pitch, 105-in dia
Length	47 ft 3 in
Height	14 ft
Wingspan	53 ft 3 in
Wing area	277.8 sq ft
Wing loading	32.5 lb/sq ft
Power loading	9 lb/hp
Seats (as tested)	2 pilots and 6 passengers
Cabin length	16 ft 11 in
Cabin width	60 in
Cabin height	57 in
Standard empty weight	5,732 lb
Empty weight, as tested	6,070 lb
Maximum ramp weight	9,965 lb
Maximum takeoff weight	9,920 lb
Maximum useful load	4,233 lb
Useful load, as tested	3,895 lb
Maximum payload	3,108 lb
Payload w/full fuel	1,552 lb
Payload w/full fuel, as tested	1,214 lb
Maximum landing weight	9,920 lb
Maximum zero fuel weight	9,039 lb
Fuel capacity, std	407 gal (402 gal usable) 2,715 lb (2,681 lb usable)
Oil capacity	2.9 gal
Baggage capacity, aft baggage compartment	400 lb, 34.3 cu ft

Performance

Takeoff distance, ground roll	1,270 ft
Takeoff distance over 50-ft obstacle	2,300 ft
Maximum demonstrated crosswind component,	
flaps 0	30 kt
flaps 40	15 kt
Rate of climb, sea level	1,680 fpm
Cruise speed/endurance w/45-min rsv, (fuel consumption)	
@ Maximum cruise power, 2 pilots and 6 passengers and 100 lb bags FL260	267 KTAS/4 hr (374 pph/56 gph)
@ Long range power, 1 pilot and full fuel FL260	170 KTAS/11hr (202 pph/30 gph)
Maximum operating altitude	30,000 ft
Landing distance over 50-ft obstacle	1,830 ft
Landing distance, ground roll	815 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)	110 KIAS
V_Y (best rate of climb)	120 KIAS
V_A (design maneuvering)	151 KIAS
V_{FE} (max flap extended), 15 degrees	163 KIAS
30/40 degrees	130 KIAS
V_{LE} (max gear extended)	236 KIAS
V_{LO} (max gear operating)	
Extend	177 KIAS
Retract	177 KIAS
V_{NE} (never exceed)	236 KIAS
V_R (rotation)	78 KIAS
V_{S1} (stall, clean)	86 KIAS
V_{SO} (stall, in landing configuration)	59 KIAS

For more information, contact Pilatus Business Aircraft, Ltd., Jeffco Airport, 11755 Airport Way, Broomfield, Colorado 80021; telephone 303/465-9099; fax 303/465-9190; Internet: www.pilatus-aircraft.com

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.

multifunction display ($69,500); a Bendix/King RDR-2000 vertical-profiling weather radar ($38,325); a BFGoodrich WX 1000E Stormscope ($19,100); and a radar altimeter ($17,850).

Training SimCom Training Centers is the Pilatus-approved provider of pilot initial and recurrent training. Based in Orlando, Florida, SimCom's initial training includes three days' worth of classroom study and about 13 hours of simulator training—in SimCom's newly built Pilatus simulator. SimCom's simulators have most of the features you'd expect of a top-flight training operation, plus a wraparound, wide-screen visual display that more than makes up for the simulator's lack of motion. The training finishes up with a few hours of instruction in owners' airplanes.

SimCom initial training comes free to each owner of a newly purchased PC–12. For others, the price is $5,400 for the week-long initial course. Recurrent training normally goes for $3,220, but repeat customers who have attended a pilot initial course receive a 20-percent discount. A second pilot can attend pilot initial or recurrent training for half the normal price.

Price The PC–12 carries a $2,443,250 price tag for the basic airplane. The in-flight photographs that accompany this article show an executive version with just about every option imaginable. This airplane—N192PC—is a demonstrator based out of Pilatus Center South at DeKalb-Peachtree Airport in Atlanta. A 1998 model, this airplane has the newest version of leather cabin seats, complete with adjustable lumbar support and headrests on each seat, plus footrests for the aftmost pair of seats. It's also got dual EFIS, dual AHRS, an MFD, air conditioning, radar, Stormscope, and a lot more. It's listed at $2,981,391.

Since 1995, 102 PC–12s have been sold. That's not a bad tally for a brand-new design. The airplane projects a feeling of substance and high quality everywhere you look. The cockpit is huge, the panel is well-organized, and every aspect of the airplane exudes the Swiss fascination with order, precision, and durability. For the pilot, the subliminal message is one of confidence and security. □

Links to all Web sites referenced in this issue can be found on AOPA Online (www.aopa.org/pilot/links.shtml). E-mail the author at tom.horne@aopa.org