New magic

The Garmin G1000 brings new tricks to the Piper Meridian panel

BY THOMAS B. HAINES

The Garmin G1000 cockpit upgrade to the Piper Meridian represents the third-generation cockpit for the 10-year-old design, but the first that can be called truly integrated. Piper entered the single-engine turboprop fray starting in 1998 with the announcement of the Meridian; deliveries began in late 2000.

Those first airplanes carried the Meggitt MAGIC panel—revolutionary in its day for giving lighter airplanes cockpit gear on par with what had been the purview of only the jet set. The Meridian's MAGIC panel consisted of a primary flight display, navigation display, and engine display on each side of the cockpit. Meggitt, which owned S-Tec at the time, also supplied the autopilot. Dual Garmin GNS 530s handled navigation and communication duties. Honeywell supplied its Bendix/King RDR 2000 weather radar.

Meggitt was never able to garner much market share with the MAGIC panel and eventually moved away from the product line at about the time that Avidyne's Entegra system blossomed onto the market. Piper switched to Entegra for the Meridian in 2005, sticking with the S-Tec autopilot, Honeywell radar, and Garmin navigators, but swapping MAGIC's six screens for two larger Avidyne PFDs and a multifunction display in the middle.

PHOTOGRAPHY BY CHRIS ROSE

Looking for an even more integrated solution and an autopilot more suited to driving a speedy turboprop, Piper in late spring this year announced that Meridian customers now have the option of upgrading to a G1000 cockpit with a GFC 700 autopilot. The system includes two 10.4-inch PFDs sporting Garmin's new synthetic vision technology and an eye-catching 15-inch MFD. The pilot can interact with the G1000 through the bezel-mounted softkeys or through a pedestal-mounted keypad. The GFC 700 autopilot controller is located just below the MFD. Dual audio panels are outboard of the PFDs. A stack of three standby instruments resides next to the pilot's PFD. The Garmin GWX 68 weather radar supplants the Honeywell system and displays on the MFD along with XM satellite weather.

The basic G1000 package is a $50,000 upgrade over the basic Avidyne package. Most airplanes, whether Avidyne or Garmin, go out the door with traffic and terrain warning, Stormscope, and satellite weather systems that add about $75,000 to the cost in either case. The Avidyne-equipped price is $2,104,500; the G1000 version totals $2,154,500.

Some may argue that's a big hit for a single-engine turboprop (although it's the least expensive of such airplanes by about $1 million). However, even with the increasing price, the value equation for the Meridian has improved since its introduction. When the Meridian debuted in 2000, the MAGIC-equipped price was $1.6 million. By 2005 with the Avidyne introduction, the nicely equipped price was $1.9 million. Inflation alone accounts for almost $400,000 of the price change since 2000. So today's customer is paying about $155,000 more for a much more capable airplane. A gross weight increase a number of years ago now provides a full-fuel useful load of about 520 pounds in a fully equipped airplane—a significant increase over the 369-pound useful load in the original Meridian. The capabilities of the G1000 and especially the GFC 700 are light years ahead of the MAGIC panel and the original autopilot.

The GFC 700 truly transforms the airplane. The sophisticated autopilot flies the airplane masterfully, easing pilot workload and ultimately improving safety. Add in the synthetic vision system that essentially shows a VFR day through the PFD at all times—as well as terrain warning, Garmin's SafeTaxi chart displays, satellite weather, and an integrated crew alerting system to warn the pilot of system anomalies—and the Meridian is at the pinnacle of cockpit technology.

Get out of here

Of course, none of the snazzy technology matters if it doesn't hang together for the pilot when he needs it most. To find out how the Meridian does, we launched into scuzzy weather from Frederick, Maryland, for a climb to altitude over central Pennsylvania with a plan to land at Harrisburg's Capital City Airport to rendezvous with our photo platform—the forecasts calling for better weather in that part of the world. The usually helpful New York Center controllers were awash in arrivals and at first told us to get lost when they noticed our flight plan called for us to loiter around FL250 northeast of Harrisburg for some

speed runs. But after making their displeasure known, they went to work and found a hole for us while we captured some performance data.

With Piper project pilot John Kronsnoble in the right seat and AOPA photographer Chris Rose in the back and partial fuel, we were close to maximum takeoff weight. The G1000 posted our rotation speed of 85 knots as well as V_X and V_Y on the airspeed indicator. The drill is to shoot for an initial climb of 125 KIAS until safely away from obstacles and then transition to 135 knots for a cruise climb, which yielded more than 1,000 fpm for nearly the entire ascent. Above FL200, the climb speed to hit is 145 KIAS. The speeds are easily managed by the FLC (flight level change) mode on the GFC 700—just dial in the speed you want and it will supply the climb rate to maintain it, without allowing the airplane to get too slow. Although the GFC 700 includes a yaw damper, the pilot must still manage the rudder trim. If your backside misses it, an annunciator alerts when the yaw gets out of whack. Rudder trim is adjusted with a horizontal rocker switch below the autopilot controller. Typical Piper, the Meridian flies with no bad habits and feels like the big airplane that it is.

On this spring day, the temperature at FL250 was about 5 degrees C warmer than standard. At a high-speed cruise setting using 1,230 pounds of torque from the Pratt & Whitney PT-6 out front, the airplane performed right at book, showing 259 knots true airspeed on 263 pounds of fuel per hour (about 39 gph). At a long-range cruise setting of 880 pounds of torque, the speed dropped off to 229 KTAS on 209 pph (31 gph), about two knots slower than book.

As we maneuvered toward Harrisburg, we put the MFD's weather information pages to work. The XM satellite system provides an abundance of information on multiple pages, which are accessed via softkeys across the bottom of the MFD. In addition to onboard and datalink radar, the pilot can choose echo tops, cloud tops, lightning, cell movements, sigmets and airmets, METARs, and more—even a page showing long-

With its Jumbotron-like MFD and crisp, synthentic-vison PFDs, the Garmin G1000 transforms the Meridian. The GFC 700 autopilot is especially well suited to the airplane. The new console-mounted keypad (above) eases pilot workload by simplifying data input to the com radios and the nav system.

SPECSHEET

Piper PA-46-500TP
Base price: $2,021,500
Price as tested: $2,154,500

Specifications

Powerplant ..... Pratt & Whitney PT6A-42A 500 shp @ 2,000 rpm
Recommended TBO ..... 3,600 hr
Propeller..... Hartzell, 4-blade, 82.5-in dia
Length..... 29 ft 7 in
Height ..... 11 ft 4 in
Wingspan ..... 43 ft
Wing area..... 183 sq ft
Wing loading ..... 27.8 lb/sq ft
Power loading..... 10.2 lb/hp
Seats 6
Cabin length..... 12 ft 4 in
Cabin width .....4 ft 2 in
Cabin height ..... 3 ft 11 in
Empty weight .....3,433 lb
Empty weight, as tested .....3,476 lb
Max ramp weight.....5,134 lb
Useful load ..... 1,701 lb
Useful load, as tested.....1,658 lb
Payload w/full fuel.....562 lb
Payload w/full fuel, as tested.....519 lb
Max takeoff weight.....5,092 lb
Max landing weight .....4,850 lb
Zero fuel weight.....4,850 lb
Fuel capacity, std...173 gal (170 gal usable) 1,160 lb (1,139 lb usable)
Oil capacity ..... 12 qt
Baggage capacity.....100 lb, 20 cu ft

Performance

Takeoff distance, ground roll .....1,650 ft
Takeoff distance over 50-ft obstacle..2,438 ft
Max demonstrated crosswind component .. .. 17 kt
Cruise speed/range w/45-min rsv, std fuel (fuel consumption)
@ Max contin. FL280....257 KTAS/938 nm (241 pph/35.9 gph)
@ Max contin. FL250....260 KTAS/861 nm (269 pph/40 gph)
@ Max endur. FL280.. 179 KTAS/1,136 nm (135 pph/20.2 gph)
Max operating alt. .....30,000 ft (28,000 ft in RVSM airspace)
Service ceiling.....30,000 ft
Landing distance over 50-ft obstacle ....2,110 ft
Landing distance, ground roll .....1,020 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb).....95 KIAS
V_Y (best rate of climb)..... 125 KIAS
V_O (max operating maneuvering) . 127 KIAS
V_{FE} (max flap extended) .....168 (10 deg), 135 (20 deg), 118 (36 deg) KIAS
V_{LE} (max gear extended) ..... 168 KIAS
V_{LO} (max gear operating)
Extend..... 168 KIAS
Retract..... 129 KIAS
V_{MO} (max operating speed) ..... 188 KIAS
V_R (rotation) ..... 85 KIAS
V_{S1} (stall, clean)..... 79 KIAS
V_{SO} (stall, in landing configuration)...61 KCAS

For more information, contact Piper Aircraft, Inc., 2926 Piper Drive, Vero Beach, Florida 32960; 772-567-4361; www.piper.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.

range forecast conditions using symbols such as the little sun with clouds over part of it for partly cloudy, as your TV weatherman might use.

For us, the echo top and METAR pages mattered. The clag to the south had moved north across Harrisburg. I set up for a GPS Runway 8 approach to Capital City. If you have loaded an approach in a Garmin GNS 430 or 530, you'll be right at home. I allowed the GFC 700 the honors, amazed as it flew a perfect descent to the initial altitude, captured the approach, and proceeded inbound as if on rails. My only tasks were managing the power, flaps, and landing gear.

With the photo mission scrubbed, we headed home to Frederick—almost perfectly lined up for a straight-in to the ILS 23 approach. I hand flew this one, using the flight director, synthetic vision, and the big MFD to keep me headed in the right direction. The system includes dual air data computers and dual attitude and heading reference systems. A reversionary mode puts the MFD's engine data and other essential information on the PFDs, should the middle screen take a powder.

For the less fortunate

Alas, not everyone can sit up front and enjoy the view both outside and from

the displays. Still, the folks in back will be OK. The four-seat club configuration provides adequate room and air-conditioned, pressurized comfort. Passengers will especially like loading through the clamshell cabin door rather than crawling over the seats. The aft seatbacks fold forward to access the baggage section; the seatbacks can lay flat to accommodate bags as well.

The place to be, though, is up front where the new G1000 cockpit allows the pilots to do as little or as much as they want—fly it all with amazing situational awareness provided by the gear or sit back and watch the new generation of magic do its thing. It's quite a trip one way or another. AOPA

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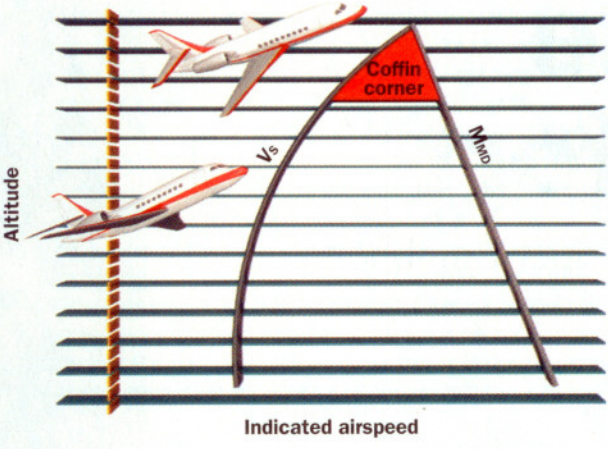
Travel along with Editor in Chief Thomas B. Haines as he samples the G1000 cockpit in the Piper Meridian (keyword: New magic).

TURBINE TALK

Coffin corner

By Barry Schiff



Pilots know that the indicated stall speed (V_S) of a lightplane remains constant with altitude. If a Cessna 182RG stalls at 55 KIAS at sea level, it also stalls at 55 KIAS at 10,000 feet (everything else being equal).

The same is not true of turbofan-powered airplanes at high altitude. Assume that a certain turbofan-powered airplane has a clean stall speed of 210 KIAS at sea level. At 35,000 feet, that indicated airspeed equates to a true airspeed of 365 knots. At such a speed, air flowing over the wings and into the pitot tube is somewhat compressed. This compression adds to the ram air pressure normally entering the pitot system and causes the indicated stall speed to increase somewhat with altitude.

At the same time, the indicated airspeed representing M_{MO} (maximum-operating Mach speed) *decreases* with altitude. For example, Mach 0.85 at 30,000 feet equals 325 KIAS, but is only 259 KIAS at 40,000 feet.

As the aircraft climbs higher, therefore, the indicated airspeed at which it stalls increases while the indicated airspeed for M_{MO} decreases. Eventually the airplane might reach an altitude where there is little difference between the two indicated speeds.

Now assume that an aircraft operating within this narrow margin begins to buffet as the result of maneuvering or turbulence. Would this be a conventional pre-stall buffet, or would it be a Mach buffet caused by a shock wave? The two are often indistinguishable, which creates a dangerous dilemma. What should the pilot do to recover?

If the pilot believes that the aircraft is stalling and increases airspeed, he could unwittingly force the aircraft beyond its Mach limit. Conversely, if he believes the disturbance is a Mach buffet and reduces airspeed, he risks deepening a stall. Either of these incorrect actions can result in a loss of control (or worse), which is why the upper tip of the operating envelope is called *coffin corner* and should be avoided. AOPA

Visit the author's Web site (www.barryschiff.com).

STEVE KARP