850 plus 1000

EADS Socata's TBM turboprop singles have undergone a series of improvements since the airplane's introduction in 1989, but none as dramatic as the latest. With the introduction of Garmin's G1000 integrated avionics, flight display, and control system, today's TBM850s promise lower pilot workload, better situational awareness, and an optimized flight control system. Garmin's GFC 700 autopilot is mated to the new TBM's G1000 avionics suite, and has a number of new capabilities. Among them are the ability to load airways into flight plans, and fully automated missed approach procedure flight guidance. At the missed approach point or decision height, you simply push the Nav button on Garmin's glareshield-mounted GMC 710 autopilot mode controller panel, and in autopilot mode the airplane will climb and track the published missed approach procedures. There's also a center console-mounted FMS (flight management system) control panel that lets you enter mode commands and flight plan entries.

PHOTOGRAPHY BY MIKE FIZER

The ultimate personal turbine single, now with Garmin panel power

BY THOMAS A. HORNE

The G1000 avionics suite gives the panel a cleaner, more organized look while at the same time providing better situational awareness. The MFD (center panel, above) shows Garmin's SafeTaxi presentation of the North Perry, Florida Airport. More—and faster—cabin cooling comes via the Liebherr mechanically driven air conditioning compressor (top left). The pilot access door (bottom left) lets the pilot enter without disturbing passengers or interfering with cargo. It comes in handy, but only 17 of last year's 60 customers opted for it.

Before the GFC 700, TBM 700s, and -850s used Honeywell/Bendix-King's KFC325 autopilot. Although the KFC325 is a great flight control system, the GFC 700 has an edge in that its pitch compensation allows full flaps to be selected while coupled to an ILS glide slope. The GFC 700 can also intercept and execute an ILS approach at any airspeed; the KFC325 was limited to 160 KIAS.

The G1000 isn't the only new feature of the latest TBM850s. XM datalink weather and entertainment is standard with the G1000, for example. And there's a newly designed, composite-construction interior with LED light-

ing; recessed side pockets; a table that stows flush with the sidewall; iPod jacks; and headset jacks located away from the armrests. With earlier TBMs, it was too easy for passengers' elbows to damage the jacks. The flush styling gives the cabin a few more inches of interior room, as does the one-piece composite headliner.

Another bonus is the airplane's new air conditioning system. Gone is the old, 14,000-BTU, electrically powered vapor-cycle system. Replacing it is a mechanically powered 24,000-BTU compressor design that uses R134a refrigerant, draws less power, cools the cabin much quicker, and occupies less space. Using

First look: G1000 training for the TBM850

Dropping in on the first skull sessions for the new TBM850's avionics suite.

BY IAN BLAIR FRIES

Last fall I attended a meeting at EADS Socata headquarters in Tarbes, France, where the TBM850 is built. A primary goal of the meeting was to learn the new TBM850's Garmin 1000, and to determine how best to teach pilots to use the sophisticated avionics suite. Socata engineers, test pilots, chief pilots, instructors, marketing experts, and maintenance representatives attended the briefing in preparation for the delivery of the first TBM850 with the new glass cockpit.

The menu of standard G1000 features is long, but specific to the TBM850 are interactive electrical, fuel, and anti-icing schematics, electronic checklists, and automatically scheduled pressurization. A crew alerting system (CAS) provides several dozen precautionary and emergency warnings in plain English, and these warnings are tailored to the TBM.

The TBM850's G1000 installation has 26 Garmin LRU's (Line Replaceable Units), and three large display screens. Screens display optional Jeppesen approach plates, taxi diagrams, forward-looking terrain and obstacle avoidance, and XM satellite weather. Optional third-party LRU's—an L3 Stormscope, Becker ADF, Honeywell DME, Kannad ELT, and Honeywell radar altimeter—may also be integrated.

Engine exceedences, autopilot disconnects, and dozens of other abnormal occurrences are recorded in a fault log. Details can be downloaded on an SD card, and the log then e-mailed to Pratt & Whitney, Socata, or Garmin as required.

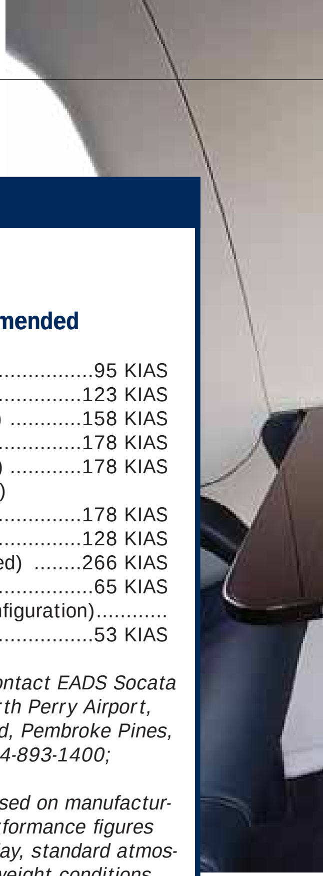
The G1000 has robust maintenance and test software. For example, each of the five TBM autopilot servos can be individually tested, including clutch slip torques (the force necessary to overcome an errant autopilot control). As for faulty wiring connections, they can be quickly identified and repaired via the G1000's diagnostics. In some cases the problem can be corrected by juggling software, and in others an LRU might need replacement. LRUs are not field repairable, but a replacement exchange is free under the two-year warranty, and thereafter at a fixed cost.

Pilot initial training will be conducted at SimCom's TBM850 training center in Orlando. Training takes five days, and a sixth day if the TBM850 is their first turbine aircraft. Pilots are assumed to be instrument proficient upon entering the course, a requirement stressed by the instructors. Only limited time is devoted to a review of conventional avionics, but the extra G1000-specific training for this new airplane substantially complicates the curriculum. A pilot with Garmin GNS430 or GNS530 experience may transition to a G1000 system somewhat more easily, but even so, the G1000 system requires a lot of study and practice. That goes for pilots already familiar with the G1000; they are likely to need type-specific training just like any other pilot.

We found Garmin's G1000 handbooks and a PC trainer on DVD very helpful, but the participants unanimously agreed that time in a flight-training device ought to be mandatory. As for our group, we had three operational Garmin panels, a keyboard, and an autopilot controller serving as training devices. We also had access to the factory G1000 instrument test panel, where extensive fault modes could be simulated. At the end of three days we still were not fully G1000 proficient, so there was little doubt most pilots would require a dedicated two- or three-day structured course as part of initial TBM850 training.

Our experience in Tarbes gave everybody a good feel for the G1000. It will be interesting to see how SimCom finalizes the training program for this great new airplane.

Ian Blair Fries flies a TBM 700. He is ATP, CFII, and LearJet-rated.



SPECSHEET

EADS Socata TBM850
Average equipped price: $3.082 million

Specifications

Powerplant ....Pratt&Whitney PT6A-66D, 1,825 shp, derated to 850 shp
Seats..6
Standard empty weight ....4,589 lb
Max zero fuel weight ....6,032 lb
Max ramp weight ....7,430 lb
Max takeoff weight......................7,394 lb
Max useful load............................1,443 lb
Max landing weight......................7,024 lb
Fuel capacity, std..........................292 gal (292 gal usable)

Performance

Takeoff distance over 50-ft obstacle.......... 2,840 ft
Cruise speed / range w / IFR fuel rsv
@ Max cruise power setting, 26,000 ft ....320 kt / 1,410 nm
@ Economy cruise power setting, 31,000 ft ....252 kt / 1,585 nm
Max operating altitude................31,000 ft
Landing distance without reverse thrust ....2,430 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)................95 KIAS
V_Y (best rate of climb) ....123 KIAS
V_A (design maneuvering) ....158 KIAS
V_{FE} (max flap extended)..............178 KIAS
V_{LE} (max gear extended) ....178 KIAS
V_{LO} (max gear operating)
Extend ....178 KIAS
Retract ....128 KIAS
V_{mo} (max operating speed) ....266 KIAS
V_{S1} (stall, clean) ....65 KIAS
V_{SO} (stall, in landing configuration)............ ....53 KIAS

For more information, contact EADS Socata North America, Inc., North Perry Airport, 7501 South Airport Road, Pembroke Pines, FL 33023; telephone 954-893-1400; www.tbm850.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.

The newly designed interior has relocated headset jacks, more ergonomic armrests, and composite-construction sidewalls (above left). The cockpit overhead panel (above right) contains, from left, lighting controls, battery and generator switches, starter switch, fuel controls, autopilot, and avionics switches. New leather seats and flush-mounted fold-out table (far right) give more interior space than earlier TBMs.

the space savings, the forward baggage compartment was enlarged, and the aft external baggage compartment eliminated. The interior baggage area behind the aft seats—capable of carrying up to 220 pounds of cargo—is the same as in previous TBMs.

Passengers are sure to like the new, two-zone temperature control system. Passengers and pilots can each select their own temperature levels. Passenger controls are located on the left sidewall, just aft of the rear-facing seat behind the pilot.

Rounding out the upgrades is an 11-gallon fuel capacity increase—from 281 to 292 gallons—made possible by using more internal wing volume and

The G1000 marks yet another milestone for both Socata and Garmin.

moving the fuel caps outboard on the wings. This provides about 15 minutes' more flight time, Socata says, but the extra 74 pounds' worth of fuel somewhat offsets the G1000's 112-pound weight savings, and the savings from the new cabin and compressor. In the final analysis, there is a 50-pound gain in useful load compared to older TBMs, Socata says—unless you order the optional $89,350 pilot access door, which weighs 75 pounds. Base price of the G1000 TBM850 is $2.9 million; average-equipped price is $3.082 million, excluding the pilot door.

The G1000 brought about a thorough study of the educational standards required for both initial and recurrent pilot training. The first evaluations of the G1000 installation and operating procedures took place at the Socata factory in Tarbes, France last fall (see "First Look: G1000 Training for the TBM850," page 77). Subsequently, SimCom—the TBMs' designated training center—began generating G1000 training materials and course requirements. As of this writing, a G1000-equipped simulator was under construction, and it should be completed and installed at SimCom's Orlando training center by July.

Plans call for pilots to be evaluated for their competence with Garmin's GNS 430/530 Nav/Com/GPS units before formal training begins. What follows should be a one- to three-day course devoted to G1000 operations, depending on pilot proficiency. Then it's on to the more traditional components of simulator-based training: instrument procedures, practice approaches, and study of the airplane's systems.

The G1000 marks yet another milestone for both Socata and Garmin. For Garmin, it's another step forward in its march toward industry dominance. For Socata, it signifies the optimization of the TBM design, what with its already exemplary 320-knot/1,410 nm max cruise specs. It will be interesting to see what Socata's next offering will be. The open secret is that it will be a twinjet rivalling Cessna's Mustang light jet. Stay tuned, and visit the Web site (www.tbm850.com) for more information. AOPA

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WHAT IT LOOKS LIKE

Approach indexer

BY MARK R. TWOMBLY

A crucial task when planning your landing in a turbine aircraft is computing approach speed. Aircraft landing weight, flap configuration, field elevation, barometric pressure, ambient temperature, and wind gusts factor into the computation. But, in truth, the approach is best flown using angle of attack (AOA), with the approach indexer as the basic monitoring device in the final stages of the approach.

AOA is preferable to a numerical airspeed value because it continuously analyzes real-time conditions to compute the ideal approach AOA, and thus airspeed.

The AOA system on a Cessna Citation II (CE-550) is comprised of a conical probe transmitter on the right side of the fuselage, a flap position sensor, an AOA gauge on the panel, a fast/slow indicator integrated into the ADI, and an approach indexer.

The slotted probe is heated for anti-icing, and rotates to allow for uniform airflow around the probe. The airflow and flap-position information determine the ideal AOA despite varying aircraft weights and configurations.

Angle of attack indexer shows "nose up" chevron illuminated, indicating that airspeed is fast, and the pilot should raise the nose.

Early in the approach the pilot can monitor AOA using the AOA gauge or, more likely, the fast/slow indicator just to the left of the attitude indicator. The approach indexer is good for monitoring AOA on short final because it is a heads-up device—the pilot can look out the windshield to maintain visual contact with the runway environment while still referencing AOA status using the approach indexer.

The approach indexer typically is mounted near the windshield center post and angled toward the left-seat pilot. It consists of two lighted chevrons, one pointing up and the other down, on either side of a lighted circle.

The chevrons point to the direction the nose should go to achieve the desired AOA. For example, if the upper chevron, which points downward, is illuminated amber, it's a signal to the pilot that airspeed is low and the nose should be lowered (AOA decreased) to increase airspeed. If the bottom up-pointing chevron is illuminated amber, airspeed is high and the nose should be raised (AOA increased). If the middle circle is illuminated green, AOA is on target.

Two other indications are possible on the approach indexer. If the top chevron and middle circle are both illuminated (the chevron amber and the circle green), AOA is slightly high and should be decreased slightly. If the bottom chevron is illuminated amber and the circle green, AOA is slightly low and should be raised slightly.

Mark R. Twombly flies a Citation II and a Citation VII based in southwest Florida.

Severe propeller icing

BY RICK WHELDON

In general aviation, severe propeller icing beyond the anti-ice capabilities of the propeller heater boots is easily missed but should cause concern. Why? Simply put, the pilot does not know that there is ice on the propeller because he cannot see it (at least, not without a stop-action camera.) The pilot should notice, however, the deteriorating aircraft performance.

Several years ago, a colleague was conducting ice research in a twin-engine turboprop. He experienced a 45 to 50 knot speed decrease over an 85-second period, so he pushed the nose down and added torque to regain lost airspeed and exit the icing. Visible ice on the wings was unremarkable, appearing "moderate" and manageable. However, stop action photography revealed 3/4-inch thick ice on each propeller blade, extending from the root to the tip and up to 1.5 inches behind the leading edge. Although the propeller boots were operating properly, the severe ice overwhelmed them. More alarming was the ice outboard of the propeller boots. Since the outer sections of the propeller blades produce the majority of thrust, severe ice on those sections reduces thrust dramatically. Thrust loss, not airframe icing, explained the 50-knot speed loss.

Since this flight, the FAA and industry have engaged in a study of severe propeller icing and reproduced the phenomena in an icing wind tunnel. (For the complete report, see www.sae.org/events/icing/presentations).

Although the propeller boots were operating properly, the severe ice overwhelmed them.

How to respond to severe propeller ice? Airspeed monitoring is the key. Maintain AFM minimum icing airspeed. Immediately demand an altitude change, and, if necessary, declare an emergency. Since thrust is reduced, a descent or course reversal might be the only options. Icing conditions are seldom more than 3,000 feet thick, so even a small descent will often fix the problem. Hand fly the aircraft. Avoid abrupt control inputs. If any unusual roll response is encountered, lower the nose. This type of icing is, by definition, "severe," so the only defense is to get out! AOPA

Rick Wheldon is vice president of Turbine Air Services, Inc., of Addison, Texas.