AVIATION WEEK

Pilot Report: Daher Socata TBM 900

We fly the fastest civil single-engine turboprop

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A 325-kt cruise speed may seem slow by light jet standards, but it's pretty impressive when the aircraft you're flying only is burning 400 lb. per hour. Daher-Socata's TBM 900, the latest iteration of the TBM 700, is at least 14 kt faster than TBM 850, based on our flying both aircraft back-to-back. It also needs less runway and climbs faster, plus it uses less fuel and is quieter both inside and outside.

Last Thursday, we strapped into the left seat of TBM 900 S/N 1014 with Daher-Socata's chief pilot Stéphane Jacques at the firm's plant in Tarbes, France, for a two-hour evaluation of the myriad improvements wrapped into the new model. The preflight walk-around revealed much about what makes the aircraft faster and quieter than its predecessor. Most obvious are the aircraft's new composite Hartzell five-blade prop and winglets.

The Hartzell five-blade incorporates the latest 3-D aero computer modeling, one that analyzes the airflow of the prop around the nose of the aircraft. Socata officials say they looked closely at an advanced prop from MT-Propeller but opted for the Hartzell because the aircraft cruises 3 to 5 kt faster.

The winglets were designed in-house at Socata. Their principal benefit is drag reduction at the higher angles of attack encountered during takeoff and climb. They also were added for aesthetic value.

On close inspection, it's apparent that dozens of subtle drag-reducing mods were made to TBM 900, including adding inner main landing gear doors, recontouring the tail cone and reshaping the engine nacelle. A small, sharp strake, ahead and below of the left wing leading edge, helps tame the entertaining, if not colorful, stall characteristics of earlier TBM models.

It's tougher to spot the changes made to the engine air inlet, plenum and exhaust stacks. Socata's aero engineers undertook the industry's first full-scale CFD analysis of a PT6A engine inlet. They optimized the size and shape of the opening and internal contours to increase ram recovery and thus boost available torque. The exhaust stacks were reshaped to increase thrust output and to reduce aft-section airflow stagnation that caused much of the soot accumulation on the sides of the nacelle and fuselage.

TBM900 doesn't have a 700-shp limitation for takeoff, as did all previous TBM models. All 850 shp from its Pratt & Whitney Canada PT6A-66Ds are available all the time, subject to ITT limits. The additional 150 shp, combined with TBM900's more efficient air inlet, reduces takeoff distances over a 50-ft. obstacle by as much as 23%. Initial climb gradient and time to climb to FL310 also are improved because the improved air inlet ram recovery enables the engine to produce rated power at lower ITTs.

Several ergonomic improvements have been made to the cockpit. It's simpler, and functions are more automated. A new single power lever, mainly designed by Capt. Jacques, integrates the power, prop and condition lever controls. The power lever has moves through *h*-pattern gates, not unlike an auto's manual gearshift lever. The right side of the *h* has idle-cutoff, low-idle and high-idle positions.

During the start sequence and at low idle, bleed air automatically is shut off to prevent thermal stress on the engine. Moving the power lever to the left side of the *h* provides normal-range power control and prop-reverse functions.

TBM900 has automatic torque limiting, so it offers "set and forget" power management for takeoff and initial climb. The upgrade is most appreciated by pilots because precise high-power setting of a PT6A can be challenging of ram recovery with speed change and use of the inertia separator. The torque-limiting function, though, is no substitute for a FADEC.

The cockpit has many other detail improvements. The avionics switch on the overhead panel, for instance, has been eliminated. Changes to electrical load distribution allow the Garmin G1000 avionics system to be powered up as soon as the battery is switched on, with minimal battery drain. The engine-start switch has been changed to a solenoid design that automatically pops back to “off” once the start cycle is complete.

Version 14.01 software for G1000 upgrades the displays with an ISA temperature deviation indication, integrates weather radar with the MFD map and provides automatic landing field elevation inputs to the pressurization controller, among dozens of other small changes.

Takeoff weight at Tarbes was 7,100 lb. and we taxied to Runway 02. Computed takeoff distance for TBM900 was 2,450 ft. compared to nearly 3,100 ft. for TBM850. Setting 100% power was easy because of auto torque limiting. The prop stabilized at 2,020 rpm; we accelerated and rotated at 85 KIAS. After gear and flap retraction, we settled into a 170-KIAS climb. Passing through FL210, we transitioned to a 0.40 indicated Mach climb, reaching FL310 in 20 minutes, 4 minutes later than the book predicted because of warmer-than-ISA OAT and some vectoring for air traffic control.

At FL310, the aircraft, then at a weight of 6,940 lb. and in ISA-1C conditions, settled into a 325-KTAS cruise while burning 400 lb. per hour [pph]. The pilot’s operating handbook predicted 324 KTAS and 384 pph.

Down at FL280 and at a weight of 6,860 lb., the speed was the same, but fuel flow increased to 440 pph. The PIH predicted 327 kt and 429 pph. The airplane actually will cruise as fast as 330 KTAS at FL280, but only at a svelte 5,500-lb. gross weight.

At both cruise altitudes, we found the cabin to be noticeably quieter than that of TBM850 because of the new five-blade Hartzell prop. Vibration levels also are appreciably lower because the engine is more isolated from the airframe. The new air inlet and engine, for instance, are separated by a soft sealing gasket.

Next we descended to 11,000 ft. for a stall series. In the clean configuration, stall break occurred at 78 KIAS with a pronounced but controllable wing drop. Stalling with gear and flaps extended at 63 KIAS, wing drop was gentle and easy to correct. Setting 77% torque in the clean configuration, we gradually increased pitch to 31-deg. nose up. Stall occurred at about 60 KIAS with a sharp wing roll off to 30 deg.

During all three maneuvers, stall recovery was immediate when we crisply reduced angle of attack. Then we headed back to Tarbes.

Crossing the field at 11,000 ft., Jacques next demonstrated an inflight engine shutdown and relight. In preparation, we extended the landing gear over the runway and stabilized the aircraft at 120 kt at idle thrust. Jacques then shut down the engine. Even with gear down, the aircraft has an excellent power-off glide ratio, providing confidence that we could have executed a power-off landing after spiraling down to the runway.

We restarted the engine and returned to Runway 20 for two landings. Our first approach was an ILS to a touch-and-go. Over the runway, we flared a bit high and settled onto the pavement with no grades for style. During the second approach, we flared close the runway and touched down more smoothly.

Conclusions after the two-hour mission? With its greater speed, TBM900 more effectively competes against light jets. It’s actually faster on a 600-nm mission and it burns 26% less fuel than the Cessna Citation Mustang, according to B&CA's May 2014 Purchase Planning Handbook. Unlike light jets, TBM900 offers full-tanks and full-seats loading flexibility. It can fly between Geneva and Moscow; Athens and Le Bourget; or Shannon, Ireland, and Helsinki.

Admittedly, TBM900 lacks twin turbine redundancy, but during the past 40 years the PT6A has proven to be one of business aviation's most reliable powerplants. Daher-Socata plans to build 50 TBM900 aircraft in 2014, and it has buyers for virtually all of them.