Business & commercial Aviation
PILOT REPORT

Update: The TBM 700

Aerospatiale's pioneering venture into the new world of single-engine turboprops for business aviation is exploring uncharted territory.

B/CA STAFF REPORT

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When asked why his company was not more adventurous in product design, the president of a well-known firm remarked that pioneers spend too much time avoiding arrows. Yet for Aerospatiale, developer of the TBM 700, pioneering the concept of a single-engine turboprop designed for the executive marketplace appears to be devoid of arrows and surrounded by clear skies.

To date, orders for the 300-knot, pressurized aircraft number 92 with more than half being taken by TBM North America, the sales and marketing arm of the French-manufactured aircraft for the United States and Canada. The next uncommitted TBM 700 will not roll off Aerospatiale's assembly line in Tarbes, France until the second quarter of 1993, assuming production continues at its current rate.

Not all of those who explored the uncharted land of single-engine turboprops for business aviation have been so fortunate. Beech Aircraft spent considerable time and effort in the mid-1980s developing the Model 38 Lightning, using its experience with the T-34C military trainer and the pressurized Baron. Mike Smith also used basic components of the Baron to design and fly his version of a turbine-powered single. Initial acquisition cost and marginal range performance appeared to limit the marketability of those attempts, however, and neither aircraft progressed beyond the prototype stage.

Several conversions of piston-powered singles to Allison turboprop powerplants have been certified, but their popularity has been modest. Obviously, Cessna's Caravan series has been quite successful, but that unpressurized turboprop single was designed specifically for the utility market, not for executive transportation.

For a variety of reasons - not the least of which are impressive speed, adequate range and excellent handling - the Aerospatiale TBM 700 has attracted considerable attention since its introduction in 1988, and appears to be headed for long-term production as a business aircraft. Since B/CA's last look at the aircraft (June 1990, "Inflight Report: Aerospatiale/Mooney TBM 700," page 58), maximum gross takeoff weight has been increased by 329 pounds to 6,579 pounds, and Aerospatiale has initiated negotiations to acquire Mooney Aircraft's 30-percent ownership in the program.

Cost, particularly when related to performance, also is an interesting consideration. Although the aircraft's purchase price of $1.35 million exceeds by four times the price of the most expensive piston single currently in new production and is within $600,000 of a C90A King Air, the TBM 700 delivers more speed and range performance per dollar than any turbine aircraft, jet or turboprop, currently manufactured.

Cruising at altitudes between FL 200 and FL 300, the aircraft at mid-weight achieves speeds between 282 and 300 kts. To acquire any other new aircraft with that speed capability requires an outlay of more than $3 million. Range per dollar of acquisition cost also is more than any turbine aircraft. The lowest-priced turboprop twin currently manufactured that exceeds the TBM

700's max-fuel range of 1,467 nm sells for more than twice the turboprop single's price. And, while the lowest-price fanjet achieves approximately the same range as the TBM 700, it sells for about $2 million more than the turboprop.

High speed, attractive range and only one powerplant to fuel and maintain obviously yield significantly lower operating costs than a turbine twin.

EASE OF HANDLING

Handling is an attractive feature of this French import. Designed by the division of Aerospatiale that produced the Rallye STOL (short takeoff and landing) aircraft and currently manufactures the Trinidad and Tobago piston singles as well as the Epsilon turboprop military trainer, the TBM 700 reflects years of experience with low-speed aerodynamics and flying qualities. FAA certification requirements forced Aerospatiale engineers to limit the aircraft's flaps-down stalling speed to 61 kts, which gives the TBM modest approach speeds typical of high-performance piston singles. When flown at pattern speed or slower, the aircraft is responsive and without vice. Yet at maximum cruise, it also exhibits good handling, with comfortable control forces and well-damped dynamic response to control inputs or gusts.

Engine management is an important aspect of TBM 700 characteristics. With only one powerplant, there are considerably fewer demands on the pilot during normal operations - one set of instruments to scan, no need to sync the props during power changes, minimal attention to fuel management other than watching total consumption. This last point is facilitated by the aircraft's automatic fuel-leveling system, which cycles the fuel selector valve every few minutes between the right- and left-wing tanks in order to maintain lateral balance without pilot intervention. Lack of a second engine also eliminates asymmetric power in the event of uneven power application or engine malfunction, thereby significantly reducing the handling requirements in normal as well as emergency situations.

With respect to handling, the degree of piloting skill to control the TBM 700 is no greater than what is required to pilot a sophisticated piston single. Obviously, the knowledge and skill to operate a high-performance aircraft safely and efficiently at Flight Level altitudes and at TBM 700 speeds are a cut above those required to fly an unpressurized aircraft that rarely ventures above 12,000 feet.

While the use of one engine significantly reduces acquisition and operating costs, and offers benefits in handling and reduced workload, what happens if that powerplant fails and the TBM becomes an instant glider?

First, the likelihood of the Pratt & Whitney Canada PT6A-64 employed in the TBM 700 failing during flight is extremely low. As a family of powerplants dating back to the early 1960s the PT6A series has experienced an MTBF of 340,000 hours. Time between overhauls of 3,000 hours and on-condition hot section inspections should reveal potential difficulties long before a pilot is likely to experience a significant engine problem in flight.

Furthermore, the PT6A-64 is the product of about 20 years of development. Its gas producer section is essentially the same as that used on the PT6A-67R that powers the Shorts 360 commuter airliner, an aircraft with many hours of successful operation. While the PT6A-67R produces 1,360 shp for takeoff, the TBM 700's PT6A-64 is flat rated to 700 shp, thus relaxing its working environment during operations at lower altitudes. The forward or power section of the TBM 700 engine was developed from the PT6A-61 used on the Piper Cheyenne IIIA.

Another consideration in evaluating the risks of flying behind one versus two engines is the options available if one powerplant fails. When an engine quits on takeoff with a light twin, the resulting loss of performance and deterioration in handling qualities due to asymmetric power places considerable demands on the pilot, not the least of which is what option to follow: continue the climb or execute an emergency landing off airport.

Unfortunately, too many pilots have assumed that they could continue to climb when in fact their aircraft's engine-out performance was so marginal and the difficulty of handling the aircraft so great that they lost control and crashed. And experience has proven that crashing out of control is far more likely to produce serious or fatal injuries than making a controlled emergency landing.

Furthermore, for aircraft such as the TBM 700 that cruise at altitudes between FL 200 and FL 300, the effective area available within gliding range is between about 2,000 and 3,000 square miles. With the ability of today's Loran-C units to identify nearby airports instantly, there is a high probability that a dead-stick landing could be made at a suitable airport in the extremely rare event of a TBM 700 engine failure.

ASK THE MAN WHO OWNS ONE

To learn more about this aircraft and to examine the pros and cons of a single-engine turboprop for business transportation, we visited with Robert Pond, industrialist and long-time advocate of general aviation, and owner/operator of the first production TBM 700.

Formerly the owner and currently the chairman of his family's midwest manufacturing company, which has annual sales of more than $100 million, Pond started using his personal Cessna 180 in 1950 to expand the reach of his father's small industrial vacuum cleaner

TBM 700

These graphs are designed to indicate approximately how the TBM 700 would fit into your operation.

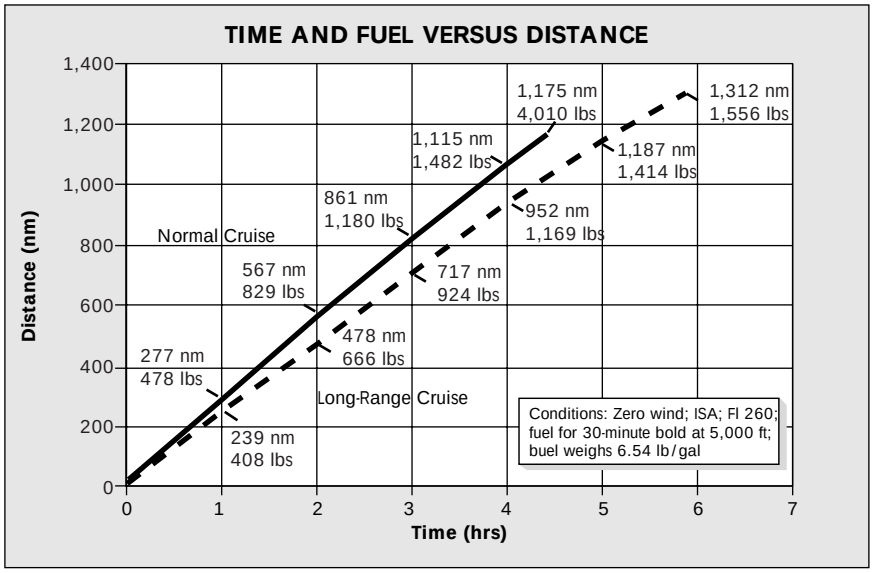
Time and Fuel Versus Distance—This graph can be read from either axis to determine roughly how far you will go in a specific time or how much time is required to travel a desired distance. For example, if you expect your typical mission will be about 600 nm, you can see that the TBM 700 will require about 2 + 00 to complete the trip and will use about 829 pounds of fuel if flown at long-range cruise at FL 260.

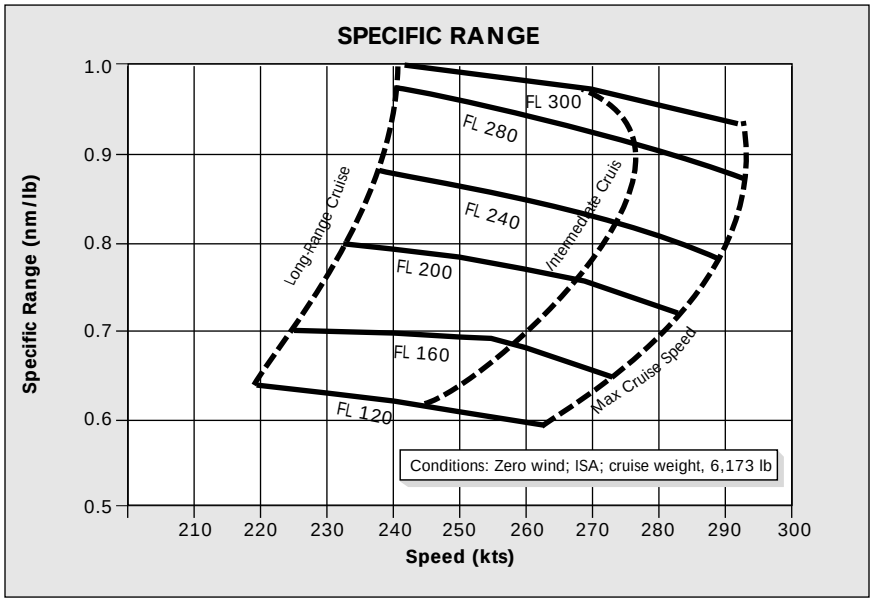
Specific Range—The specific range of an aircraft is expressed in nautical miles per bound of fuel and is a measure of efficiency. Relatively large specific range numbers indicate a high mileage yield for earch pound of fuel that is consumed; smaller numbers indicate less efficient fuel settings.

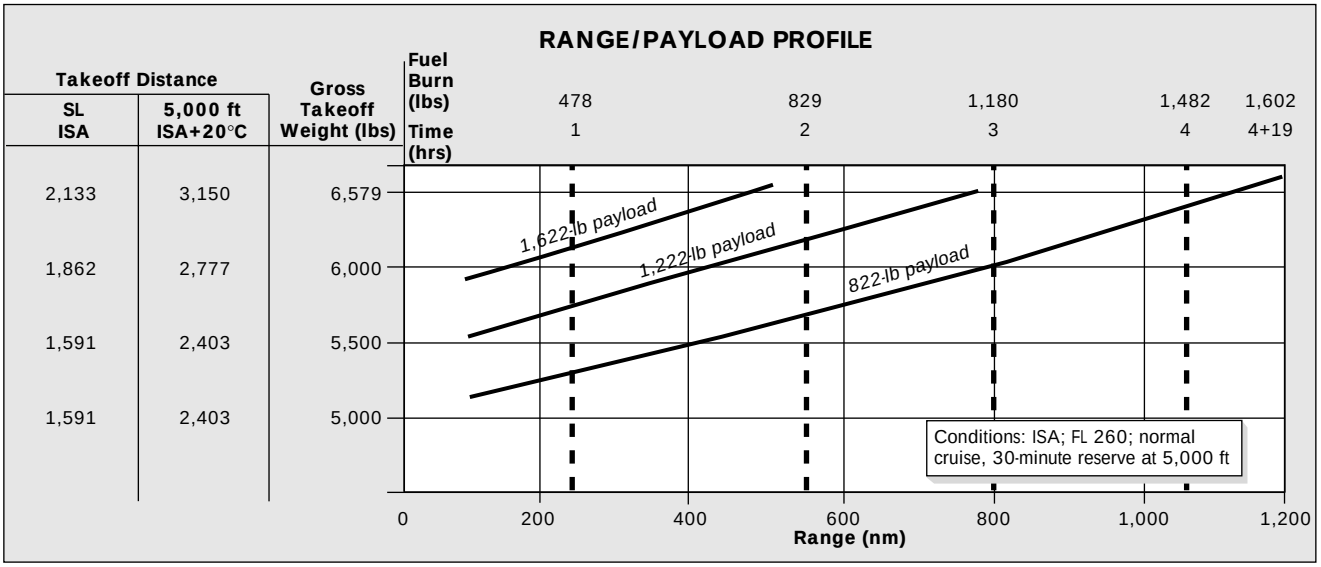
This graph shows specific range values for the TBM 700 at six different altitudes. For example, at FL 240, the aircraft yields a specific range of 0.822 nm/lb at 285 KTAS; slowing to 238 KTAS increases the specific range to about 0.88 nm/lb at FL 240.

Range/Payload Profile—This graph enables you to simulate trips flown at normal cruise and FL 260 under several payload and runway restrictions. For example, a trip of about 60 nm with a payload of 822 pounds would require about 2 + 00 to complete and would require about 1,700 feet of runway to clear a 50-foot abstacle under sea level, ISA conditions. You also can see that the maximun, no-wind range with a payload of 822 pounds is approximately 1,100 nm.

Note—The numbers and plots presented on these graphs are approximate. No attempt has been made to optimize the climb or descent profiles. Do not use these data for flight planning purposes.







SPECIFICATIONS
TBM 700

B/CA EQUIPPED PRICE	$1,350,000
ENGINES	P&W PT6A-64
Power	700 shp
TBO	3,000 hrs
SEATING	1+5/6
DIMENSIONS (ft/m)	
External	
Length	34.2/10.4
Height	13.1/4.0
Wing span	39.9/12.2
Internal	
Length	15.0/4.6
Height	4.1/1.2
Width	4.0/1.2
WEIGHTS (lb/kg)	
Max ramp	6,614/3,000
Max tokens	6,579/2,984
Max landing	6,250/2,835
Zero fuel	6,090/2,762
BOW	4,055/1,839
Max payload	2,035/923
Useful	2,559/1,161
Max fuel	1,911/867
Payload w/max fuel	648/294
Fuel w/max payload	524/238
LIMITS	
V_{MO}	270 KCAS
PSI	6.2
Takeoff, SL/ISA (ft/m)	2,136/651
Takeoff	
5,000 ft at 25° C (ft/m)	3,033/924
PERFORMANCE	(see graphs)

business when it had revenues of only $350,000 per year. As the firm's sales and profits grew—in large measure due to the added reach provided by general aviation—Pond upgraded from the Cessna single to several light piston twins and eventually to turbine equipment, including a Gulfstream II and Sabreliner 60 (which he still owns and operates).

With more than 15,000 flight hours as pilot-in-command and with type ratings for all the aircraft used by his company, the World War II naval aviator is well qualified to express an opinion on the concept of single-engine turboprops for business transportation .

According to Pond, the features that attracted him to the TBM 700 were pressurization in a personalized aircraft, speed, single-pilot operation and turbine reliability. Although a strong believer in corporate aviation staffed by professional crews, Pond's experience as a businessman and pilot has convinced him that there are situations where the ability to travel at turbine speed without requiring a two-person crew is cost effective and safe. As proof of his convictions in the concept of single-engine turboprops for safe and efficient transportation, 67-year-old Pond routinely pilots the TBM 700 for business travel with his wife.

Just as the early pioneers were rewarded for their exploration of new territories, so may Aerospatiale find bountiful new horizons with the TBM 700. **B/CA**