

Tech focus

Some business aircraft and their systems are highlighted this month.

by Ryan Gehm

Falcon 7X takes to the skies

At **Dassault Aviation**'s facility in Bordeaux Mérignac, France, in early May, the Falcon 7X s/n 1 took flight for the first time. Test pilots Yves "Bill" Kerherve and Philippe Deleume were at the controls for the 1 h, 36 min flight.

"The first flight of the Falcon 7X was a success," said Kerherve, the Senior Test Pilot for Dassault Aviation. "We're on track to start the rigorous 15 months of flight testing that lay ahead."

After departing Bordeaux International Airport, the aircraft climbed directly to 10,000 ft where various systems checks including hydraulic, fuel, air data systems, and landing gear extraction/retraction tests were performed. The airplane then climbed to 25,000 ft where acceleration/deceleration tests were conducted as well as basic autopilot and auto-throttle operations.

The Falcon 7X carried the registration numbers F-WFBW because it is the first business jet designed with a fly-by-wire flight control system, according to the company. The test aircraft was fully equipped with instrumentation to allow the measurement of more than 3000 digital and 1000 analog parameters.

During the next test flight, the airplane will be relocated to the Dassault Test Center in Istres, France. The second test aircraft was to arrive in Istres in the second quarter, and the third test aircraft was scheduled to arrive this summer. Falcon 7X s/n 3 will be outfitted with a full interior and will be used for long-range and endurance tests as well as interior sound level validation.

Powered by three **Pratt & Whitney Canada** PW307A engines, each producing 7500 lb of thermo takeoff thrust, the business jet will have a range of 5700 nmi.

Approximately 1200 flight test hours have been allotted before final certification by the **FAA** and **EASA** (European Aviation Safety Agency) before the end of 2006.

A static and fatigue test airframe has been undergoing tests at the Toulouse Aeronautical Test Center (CEAT) since



The Falcon 7X long-range business jet from Dassault Aviation took its first flight in early May from Bordeaux International Airport in France.



A Falcon 7X test airframe has been undergoing static and fatigue testing since March at the Toulouse Aeronautical Test Center. The airframe has been built as a standard airframe but without most of its internal systems that are not a factor during fatigue testing.

March. Initial testing concentrated on static testing to support the early stages of flight envelope expansion during the first several flights of the Falcon 7X. Fatigue trials have begun, with a testing rate up to the equivalent of 300 "flights" per day. Ten-thousand flights (or half the life of the aircraft) have been simulated at CEAT thus far; by mid-2006, two aircraft lives (40,000 flights) will have been simulated.

After fatigue testing, engineers will focus on static trials with the airframe being tested up to 100% of the Design Load Limit (DLL). Ultimate load testing (150% DLL) will follow. Wing flexing at

the wingtips has reached 1 m, but will increase to 1.8 m during ultimate load static trials. The test rig to which the airframe is attached is comprised of 64 computer-controlled actuators and four pressurization systems for the main cabin and fuel tanks. In all, more than 2000 parameters are recorded simultaneously by 2000 strain gauges.

According to Dassault, this is the first Falcon aircraft to generate more than 50 firm orders before first flight. With a delivery lead time into early 2009, the company will increase production of the Falcon 7X from 2.5 to 3.0 per month.

Gulfstream G150 takes flight; G450 enters service

On May 3, **Gulfstream Aerospace's** newest business-jet aircraft, the wide-cabin, high-speed Gulfstream G150, successfully completed its first flight in Tel Aviv, Israel. Gulfstream, a wholly owned subsidiary of **General Dynamics**, designed and built its first true midsize business jet in collaboration with **Israel Aircraft Industries (IAI)** in Tel Aviv.

Flown by IAI Chief Test Pilot Ronen Shapira and G150 Project Test Pilot Yoram Geva, the G150 took off from Ben Gurion International Airport and flew for 4 h, 13 min. During the flight, the pilots tested the business jet's flight-handling qualities and characteristics, performed initial checks of all aircraft systems, and cycled the landing gear and flap/slat system. The airplane was flown to 20,000 ft and achieved a maximum speed of 250 knot. IAI's Flight Telemetry System enabled IAI and Gulfstream flight-test engineers on the ground to monitor on a real-time basis all of the G150 aircraft systems during the flight as well as record the data from the first-flight test point.

"Based on the pilots' initial reports, the G150's flying qualities were outstanding and all systems were fully operational," said Pres Henne, Senior Vice President, Programs, Engineering and Test, Gulfstream. Henne added that the G150's flying characteristics are similar to the "highly maneuverable and successful" Gulfstream G100, but with a "significantly roomier cabin."

In January, the G150 rolled out of the IAI manufacturing facility in Tel Aviv. It remains on schedule for type certification by the **Israel Civil Aviation Authority** in the first quarter of next year, followed by validation from the **FAA**, and entry into service in the third quarter of 2006. Following certification, the G150 will be flown to Gulfstream's Dallas, TX, facility for the final phase of its manufacturing.

Powered by two **Honeywell TFE731-40AR** engines, the G150 can reach speeds of up to Mach 0.85 and altitudes of 45,000 ft. At a long-range cruise speed of Mach 0.75, the jet can fly four passengers nonstop up to 2700 nmi, farther than any other aircraft in its class at this speed, according to Gulfstream.



The Gulfstream G150 business jet successfully completed its first flight in Tel Aviv, Israel, in early May.



The G450 is powered by two Rolls-Royce Tay 611-8C engines improved specifically for the jet. Performance improvements have been made in the fan, the high-pressure turbine, and the bypass/core mixer. The Gulfstream G350, expected to enter service later this year, also is powered by the Tay 611-8C.

The G150 features an entirely new cabin design. Its cabin height is 5 in shorter than in the large-cabin G350, G450, G500, and G550 aircraft models, and is designed and outfitted by the same team who designs and installs interiors for Gulfstream's larger aircraft. The G150 can accommodate six to eight passengers in a choice of several cabin configurations, and customers can choose from a selection of fine leathers, upholstery fabrics, wood finishes, and floor coverings.

In a separate announcement, the first Gulfstream G450 business-jet aircraft was delivered to its U.S.-based owner May 7.

"Just over two years ago, the G450 took its first flight, and [now] we've delivered the first of the series to its owner. We've met the development schedule that we committed to early on and have accomplished each program milestone on time," said Henne.

The aircraft features new electrical and environmental control systems; upgraded engines and nacelles; aerodynamic enhancements to the exterior; new thrust reversers; the PlaneView cockpit, which includes four large flight displays and Honeywell's Primus Epic avionics and Visual Guidance System; and the Gulfstream Enhanced Vision System, which was developed to enhance pilot situational awareness while reducing pilot workload, said Henne.

Powered by two **Rolls-Royce Tay 611-8C** engines, the G450 can fly eight passengers nonstop from Madrid, Spain, to Caracas, Venezuela, or Dallas to Paris, France, for example, with its range of 4350 nmi. The business jet can cruise at altitudes up to 45,000 ft and at speeds up to Mach 0.88. The cabin provides seating for up to 19 passengers. The G450 took its first flight in April 2003.

Embraer doesn't take business jets lightly

Embraer is strengthening its position in the business-aviation market by expanding its product portfolio to include offerings for the Very Light and Light categories. Recently created, the Very Light Jet category is made up of aircraft that carry six to eight people or up to 10,000 lb. The already-established Light segment is comprised of jets that commonly transport up to 8 or 9 people.

The company also will offer a complete range of integrated service solutions that will support the product expansion, ranging from sales to full-scale customer support.

"The Legacy has paved the way for Embraer to build a name in the business-aviation market. This has been an enriching experience from which valuable lessons were learned. The accrued knowledge will shape our entrance into the Very Light, Entry, and Light Jet segments," said Mauricio Botelho, Embraer President and CEO.

Embraer's move into the Very Light and Light categories was approved by the company's Board of Directors in April. The investment in the new jets will total \$235 million. Based upon market assessments, Embraer has estimated demand for approximately 3000 Very Light, Entry, and Light jets over the next decade, not including the air-taxi market.

"Embraer is committed to making long-term investments in this business to



Embraer is expanding its product portfolio to include business jets for the Very Light and Light segments.

offer revolutionary products and completely integrated solutions to a sophisticated customer base. Our goal is to build a robust business aviation unit and a global infrastructure to support it," said Luis Carlos Affonso, Senior Vice President for the Corporate Aviation Market.

Premium comfort, enhanced performance, and low operating cost are key design drivers for these jets, according to Affonso. They will be designed for

single-pilot operation, high utilization, and high availability.

Embraer's Very Light Jet will carry up to eight people and be powered by Pratt & Whitney Canada's (P&WC) PW617F engine, with 1615 lb of thrust. Its range will be 1160 nmi (NBAA [National Business Aviation Association] IFR [Instrument Flight Rules] reserves with 100 nmi alternate) with four people on board, and it will have a maximum operating speed of Mach 0.7. The airplane is designed for a short takeoff distance and is capable of flying at 41,000 ft.

The Very Light Jet is expected to enter service in mid-2008 and will be priced at \$2.75 million in 2005 economic conditions.

The Light Jet will be powered by P&WC's PW535E engine, with 3200 lb of thrust. Accommodating up to nine people, the Light Jet's range will be 1800 nmi (NBAA IFR reserves with 100 nmi alternate) with six people on board, and it will have a maximum operating speed of Mach 0.78. The airplane is also designed for a short takeoff distance and is capable of flying at 45,000 ft.

The Light Jet is expected to enter service in mid-2009 and be priced at \$6.65 million in 2005 economic conditions.

Good business for business aircraft

A total of 7417 business aircraft valued at \$106.7 billion (in 2005 U.S. dollars) will be produced from 2005-2014, according to Teal Group analysts in their 15th annual world business aircraft production forecast. This compares to their forecast last year that called for 6413 business jets worth \$91.7 billion to be produced in 2004-2013.

"After tremendous growth in the 1990s, the business-jet market stalled in the early years of this decade, leading to fears of permanent market deflation.

Last year, however, saw a hopeful recovery, with double-digit growth in the value of deliveries over 2003," said Richard Aboulafia, Lead Analyst for Teal Group's World Military & Civil Aircraft Briefing.

A total of 562 business jets worth \$8.7 billion were delivered in 2004.

"Although this is a sound market at its current size, talk of continued growth is premature," said Aboulafia. "There are too many uncertainties about the economy (oil prices, equities markets,

corporate profits, interest rates) for us to confidently predict sustainable growth. We do not see a return to the 2000-2001 market peak until after the current forecast period."

Of the 7417 business jets expected to be produced over the next 10 years, about 40% of these (by value) will be Class Four and Five (high-end) models. "Additionally, we forecast production of 152 jetliners and regional jets, worth a combined total of \$4.4 billion," said Aboulafia.