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Eclipse 550 Debuts

Eclipse Aerospace to produce new aircraft in 2013 with Sikorsky.

By Fred George
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Plenty of diehard Eclipse 500 skeptics scoffed at Mason Holland, chairman and CEO of Eclipse Aerospace, when he announced at the 2011 NBAA Convention that his firm intended to resume building the aircraft sometime in 2013. Cynics all but buried the very light jet (VLJ) concept after EA500 production stopped in 2008, writing it off as a misguided, overhyped folly of Vern Raburn, founder of failed Eclipse Aviation (See *Fast Five*, page 25.)

But Holland believes the original aircraft had great potential value, if only Eclipse Aviation had finished its development. For instance, the Eclipse 500 lacked certification for flight into known ice, a full-function flight guidance system and a true FMS, among its other shortcomings.

Now Holland will get the chance to prove his premise because he really is restarting the assembly line in Albuquerque, N.M., and the new production aircraft will not only deliver on 100% of the promises of the original aircraft, it will offer several new features. Accordingly, the improved aircraft has a new designator — Eclipse 550 — and will be priced at $2.695 million in 2011 dollars. That should make it at least $1 million less expensive than the Embraer Phenom 100, the next lowest priced twin turbofan light jet.

"This is a great day for Eclipse Aerospace," Holland told a packed meeting room at the recent NBAA convention, announcing the restart. "We only acquired the assets [of Eclipse Aviation] two years ago. This will be the most advanced light jet in production. It will offer the best operating economics."

Eclipse jet skeptics further sobered when Jeff Pino, president of Sikorsky Aircraft, the United Technologies Corp. (UTC) subsidiary that now owns a chunk of Eclipse Aerospace, stepped up to proclaim that Sikorsky's PZL Mielec will manufacture most of the new primary airframe components, including wings, fuselage and empennage. Based in Poland, PZL Mielec has a reputation for high quality manufacturing and its labor costs are considerably lower than those in the U.S.

Sikorsky's hands-on participation in new aircraft production leaves no doubt about the program's credibility and little doubt about its chances for future success. Pino said that Sikorsky also will be involved in production line operations and supply chain management for Eclipse Aerospace. Those two critical functions bedeviled Eclipse Aviation and directly contributed to the downfall of the original company in 2008.

"One thing you learn is that UTC is an extremely disciplined and well-managed company. Sikorsky will take an extremely disciplined approach to this program. We have a supply chain that can be made operational very quickly," said Pino, referring in large part to PZL Mielec's manufacturing capabilities.

UTC, whose subsidiaries also include Pratt & Whitney, Hamilton Sundstrand and Carrier air conditioners, is a $54 billion conglomerate that derives 43% of its revenues from its aerospace businesses. Sikorsky will manufacture most of the airframe components for the Eclipse 550, while Pratt & Whitney Canada (P&WC) will supply the engines. By dollar value, those two firms collectively will account for about two-thirds of the aircraft's content.

Innovative Solutions & Support (IS&S) will supply most of the Avio integrated flight management system (IFMS) avionics package for the Eclipse 550, as it does for

Eclipse Aerospace's $2.15 million Total Eclipse, a nose-to-tail makeover of the original aircraft currently offered by the Albuquerque company.

Eclipse Aerospace named the new aircraft Eclipse 550 because it will offer several standard or optional upgrades that enhance its capabilities over the original EA500. These include synthetic and enhanced vision, auto-throttles, ADS-B, TCAS I, dual FMS to meet RNP requirements, and EASA-spec equipment including DME and ADF. Other features include an FAR Part 135 package including a stand-alone emergency standby instrument system, Iridium satcom phone and a radio altimeter, along with a paperless chart capability.

Even with a panoply of new features, Eclipse Aerospace has managed to slash the number of vendors from 135 for the Eclipse 500 to 75 for the Eclipse 550. Having fewer and better suppliers, and having Sikorsky manage both procurement and production, should help prevent the assembly line disruptions that plagued Eclipse Aviation.

Retaining the Original Airframe and Systems

The Eclipse 500 evolved from the late 1990s' five-seat Williams V-Jet II. That experimental aircraft was commissioned by Sam Williams of the turbine engine company that bears his name and built by Burt Rutan's Scaled Composites in Mojave, Calif. The V-Jet II was conceived as a technology demonstrator intended to show off Williams' revolutionary 700-lb.-thrust FJX-2 turbofans that promised record low manufacturing costs and ultra-high fuel efficiency. Williams envisioned a twin-turbine VLJ that could replace light piston twins such as Beech Barons.

Raburn bought into the concept with great passion, ultimately founding Eclipse Aviation to bring it to fruition. Using the basic V-Jet II concept, Eclipse Aviation developed the all-aluminum Eclipse 500. Raburn chose aluminum over composites for the airframe because it was more efficient to fabricate and assemble parts for mass production. His dream was to build the Eclipse 500 in unprecedented quantities, thus making possible an $837,500 price tag.

Raburn raised hundreds of millions of dollars that he invested in new avionics technology, drag-cheating aerodynamics and high-volume manufacturing equipment.

Eclipse Aviation was the first U.S. civil aircraft manufacturer to use friction stir welding (FSW) to join aluminum parts. The process is used extensively for the pressure vessel and it eliminates about 60% of the mechanical fasteners in the airframe and slashes labor hours. Conventional mechanical fasteners are used exclusively to join nose and aft fuselage components. Pino and Holland intend to move one of Eclipse Aerospace's FSW operations to Poland.

Oliver Masefield, Ph.D., lead engineer on the program, tapped Ian Gilchrist at Seattle-based Analytical Methods Inc. to design the Eclipse 500's high-speed, laminar flow airfoil that was inspired by the NACA 65000-series wings of some 1950s' era U.S. Air Force fighter jets. The 144.4-sq.-ft. Eclipse wing has an 8.9:1 aspect ratio, a leading edge with no sweep and is tailored for good high-lift characteristics at low speed. Its drag divergence Mach number is 0.68, well above the aircraft's Mach 0.64 redline. That characteristic enables the aircraft to cruise efficiently all the way up to M_{MO} and it assures positive pitch stability at high speed. However, the junction between the deice boot and wing upper surface is not conducive to laminar flow, thus the wing has more drag than the wind tunnel predicted.

Functionally, the aircraft can be divided into four areas: (1) Avio IFMS avionics suite (see avionics sidebar), (2) thrust control (see engine sidebar), (3) essential systems and (4) mechanical flight controls.

Most normal systems are controlled through dual aircraft computer system boxes tied into the Avio IFMS, making it one of the most integrated avionics and control systems ever installed in a business jet. Systems that are controlled by the Avio IFMS include engine fire extinguishing, fuel, electrical, electronic circuit breakers, environmental, pressurization, ice protection, normal landing gear operation and exterior lights.

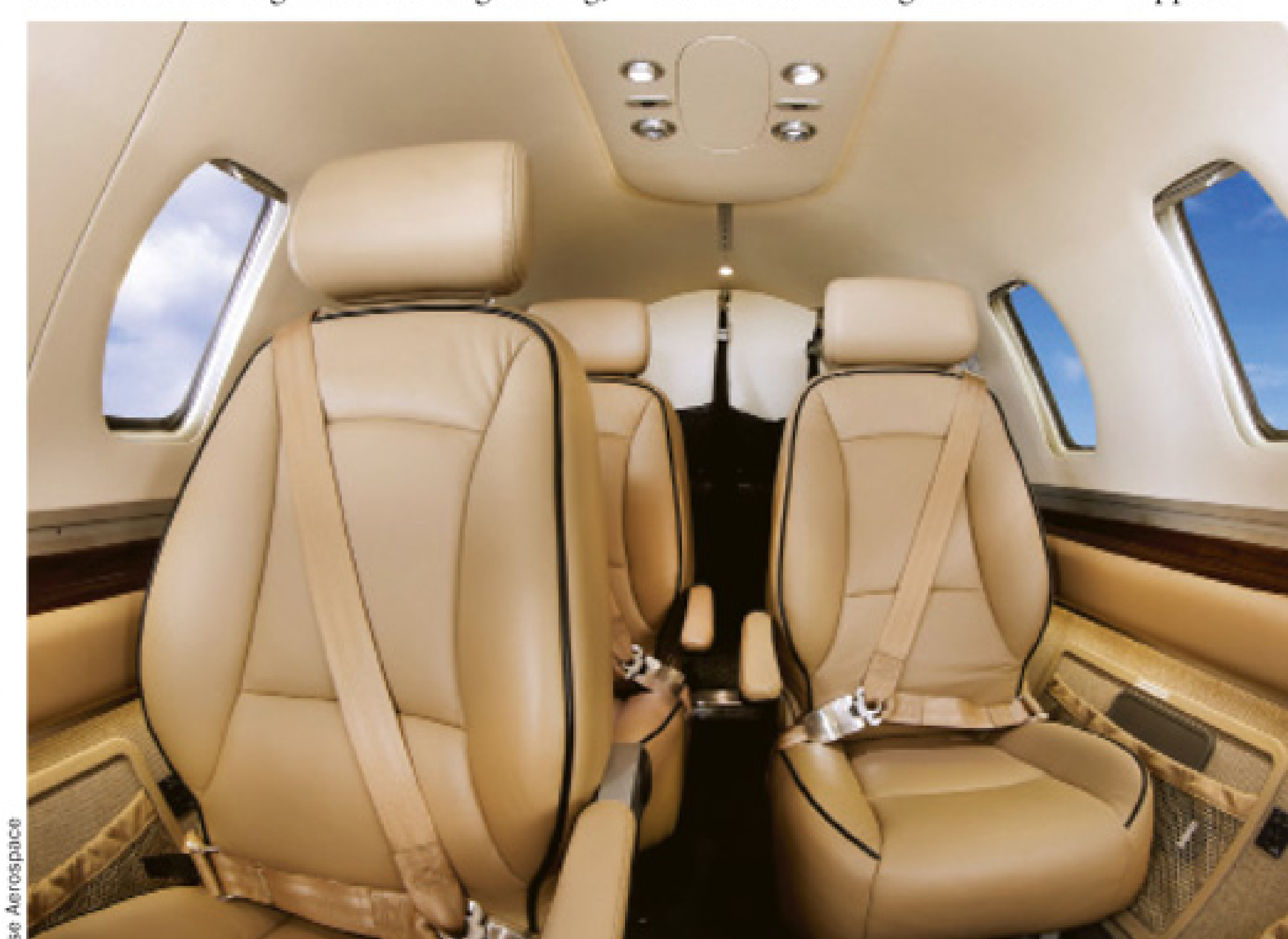
Essential systems not controlled by the Avio IFMS include the batteries, certain stand-alone circuit breakers, oxygen, emergency gear extension, cabin pressurization dump and the emergency locator transmitter.

The mechanical flight controls include the ailerons and elevators that are actuated by side-stick controls, a rudder that is operated by foot pedals and electrically actuated trim tabs and trailing edge flaps operated by switches.

The side-stick controls free up knee room and make it easier to climb into and out of the crew seats. The lower instrumental panel has slide-out multifunction keyboards that extend toward the pilots' knees and control CNS functions, FMS programming and EFIS reversionary modes, among other functions.

Masefield was no fan of spring or servo tabs, devices that are used to reduce control force. As a result, the Eclipse 500 has relatively hefty roll control effort at high speed. Unless spring or servo tabs are fitted to the Eclipse 550's ailerons, it too should have relatively heavy roll control forces.

Brushless DC linear actuators are used to move the trim tabs and flaps. They also operate the nose and trailing-link main landing gear and air-conditioner ground vent doors. Tamagawa Seiki now supplies



Eclipse Aerospace

The five-seat configuration that includes two cockpit seats and three in the main cabin is popular because the staggered chairs provides more shoulder room for the rear passengers. There is no external baggage compartment, thus all luggage must be carried inside the cabin.

these components and they have proven to be highly reliable and are virtually maintenance free.

The wheel brakes are hydraulically actuated by the rudder pedals. There is no anti-skid system and the twin PW610F-A turbofans produce considerable idle thrust after landing touchdown. The nosewheel steering also is mechanically operated through the rudder pedals, providing up to 15 deg. of steering authority. The nosewheel will free caster beyond 15 deg., thus differential thrust and braking can be used to turn tightly in confined areas.

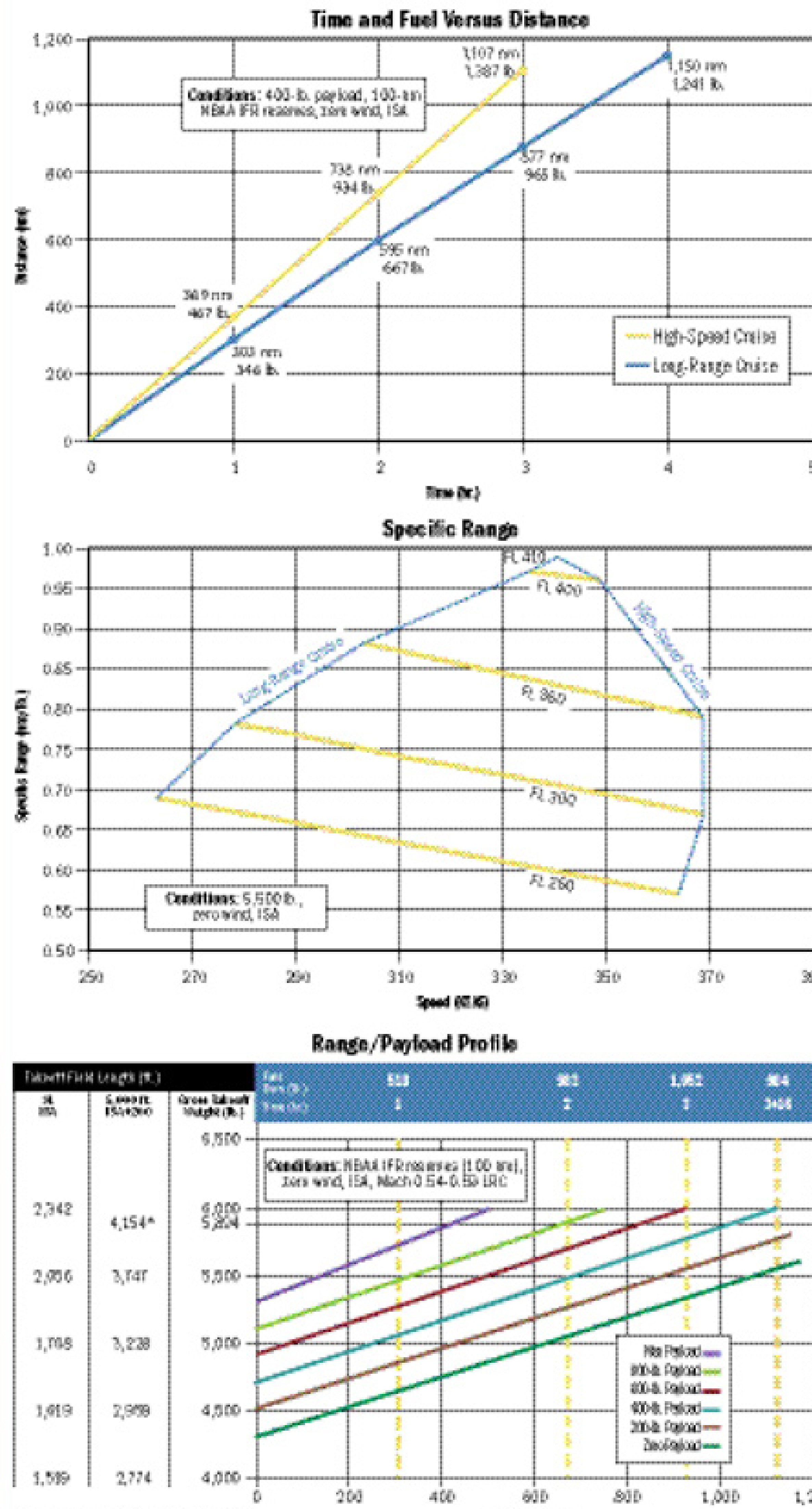
The Eclipse 500 was one of the first light jets to use separate batteries for engine start and for avionics and systems power. The architecture prevents power surges to the Avio IFMS and supports a true split bus electrical distribution system after engine start. There are 127 electronic circuit breakers that are controlled through the Avio IFMS. There also are mechanical circuit breakers for the left PFD and left aircraft computer system, plus some optional equipment.

The 22-amp/24-VDC sealed, lead-acid batteries are mounted in the nose bay to offset the weight of the engines. This results in relatively long electrical cables running aft to the engines' 200-amp/30-VDC starter/generators. In addition, battery heater blankets are needed to assure optimum battery performance. Even so, the start battery works hard to crank the engines for start. Battery-only engine starts are allowed only at oil temperatures above 5C/41F. GPU-assisted engine starts are allowed only at oil temperatures warmer than -20C/-4F. Below that oil temperature, engine starts are not permitted.

Each engine has its own fire detection loop and fire extinguisher bottle. Some other FAR Part 23 light jets only have one fire bottle for both engines. The Eclipse uses a proprietary fire extinguishing agent called PhostrEx, a phosphorus tri-bromide compound that catalytically binds with essential combustion ingredients to poison the flame chemistry. It's ozone friendly, but once used it's also highly corrosive unless washed away from engine parts with fresh water. Early PhostrEx bottles were prone to leaking and replacement canisters were not readily available. Eclipse Aerospace redesigned the bottles to prevent leaking and relocated the filler ports to the top of the canisters. With these modifications, the PhostrEx bottles on the Eclipse 550 should be problem free.

The 8.33 pressurization system is fully automatic. The IFMS provides a landing field elevation input so that no crew input is required. A vapor cycle air-conditioner cools

Eclipse 550



NOTE: Do not use these data for flight planning purposes because they do not take into account ATC delays and less than optimum routings and altitudes, along with other factors that can alter actual aircraft performance.

These preliminary graphs are designed to illustrate the performance of the Eclipse 550 under a variety of range, payload, speed and density altitude conditions. Do not use these data for flight planning purposes because they are gross approximations of actual aircraft performance based upon Eclipse 500 AFM data, Eclipse Aerospace projections and our estimates. Actual performance of the Eclipse 550 may fall short of these projections because of empty aircraft weight gain compared to Eclipse 500 aircraft. In addition, the performance of the PW610F-A turbofan is degraded by warmer-than-standard temperatures because of its small size and modest flat rating.

Time and Fuel Versus Distance — This graph shows the relationship between distance flown, block time and fuel consumption for the Eclipse 550. High-speed cruise is flown at 0.64 Indicated Mach Number. Long-range cruise is flown at an average 0.525 IMN. As illustrated by the chart, there is only a slight difference in maximum range between the two profiles, but the long-range profile adds about an hour to travel time.

Specific Range (5,500 lb., ISA) — This graph shows the relationship between cruise speed and fuel consumption for the Eclipse 550 at representative cruise altitudes for a 5,500-lb. aircraft, according to data obtained from the Eclipse 500 ETT NG Airplane Flight Manual.

Range/Payload Profile — The purpose of this graph is to provide simulations of various trips under a variety of payload and two airport density altitude conditions, with the goal of flying the longest distance at high-speed cruise. Each of the six payload/range lines was plotted from gross approximations of data published in the 2007 Purchase Planning Handbook, starting at zero and ending at the maximum range for each payload condition. The graph illustrates, for instance, that the Eclipse 550 will be able to carry three passengers 920 nm. FAR Part 23 takeoff distances over a 50-ft. obstacle are shown for sea-level standard day and for our 5,000-ft. elevation, ISA+20C airport. Maximum allowable takeoff weight at 5,000-ft, elevation, ISA+20C is 5,894 lb. based upon a 500-fpm one-engine-inoperative climb rate with gear retracted and flaps extended to the takeoff position.

the cabin and engine bleed air furnishes the heat. Dual zone temperature controls are provided for the cockpit and cabin.

Pneumatic deice boots on the wing and horizontal tail leading edges provide ice protection. Anti-ice protection for nacelle inlets is provided by engine bleed air and electrical heaters protect the probes and windshields.

There is a 40-cu.-ft. oxygen bottle in the nose bay. The crew has quick donning, on-demand flow oxygen masks and the passengers have constant flow, drop-down oxygen masks available for use in case of cabin depressurization.

Interior Accommodations

Passengers enter the cabin through a 3.9-ft.-high by 1.9-ft.-wide, clamshell, air stair door. The cabin tapers from the widest cross section in the front to the rear section that is considerably smaller.

Aisle width still will be a scant 9 in., thus the three passenger seat configuration will afford better access to the cabin than the optional four passenger chair layout. Individual seats may be removed to provide more room for fewer passengers and it's advisable to board the aircraft from rear to front to ease access. Max payload is 995 lb., and thus it's possible to fill all six seats. NBAA IFR range with max payload is 500 nm and it's likely that six people will be ready for a stretch after a 1-hr., 40-min. mission. Available payload with full fuel is projected to be 500 lb., thus the Eclipse 550 will have to shed 80 lb. of empty weight compared to the current Total Eclipse.

Eclipse 550 aircraft will have interiors far plusher and better fitting than the original Eclipse 500, based upon our impressions with Total Eclipse aircraft on display at NBAA. A single piece headliner, tight tolerance components and improved acoustical insulation will make the aircraft more attractive and quieter for passengers.

Flying Impressions

On the eve of the 2011 NBAA Convention, we belted into the left seat of Total Eclipse s.n. 54 for a hands-on demonstration of the latest avionics upgrades the company has made to the aircraft, including features that will be standard in the Eclipse 550. We were accompanied by Matt Blackburn, business development director for North American Jet, a charter and MRO firm in which Holland has invested. Our flight plan would take us from North Las Vegas Airport to Grand Canyon National Park Airport. We'd stop there for fuel and then return.

Holland and Blackburn walked us around the aircraft, pointing out the many improvements made to the Total Eclipse, a completely upgraded version of the original aircraft. The package includes flight into known ice certification, a completely new interior, Avio IFMS, a completely new interior with much improved fit and finish, and fresh paint from Hillaero Modification Center in Lincoln, Neb. During the makeover, the aircraft is brought up to date with all mandatory Service Bulletins and Airworthiness Directives, it is enrolled in P&WC's Eagle Service Plan and it is delivered with a new aircraft warranty. The newly certified upgraded combustion liners installed into the PW610F-A turbofans will allow the aircraft to fly up to 41,000 ft., eliminating the 30,000-ft. altitude restriction imposed by AD 2011-6-06. However, s.n. 54 did not have the upgrade.

Preflight checks were quick. Everything that needs to be checked easily could be reached, seen or touched because of the aircraft's low stance. Boarding the aircraft, we found it convenient to recline the copilot's seat to open up more room for climbing into the left seat. The cockpit doesn't have storage pockets for navigation charts and checklists. Rather, those items are placed in the narrow aisle between the seats for ready access.

Basic operating weight of this Total Eclipse was 3,927 lb., assuming a standard 200-lb. pilot. That's 98-lb. greater than the BOW of the original aircraft, according to our May 2007 *Purchase Planning Handbook*. We assumed Blackburn weighed 200 lb. for computation purposes. With 1,055 lb. of fuel aboard, the Avio IFMS automatically computed takeoff weight to be 5,182 lb. and it computed an 84 KEAS rotation speed. Eclipse jets display equivalent, rather than indicated, airspeed because it is corrected for both instrument error and high-speed compressibility.

The Avio IFMS also displayed a center of gravity chart that illustrated the change in c.g. with fuel burn. It also verified that the aircraft would remain inside the c.g. envelope for the entire flight and computed an 84 KEAS rotation speed. The Avio IFMS doesn't yet have a full airport performance database. We looked up other pertinent data in the AFM. The V50 speed, the target speed for 50 ft. above the runway, was 101 KEAS. Best OEI rate-of-climb speed with gear and flaps set for takeoff was 102 KEAS and with flaps retracted it was 123 KEAS.

Part 23 all-engine takeoff distance over a 50-ft. obstacle was about 2,500 ft., based upon KVGT's 2,205-ft. field elevation, 19C OAT and 30.09-in. Hg altimeter setting. OEI takeoff runway performance is not published for the aircraft. But the aircraft would have climbed at 550 fpm with gear retracted and takeoff flaps extended and 850

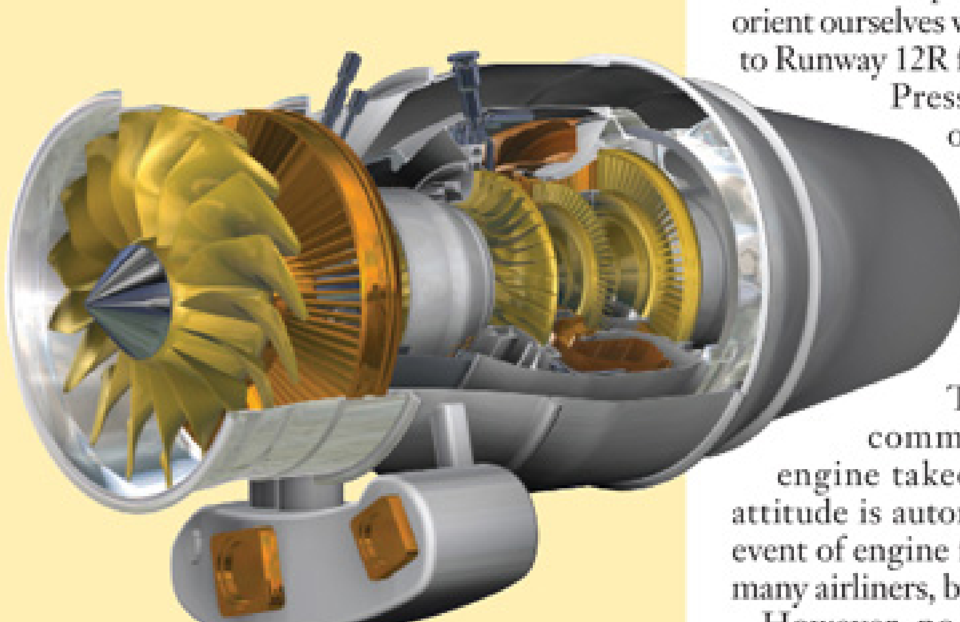
Eclipse Aerospace

Switching to Michelin bias-ply tires has eliminated excessive wear characteristics of original radial tires.

Pratt & Whitney Canada PW610F-A Turbofans

Rated at 900-lb. thrust for takeoff, the Pratt & Whitney Canada PW610F-A is the smallest member of the PW600 family that also is installed on the Cessna Citation Mustang and Embraer Phenom 100. The engine features a conventional, two-spool design with an inner shaft attached to the wide-chord front fan that is powered by a single-stage low-pressure turbine. The outer shaft has a single-stage, axial flow compressor and a single-stage centrifugal flow high-pressure compressor. Low-temperature, low-velocity bypass air from the fan and high-temperature, high-velocity exhaust from the core are combined by a deep fluted exhaust mixer nozzle in the tailpipe. Engine functions are controlled by stand-alone FADECs. Three position knobs on the overhead panel in the cockpit are used to select engine off, run/start and continuous ignition for flight in heavy precipitation. Electric servos in the throttle quadrants will move the thrust levers for the full flight auto-throttle system.

Notably, these engines do not have stand-alone permanent magnet alternators to supply electrical power to the FADECs in the event of main aircraft electrical system failure. However, they use fail-passive stepper motors to control fuel supply to the engines and the redundancy of the split bus architecture electrical system provides sufficient safety and redundancy to meet FAA certification requirements.



fpm with flaps and gear retracted, according to the AFM.

Prepping the aircraft for engine start involves turning on the batteries and calling up a series of interactive synoptic systems diagrams on the MFD that graphically indicate appropriate functioning of electrical relays, electronic circuit breakers and fuel pumps, among other systems components. After a lapse of four years since earning my single-pilot type rating, Blackburn's guidance through these processes was essential.

For engine start, the starter/generator switch for each engine is left in the off position until the engine is running, contrary to the original checklist protocol. This prevents balky behavior by the generator control units that can act up with the switches left in the automatic position during engine start. After start, the switch is positioned to automatic and the generator comes on line, not unlike the procedure in a vintage Learjet or King Air.

We called taxi and advanced the throttles to roll out of the chocks. Starting the first turn, the aircraft's bungee-like link nosewheel steering didn't provide crisp response, a quirk found in the original Eclipse 500. This required us to use differential thrust and braking to maneuver in confined areas. An electronic Jeppesen chart with airplane symbol enabled us to orient ourselves with the assigned taxi route to Runway 12R for takeoff.

Pressing a button at the base of the left throttle handle — not the usual thumb button on the outside of the throttle — activated the flight director's takeoff and go-around pitch guidance mode. This presets the pitch command to 10 deg. for all-engine takeoffs. Commanded pitch attitude is automatically reduced in the event of engine failure, a feature found in many airliners, but few light jets.

However, no other lateral or vertical modes can be preselected until after takeoff with weight off the wheels for 15 sec. We prefer flight guidance systems that provide lateral navigation guidance with TOGA, such as heading or even LNAV using the FMS.

The primary purpose of the flight was to evaluate the enhanced capabilities of Avio IFMS release 2.04. We soon concluded that many of its features are quite original, departing from industry standard conventions embraced by Garmin, Honeywell, Rockwell Collins and Thales, among others. The Avio IFMS also departs from many the design specifications that were originally published by Eclipse Aviation.

Engaging the flight guidance's altitude change mode, for instance, doesn't cause the speed bug to synch to the aircraft's current equivalent airspeed. Instead, it causes a shift in commanded airspeed to best rate of climb speed. Conversely, during descent, altitude change commands a 3-deg. pitch down rather than synching with current airspeed. Increasing or decreasing descent angle is done with the pitch wheel on the flight guidance panel. Using the speed mode for descent involves several button pushes and the protocol is not easily discoverable. The APPR (approach) button must be pushed not once, but twice, to activate the mode.

Because of the differences between the original Eclipse 500 and other jets we've flown, we often asked ourselves during the flight, "What's it doing now?"

Blackburn programmed in the RNAV GPS Runway 03 approach for Grand Canyon Airport. We soon discovered that the IFMS will compute and display a 3-deg. glidepath but it doesn't provide vertical guidance on the flight director for LNAV/VNAV GPS approaches. Flight director lateral and vertical guidance only is available for ILS and LPV approaches.

The Avio IFMS automatically computed VREF at 87 KEAS for landing at Grand Canyon, based upon a landing weight of 4,700 lb. Field elevation was 6,609 ft., computed touchdown speed was 75 KEAS and AFM landing distance was approximately 4,300 ft.

Blackburn advised flying the approach at VREF+10. At the fence, he advised to slow to VREF. At 50 ft., we slowly reduced thrust to idle. The aircraft didn't decelerate quickly and we floated excessively.

Make a note. We learned its importance in 2007, but didn't practice precise speed discipline on this landing. The Eclipse doesn't have ground spoilers or anti-skid brakes. It will float in ground effect and there is considerable residual idle thrust from the PW610F engines. In addition, it's not hard to flat spot or even pop a tire if excessive brake pedal force is applied at high speed. So, speed control is critical if pilots want to make book landing distances. But savvy Eclipse 500 pilots say it's possible to achieve AFM landing distances if you nail the published speed numbers.

After stopping briefly for fuel, we flew VFR back to North Las Vegas at 16,500 ft. VREF landing speed was 87 KEAS and computed landing distance was 3,200 ft. The Eclipse 550 should have shorter published landing distances than other light jets, but the competitors all have anti-skid brakes and thus their stopping distances should be more predictable and consistent, especially on contaminated runways.

Conclusions? The Avio IFMS provides the Total Eclipse with impressive new capabilities, including XM radio weather, WAAS approach, JeppView charts and an excellent moving map display. But in its current state, it's still a work in progress. We're looking forward to flying with the complete package of IFMS features in the new production Eclipse 550.

Probability of Future Success

Now a keenly interested observer, Raburn has high hopes for the Eclipse 550.

"We had some amazingly good suppliers, such as Ducommon, Fuji Heavy Industries and Pratt & Whitney Canada," he said. "But we also had some extraordinarily bad ones. An outsourced supply chain has to work 100% of the time. That's Sikorsky's strong suit. It has the process and quality systems, plus so much tribal knowledge."

Sikorsky also is extending its participation in the Eclipse program to include air charter, fractional ownership and aircraft management. The Total Eclipse on display at the NBAA Convention hall, for instance, shortly will enter service with Sikorsky's Associated Air Group in Wappingers Falls, N.Y. AAG currently operates nine S-76 medium helicopters. A spokesman said the charter rate for the Total Eclipse will be less than $2,000 per hour.

A second Total Eclipse will enter service with AAG with the intention of starting a fractional ownership program. If all goes well, it's probable that AAG will operate Eclipse 550 aircraft when they enter production in 2013, Raburn believes.

Eclipse 500 operators also are giving Holland high marks for product support. Essential parts now are available and AOG delays are rare. In the past six months, 81% of requested parts were shipped the same working day and 89% were on their way within 24 hr. The number of back-ordered parts has been slashed by 98.75% and the number of rotable spares has been increased. Sikorsky is helping with logistics with its worldwide support network.

Fleet usage has increased to 1,700 hr. per month from 1,000 hr. per month when Eclipse Aerospace acquired the company in August 2009. Product improvements have been made to the landing light, ice protection system and PhostrEx fire extinguishers. A rubber gasket has been installed below the front equipment bay access door, thereby eliminating the need to reseal the door gap and repaint the area during routine removal and replacement for maintenance operations.

Yet to be accomplished is a battery upgrade. Eclipse Aviation originally planned to use lithium-ion batteries in the aircraft, but the development effort foundered. Upgrading from lead-acid to high power Li-I batteries could eliminate the low-temperature engine starting restrictions and make the aircraft easier to operate in cold climates.

Holland believes, though, that if he can hold down the price of the Eclipse 550 to less than $3 million, he can capture a sizable portion of the new light jet market currently owned by the Citation Mustang and Embraer Phenom 100.

Pino tacitly endorses the business plan or else he wouldn't have pushed for Sikorsky's involvement in the program. Both Pino and Holland believe that Eclipse 550 assembly lines eventually may be established in new locations.

Thus, Williams' and Raburn's dreams to create a new class of very light, twin-turbofan aircraft are back on track to become reality because of Holland's commitment to the program and Sikorsky's growing participation. Beginning in 2013, there may be as much buzz about Eclipse VLJs as there was in 2003. BCA

Avio IFMS Avionics Suite

The Eclipse 550's Avio cockpit has left- and right-side, 10.4-in. portrait configuration PFDs, plus a 15.3-in. landscape configuration MFD in the middle. Functions are controlled by line select keys with soft labels on each display, inner and outer knobs at the corners of the displays, a few stand-alone switches in the instrument panel and slide-out multifunction keyboards in front of the pilots' knees.

Production aircraft will have a full complement of situational awareness features including SVS, EVS, electronic charts, multilayer maps, XM satellite radio weather and full-function FMSes capable of RNP guidance, along with 23 types of ARINC 424 procedures. They'll also have auto-throttles that are fully integrated with the IFMS, so functioning should be as smooth and precise as similar systems in large-cabin jets and airliners.

Equally impressive is the integration between Avio and aircraft systems. There are interactive synoptic diagrams for virtually every system that display normal, abnormal and emergency status with animation, color coding and alphanumeric characters. Even brake fluid quantity and fuel temperature are monitored. The performance of all systems, engines and avionics is logged in a quick-access recorder for later analysis by maintenance personnel, accident investigators or safety management system officials.