
Boom Supersonic

New Jets 2018

Can new models on the market convince reluctant buyers?

by Mark Huber

In a 1939 House of Commons speech, Britain's Winston Churchill called Russian foreign policy, "a riddle, wrapped in a mystery, inside an enigma." The same could be said to describe the current new business jet market. Despite the longest bull run in stock market history, some of the lowest unemployment numbers on record, and strong consumer spending in both the United States and Europe—markets that collectively comprise three-quarters of the global market for new corporate jets—new jet sales numbers have not reflected this prosperity.

In 2008, cruising on the contrails of a pre-crash market that saw the Dow Jones Industrial Average peak just above 14,000 in late 2007, OEMs delivered 1,313 new business jets; last calendar year, with the Dow finishing just below 25,000, just 677 new jets were delivered, according to the General Aviation Manufacturers Association (GAMA). (For the first half of this year deliveries stood at just 296 compared to the same number in 2017.) This, despite the fact that used jet inventories have tightened to the equivalent of less than 9 percent of the in-service fleet, the U.S. corporate tax rate has been slashed, and accelerated depreciation has been expanded.

The long-presumed sales model, that new jet sales follow the stock market and/or corporate earnings, has been broken for the better part of the last two decades, with new jet sales largely frozen in the range between 660 and 760 over the last 10 years. If this market were a movie it might very well be titled *On Stagnant Pond*. The reasons for this stagnation are myriad. The growth of the Asian business jet market did not materialize as quickly as initially forecast, OEMs were slow to bring certain new products to market, and pure fractional ownership—a traditional large driver of OEM sales—began to fall from customer favor. But beyond all these factors is a fundamental shift in the way consumers view business jets and business jet travel—increasingly as a service and less of an asset class.

While new jet sales have not improved in tandem with the economy, the charter market has grown, particularly the large-cabin market. VistaJet chairman Thomas Flohr noted in May 2018 that the global air charter market grew by 5 percent in 2017 and aircraft utilization has returned to levels not seen since the 2008 recession.

"The number of charter flight hours is now at its highest level since 2008," he said.

VistaJet, which operates an all-Bombardier fleet of super-midsize and large-cabin business jets, is one of a growing number of membership and charter companies reporting double-digit annual growth in recent years. Of the top 25 U.S. business jet charter fleets, 20 reported adding aircraft to their fleets in 2016, and five of those collectively added 100 aircraft. But a deeper dive into those numbers reveals that 53 of those aircraft were added by Gama Aviation, the operator for membership program Wheels Up, and 20 by jet card/aircraft management program Jet Linx.

A report prepared by the consulting firm Wealth-X for VistaJet earlier this year confirms what sellers of high-ticket items have long-suspected: younger high-net-worth individuals tend not to buy aircraft until they have achieved billionaire status and then only when they are older. And even when the charter market dips, as it did this past July, large-cabin aircraft seem to be resilient. According to Argus, the large-cabin charter market grew by 11.4 percent in July even as other sectors took a pause.

Still, even with this perceived ownership aversion, there are positive indicators for the new jet market. Four of the "Big Five" OEMs—Bombardier, Dassault, Gulfstream, and Textron—have genuinely new—not just refreshed—products in the pipeline aimed at the super-midsize to large-cabin markets, and the rational assumption is that these new products will prove sufficiently compelling—in terms of fuel-efficient engines, advanced avionics, more comfortable cabins with greater connectivity, and overall less burdensome maintenance—to move new jet sales off the dime.

And further down the food chain, new and disruptive smaller models from Cirrus, Honda, and Pilatus are creating new categories that could further stimulate sales. This, combined with the recent culling of the available used fleet that is less than 20 years old, should theoretically brighten the prospect for new jet sales, although residual values of many recent used models remain depressed as to overall flight hours, which have not kept pace with the overall fleet growth in the years since 9-11. Access to new and more efficient aircraft may stimulate higher utilization rates. For those willing to buy, there is certainly no shortage of choices. The larger question that looms is: Are new models compelling enough to persuade reluctant buyers to "pull the trigger?"

SUPERSONICS

Aerion AS2

Aerion plans to fly the 12-passenger AS2 in 2023 and make a supersonic crossing of the Atlantic in October of that year—the 20-year anniversary of the last flight of the Concorde. In December 2017, Aerion signed an agreement with Lockheed Martin to develop the aircraft, and the two companies' teams of engineers are working together on a daily

basis, the company said.

Aerion last year announced an agreement with GE Aviation to develop engines in the 18,000-pound-thrust class to power the AS2, for which Aerion said it is spending $1 billion. According to Aerion, the chosen powerplant has already accumulated some one billion hours of service, which indicates it is likely the CFM56. A low-bypass turbofan engine will be built around the core for the AS2.

The company is working with the FAA and ICAO on noise and emissions standards for future supersonic aircraft. The FAA recently paved the way for development of supersonic aircraft with the announcement it is working on a pair of rulemakings, the first a proposed noise certification and the second a clarification of procedures required to obtain special flight authorization to conduct supersonic flight testing in the U.S. The AS2's top speed has been dialed back to Mach 1.4 from 1.6 to minimize design complexities and keep the aircraft firmly within the envelope of current technological capabilities.

In 2014 Aerion revamped its proposed supersonic bizjet as a trijet with more range and a larger cabin. The new AS2 retains its predecessor design's supersonic natural laminar-flow wing, but will now have a range of at least 5,000 nm and a cabin cross-section nearly the size of a Gulfstream G550's. The 30-foot-long cabin, which is 17 feet shorter than the G550's, will feature a two-lounge layout, galley, and both forward and aft lavatories, plus a baggage compartment accessible in flight.

Mtow grows to 121,000 pounds and the fuselage is lengthened to 170 feet. Balanced field length is 7,500 feet at mtow, but that is reduced to 6,000 at partial-fuel takeoff weights of less than 100,000 pounds. The lighter fuel load reduces range by approximately 20 percent. While maximum speed is Mach 1.4, the aircraft is designed to cruise efficiently at Mach 0.95 to comply with existing supersonic overflight bans.


HyperMach SonicStar


Aerion AS2

Aerion said that an earlier relationship with Airbus had been instrumental in helping with the design of an articulating landing gear system, the fuel system, the computerized fly-by-wire flight control architecture, and the carbon-fiber wing, fuselage, and empennage structures. In 2015, the program got another boost when fractional operator Flexjet signed a letter of intent for 20 AS2s with plans to offer them to its Global Lease customers.

HyperMach SonicStar

This again-revised design proposes a top speed of Mach 5.5, a maximum range of 9,600 nm and seating for up to 36 passengers. The company says it has completed several rounds of financing and is continuing to develop its revolutionary hybrid engines. It expects to have an operating engine by next year. First flight for the $180 million aircraft is estimated in 2025 and certification in 2028. A subscale flight-test vehicle is currently being designed.

Spike Aerospace S-512

Spike Aerospace flew a series of test flights of its first SX-1.2 scaled demonstrator aircraft last fall. The proof-of-concept aircraft will help validate the aerodynamics of the S-512 Supersonic Jet. The company intends for the SX-1.2 to be followed by a series of successively larger and faster aircraft, leading ultimately to a supersonic demonstrator. Spike said last year that it is already building the third generation of demonstrators with the first two complete and ready for their first flights. CEO Vik Kachoria said Spike intends to fly a crewed high-speed demonstrator in 2019.

"Our goal is to be flying crewed supersonic test flights before the end of 2019, and we're on track to achieve that," Kachoria stated. That will lead to final designs, production, and testing of the S-512.

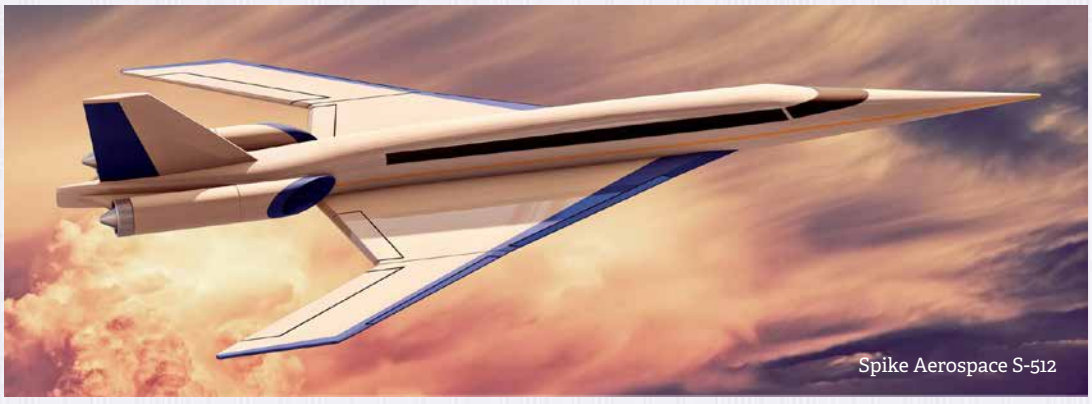
Spike has developed partnerships with Siemens, Quartus, Aernnova, Greenpoint, BRPH, and others and intends to have the S-512 flying by early 2021, with customer deliveries beginning in 2023. The S-512 will seat up to 22 passengers, with a range of 6,200 miles and a cruise speed of Mach 1.6. The company also is considering a 40- to 50-seat variant. Spike is looking for a low- to medium-bypass-ratio engine producing about 20,000 pounds of thrust at sea level. The company continues to search for additional funding for the $1 billion program and estimates a market for 600 aircraft between 2020 and 2030.

Boom Supersonic

Boom Supersonic had raised $85 million through mid-2018 to fund a one-third scale XB-1 "Baby Boom" demonstration aircraft that is now scheduled to fly sometime next year and fund its full-scale aircraft program. The XB-1 features three non-afterburning General Electric J85-21s with variable-geometry intake and exhaust, Honeywell avionics, Tencate carbon fiber prepreg, and Stratasys 3D-printed components. The scaled aircraft will be used to evaluate the larger aircraft's delta-wing, carbon-fuselage design. Its engines and hydraulic systems have been powered up, and the development team has tested the wing spar and composite joints, and completed low-temperature trials.

While Boom's ultimate goal is to manufacture a three-engine, $200 million, Mach 2.2 supersonic jetliner with about the same seating capacity as a first-generation regional jet that could be configured as a business jet, it is focused primarily on securing airline orders. Boom now has purchase commitments from a half-dozen airlines for the full-scale version that it aims to have in service by 2025.

Boom announced last year that Richard Branson's Spaceship Company will provide engineering, manufacturing, and flight-test support to Boom and the company holds an option on Boom's first 10 airframes. In December, Japan Air Lines placed an order for 20 aircraft. Two cabin configurations have been unveiled to date—for 45 and 55 passengers. The company maintains that its seat-mile costs are comparable to those for airline business class.


Spike Aerospace S-512

BIZLINERS

Airbus ACJ Neo

Airbus will make its re-engined "neo" (new engine option) A319 and A320 available for the Airbus Corporate Jet (ACJ) program with deliveries beginning in the fourth quarter of this year with the $95 million (approximately) ACJ320neo and early next year for the $87 million (approximately) ACJ319neo.

For power, neo customers have a choice of either the CFM Leap-X or the Pratt & Whitney Pure Power PW1100G. The new aircraft are 16 percent more fuel-efficient than their predecessors thanks to the new engines and the addition of wingtip "sharklets." This, plus the addition of more centerline fuel tanks, translates into more range. It increases from 6,000 nm to 6,750 on the 319 (eight passengers) and from 4,300 nm (eight passengers) to 6,000 nm (25 passengers) on the 320. Both aircraft also get lower cabin altitudes and redesigned luggage holds that provide additional capacity.


ACJ319 Pagani Infinito

Last year, Airbus Corporate Jets unveiled a new Infinito cabin design for the ACJ319neo developed with Italian hypercar maker Atelier Pagani Automobili. The design incorporates composite materials such as CarboTitanium and features a curved pathway through the cabin, shell-shaped valances and walls between zones that can switch from opaque to transparent. The interior includes soft leather carpets and a wooden floor contrasting with man-made carbon fiber in furniture and wall frames.

Airbus ACJ350 XWB

Airbus began delivering the A350 XWB to the airlines in 2014 and formally announced its intent to offer a VIP variant of the aircraft in 2016. In VIP configuration, the aircraft will be known as the ACJ350 XWB and without an interior will sell for more than $250 million. In typical executive configuration with 25 passengers, it will have an unrefueled range of 10,800 nm—about 20 hours in the air—allowing direct connections between most major city pairs on the globe.

Top speed is Mach 0.89. The cabin of the -900 variant measures nearly 170 feet long, more than 18 feet wide and eight feet tall, yielding almost 2,910 sq ft of floor space. Airbus is introducing a new Easyfit streamlined process for outfitting the cabin interior that employs the cabin wall attachment points. Mtow is close to 600,000 pounds. Obviously, an aircraft this big can't land just anywhere: it needs 6,100 feet to stop. Takeoff distance at maximum weight is 8,770 feet. While the 350's cabin is wider than the Boeing 787's, the windows on the latter are noticeably larger and feature electro-chromic dimming, while the Airbus relies on old-technology electro-mechanical shades. The larger windows on the 787 create the illusion of more interior space. However, the smaller windows on the A350 mean the cabin is marginally quieter.

The claimed fuel-efficiency advantage over the 787 appears to come from Airbus's wider use of composites–53 percent versus 50 percent on the 787. The Airbus also employs a new winglet design called a "sharklet," which reduces drag and boosts top speed to Mach 0.89 from Mach 0.85. The two aircraft feature the same engine technology.

Airbus ACJ330neo

The new VIP variant of the Airbus A330neo will be able to fly 25 passengers 9,400 nm, enabling nonstop flights from Europe to Australia. The A330neo will be powered by the new-generation Rolls-Royce Trent 7000 engines and incorporate a new high-span wing and wingtip sharklets similar to those on the A350 XWB. The improvements deliver a 12 percent fuel-burn reduction compared to a standard A330 and deliver payload and range improvements. Other new ACJ330neo features include an onboard airport navigation system, runway overrun prevention system, and LED exterior lights.

The first ACJ330neo slot will be available in 2019.

Boeing BBJ Max

The BBJ Max is the BBJ version of Boeing's new 737 Max family. The 737 Max 8, the first of potentially five Max variants, gained FAA certification in March 2016. Boeing plans to follow the Max 8 with the larger Max 9 in 2018 and the higher capacity Max 200 and smaller Max 7 in 2019. Boeing delivered the first BBJ Max 8 in April.

Boeing Business Jets (BBJ) announced in 2013 that it would build executive versions of the 737 Max known as the BBJ Max, also fitted with CFM Leap 1-B engines. They are based on the current BBJ1, BBJ2, and BBJ3, respectively, and have the same cabin sizes as their predecessors but significantly more range and, in the case of the BBJ Max 7, more luggage space. The BBJ Max 7 will be 6 feet, 4 inches longer than the BBJ1 with a range of 7,000 nm (four passengers), a significant improvement over the BBJ1, but only require seven auxiliary belly tanks as opposed to nine on the BBJ1, freeing up more cargo space. The BBJ Max 8 will have a range of 6,325 nm, a 14.6-percent improvement over the BBJ2. The BBJ Max 9 will offer a 6,255-nm range, 16.2 percent more than the BBJ3. The new aircraft will be 14 percent more fuel efficient than current-production single-aisle BBJs, thanks to new-design winglets and the new engines, which are mounted farther forward and higher on the wing and connected by new, more aerodynamic pylons. The Max also gets a more aerodynamic vertical stabilizer. To provide adequate ground clearance for the larger engines, the landing gear will be lengthened so the airplane will stand a little taller on the tarmac.

The Max will employ limited fly-by-wire controls, mainly to the wing spoilers. Other planned technology includes four big 15.1-inch Rockwell Collins flight displays in the cockpit, the same ones that are on the larger Boeing 787 Dreamliner. Maintenance on the Max will be easier than on previous BBJs, as fault data, once collected by instruments in the forward equipment bay, will now be available for technicians and pilots on the cockpit display screens. The Max will also hold more maintenance data on its enhanced onboard network system and network file server, doubling the amount of maintenance information available during flight and transmitting it live to ground stations so that issues can be quickly resolved in flight or shortly after the airplane lands. This will further enhance the aircraft's already high dispatch reliability. (Boeing quotes a 99.7-percent dispatch rate for the current-generation 737.)

LARGE-CABIN, LONG-RANGE

Bombardier Global 7500

Deliveries of the largest purpose-built business jet should begin soon. Bombardier plans to start shipping its new Global 7500 flagship large-cabin, long-range business jet sometime in the second half of this year. Announced in 2010, the new $72.8 million (base price) Global features new GE Aviation Passport engines, an aerodynamic thin wing, advanced touchscreen avionics, and computerized fly-by-wire flight controls. The quartet combines to deliver a top speed of Mach 0.925 (530 knots) and a maximum range of 7,700 nm when throttled back to Mach 0.85, enabling direct flights from New York to Hong Kong or from Singapore to San Francisco, and making it the longest-range bizjet on the market.

The new engine/wing pairing also allows the Global 7500 to utilize runways shorter than 6,000 feet when fully loaded.

The 7500 features Bombardier's Global Vision flight deck, built around Rockwell Collins's Pro Line Fusion system that includes advanced safety features including synthetic vision on a head-up display. Pilot control inputs are made via sidesticks connected to the aircraft's fly-by-wire computerized control system.

The four-zone cabin measures 54 feet, seven inches long, six feet, three inches tall, and eight feet, two inches wide yielding 2,637 cubic feet of cabin space overall. Twenty-eight vertical windows are distributed throughout the fuselage for natural light. A typical configuration can seat up to 19 passengers. The new environmental control system delivers 100 percent fresh air (as opposed to recycled air) and has a "turbo" heat and cool feature to rapidly raise or lower cabin temperature. The cabin pressurization system provides a relatively low cabin altitude, approximately 4,000 feet while cruising at 41,000 feet; the aircraft has a maximum cruising altitude of 51,000 feet.

The "nice Touch" cabin management system, designed by Lufthansa Technik, features a high-bandwidth, fiber-optic backbone that supports Ka-band satellite connectivity, iOS and Android devices, Bluetooth 4.0 modules, and USB 3.0 ports at every seat. Overall the system supports 4K, 40-inch monitors, Blu-ray, CD, and DVD, two media centers that provide on-demand audio and video in any zone and aggregate media content, a sound system custom-tuned to the aircraft, and full-color spectrum lighting with up to 200 shades that can be synchronized to the lighting at destination time zones. Bombardier designed a new executive seat for the 7500 it calls the "Nuage" (French for "cloud") that incorporates advanced comfort and storage features.

The first production Global 7500s are already on the line, and Bombardier says the airplane is sold out through 2021.

Bombardier Global 6500 and 5500

In May, Bombardier took the wraps off of two new models, the Global 5500 and Global 6500. The airplanes are fresh takes on the legacy Global 5000 and 6000 models, using those aircraft's fuselage cross-sections but adding new engines, wings, interiors, and avionics, increasing range, reducing fuel burn and emissions, and increasing passenger comfort.

Slated for delivery in 2019, the new Globals are the launch vehicles for the new Rolls-Royce Pearl 15 engine (15,125 pounds


Bombadier Global 7500


Bombadier Global 6500

of thrust) that discharges 48 percent less smoke and 20 percent less nitrous oxide, is two decibels quieter, burns 7 percent less fuel, and has 9 percent more thrust than the engine on the old Globals, the BR710.

Combined with the new engines, the new Globals feature a "re-profiled" wing and other aerodynamic cleanups that will boost overall fuel efficiency by up to 13 percent and increase maximum cruise speed to 516 knots or Mach 0.9 (from Mach 0.89) on the new models compared to the legacy Globals, according to Bombardier. It also gives the airplanes longer legs. Maximum range on the Global 5500 is 5,700 nm (500 more than on the Global 5000) and 6,600 nm on the Global 6500 (600 more than the Global 6000). However, range improves even more under high/hot conditions, taking off from airports such as 8,465-foot-elevation Toluca International in Mexico. Range out of the airport increases by 1,300 nm for both aircraft.

Inside, the new airplanes will feature Rockwell Collins's Venue cabin management and entertainment system upgraded with the ability to distribute ultra-high-definition 4K content throughout the aircraft. The cabins can be configured to typically seat 12 to 17 and also will feature the "Nuage" seat Bombardier has developed for the larger Global 7500. The conference/dining areas in both airplanes will also be fitted with a new seat design called the "Nuage Chaise" that provides traditional seat posture for dining/business meetings but can convert into a lounge for reclining.

In the cockpit, the new Globals feature the Rockwell Collins combined vision system (CVS), which merges infrared enhanced vision and synthetic vision system imagery into a single conformal view. The new Globals, initially at least, will sell for $4 million and $6 million dollars less, respectively, than their legacy siblings, the $50.4 million Global 5000 and $62.3 million Global 6000 which, for now, Bombardier plans to keep producing.

Gulfstream G500 and G600

Gulfstream obtained FAA certification for its new G500 large-cabin jet in July and is closing in on certification of the larger G600 for late this year. Testing that remains for the G600 includes fuel system, engine and thrust reverser operations, ice protection and environmental control system, crew workload, flight into known icing, and function-and-reliability. Since its first flight in December 2016 through mid-August, the G600 test program has logged more than 2,375 hours during 630 flights.

In October 2014, Gulfstream formally launched the two large-cabin jets designed to replace its G450 and G550 models. The top speed for both aircraft is Mach 0.925. The G500 has a range of 5,200 nm at Mach 0.85 and 4,400 nm at Mach 0.90. The G600 has a range of 6,500 nm at Mach 0.85 and 5,100 nm at Mach 0.90. Gulfstream has set initial prices at $44.65 million for the G500 and $55.65 million for the G600.

Power will come from Pratt & Whitney Canada's new PW800 engines. The 16,000-pound-thrust class PW814GA and PW815GA powerplants have the same core technology used in the company's geared turbofan airliner engines.

The cabin cross-section of each aircraft measures 91 inches wide and 74 inches tall—about seven inches wider and two inches taller than cabins in the G450 and G550—and they can be configured for up to 19 passengers. The G500 has three living areas and the G600 has up to four as well as an optional crew rest area. Both aircraft offer forward and aft lavatories, plus a full-size galley that can be located either forward or aft.

The cockpits feature fly-by-wire controls and active-control sidesticks and the new touchscreen Symmetry flight deck, which is driven by Honeywell Primus Epic avionics. The avionics include Gulfstream's enhanced vision, Honeywell's synthetic vision with 3-D taxi, and a head-up display system. The full three-axis digital fly-by-wire system offers benefits that include flight-envelope protection, stability augmentation, increased redundancy, and reduced maintenance. The streamlined and highly styled cockpit is finished in black leather with metallic accents. Most of the switchology found in earlier designs has been eliminated. Inputs are made through Honeywell and Korry touchscreens with large, easy-to-view icons. Gulfstream's familiar cursor-control devices (CCD) are integrated into the center console at the head of the hand grips. The console extends aft of the pilot seats, but it is lower-slung, making step-over entry and exit easier. The CCDs give each pilot control of three of the four main display screens and allow data to be shifted among them in the event of a failure.

Dassault Falcon 6X

Earlier this year, Dassault publicly abandoned its long-standing attempt to develop a new large-cabin twin with Safran Silvercrest power (*see story page 12*), the Falcon 5X, opting instead to switch to Pratt & Whitney Canada PW800 series engines (PW812D). But the divorce was long in coming and Dassault had been toiling on a "Plan B" for a while. The switch enabled an aircraft design re-think, and in February Dassault unveiled plans for the larger $47 million 6X, a 5,500 nm (Mach 0.80, eight passengers, three crew), 19-passenger design that the company advertises as "the most spacious, advanced, and versatile twinjet in the long-range business jet segment."

Cabin height is 6 feet, 6 inches; width is 8 feet, 6 inches; and length is 40 feet, 4 inches. The three-zone cabin can be completed in multiple configurations that include large entryway, crew rest area, and a rear lounge. Compared to the scrapped 5X, the 6X has a 20-inch longer cabin that carries over many of the 5X's styling cues and features including large windows (28 on the 6X), vestibule/galley skylight, and a 155-cubic-foot walk-in baggage compartment. Cabin altitude is 3,900 feet at a cruising altitude of 41,000 feet. Ka-band connectivity is optional and the in-flight entertainment and information system can distribute HD audio and video throughout the cabin.

The cockpit features seats that recline to 130 degrees, a digital flight control system, Honeywell-based EASy IIIavionics and the FalconEye combined-vision head-up display. The flaperons from the 5X also carry over to the 6X and Dassault is adopting a nitrogen-based fuel pressurization system, a first for a business jet. Dassault


Gulfstream G600

says the 6X is a twin-engine aircraft "with the low-speed performance of a three-engine aircraft" thanks to the flaperons and leading-edge slats and trailing-edge flaps that can handle approach speeds down to 109 knots and steep approaches to six degrees, facilitating landings at places like London City and Aspen.

Plans call for the 6X to begin flying in 2021 and enter service in 2022. In August, Dassault told **AIN** that the aircraft already had progressed to the detailed design phase after completing additional aerodynamic and wind tunnel testing earlier this year. Manufacturing of primary parts and subassemblies will start in the fourth quarter of this year.


Dassault Falcon 6X

LARGE-CABIN

Cessna Citation Hemisphere

Textron announced in April that it has paused the program indefinitely as engine maker Safran continues to work through development problems with the Silvercrest engine. Announced in 2015, the $35 million aircraft aims to create a niche between the traditional super-midsize and large-cabin, long-range models. To date the company has said that the Hemisphere will have a range of 4,500 nm (four passengers), a top cruise speed or around Mach 0.9, a flat-floor, three-zone cabin with seating for up to 14 and a 102-inch diameter, "class-leading operating costs and performance," and will make its first flight in 2019—although that seems highly doubtful at this point.

"We're committed to being an industry leader and will not back off on the performance specifications we want for the Citation Hemisphere," a Textron Aviation spokesperson told **AIN**. "We remain in touch with Safran on the 18- to 24-month delay of the Silvercrest engine." Textron chairman and CEO Scott Donnelly said the company is "waiting to see how the engine plays out. And then, based on that, we'll make our decisions and move forward knowing what the performance of the engine is."

Earlier this year a spokesman from Safran Aircraft Engines said the company "is fully committed to continue and complete the development of the Silvercrest engine, all the way to certification, with our primary objective being to deliver to Cessna an engine in compliance with the specifications of its new Hemisphere aircraft. As we said previously, we are working on the HP axial compressor optimization and improvements, and all the progress that has been made are shared regularly with Cessna."

SUPER-MEDIUM

Cessna Citation Longitude

Certification had been expected late last year for Cessna's $26 million entry into the super-midsize derby, but it was not to be. The most recent estimate was for this year's third quarter. The delay was caused in part by the company's need to obtain a partial exemption approval for FAA fuel tank flammability requirements.

The 3,400-nm-range Longitude features a 12 passenger, 77-inch-wide, six-foot tall, flat-floor cabin, a pair of Fadec-equipped Honeywell HTF7700L turbofan engines (7,550 pounds of thrust each), and Garmin G5000 touchscreen avionics with autothrottles and radar, optional head-up display, and extended maintenance intervals. It has a low cabin altitude of 5,950 feet, standard double-club seating with eight single executive seats of a new and wider design, a walk-in 112-cu-ft baggage compartment that is accessible in flight, a full-fuel payload of 1,600 pounds, a maximum cruise speed of 476 knots, and is designed to use 5,000-foot runways (at mtow). Other creature comforts include a vacuum-assisted externally serviced lavatory, a full galley with sink and potable water and in the cabin, a quiet cabin and 20 percent more legroom than in competing airplanes, according to Cessna.

Cessna is eschewing expensive systems like full fly-by-wire flight controls with the goal of providing a superior value proposition—both acquisition and life cycle. (It will have limited fly-by-wire for the rudder, spoilers, and brakes. The aircraft will be equipped with the LinxUs system to provide real-time maintenance monitoring and solw utions, including when it is airborne. It also has more user-friendly maintenance access ports than past models.

Cessna has focused on creating a comfortable cabin on the aircraft. Natural light throughout comes from 14 large windows. LED lighting is controlled via a wireless cabin-management system. The system also delivers a menu of information/entertainment choices, such as SiriusXM and moving maps. Iridium satcom is standard, and that allows Wi-Fi at speeds that are poised to increase significantly with the launch of next-generation satellites between now and the end of 2018. Passengers can operate the system via onboard touchscreens, controllers, or smart devices (with a downloaded app).


Cessna Citation Hemisphere

Most of the slide/swivel/reclining seats will be full berthing. While the standard configuration features a double club-four arrangement of eight single executive seats plus a side-facing single kibitzer in the front of the aircraft that's suitable for a flight attendant, the aircraft can also be ordered with an aft three-place side-facing divan or a forward two-place side-facing kibitzer. Each single seat has two USB charging ports and ample sidewall stowage for personal items.

LIGHT MEDIUMS

Pilatus PC-24

Pilatus Aircraft received simultaneous approvals for its new $8.9 million, 10-passenger PC-24 "super versatile" jet on December 7 from EASA and the FAA, including authorizations for flight into known icing and single-pilot operations. FlightSafety International started Pilatus PC-24 pilot and maintenance training at its Dallas learning center in February shortly after the PC-24 simulator at the facility was approved for training by EASA, following similar qualification by the FAA in December 2017.

In late August, Pilatus delivered Serial Number 109, the ninth PC-24. Seven aircraft are in service with customers and Pilatus dealers, two of those nine are being fitted with air ambulance interiors and will be delivered to the Australian Royal Flying Doctor Service by the end of this year. The company expects to deliver more than 20 PC-24s before the end of this year.

Popular executive interiors ordered to date include the eight-seat double club, and the 6 +2 forward club (six exec seats, plus two forward facing, quick-release commuter-style seats). Pilatus is currently conducting an active test program on grass and gravel runway operation for the PC-24. Flight tests on non-paved runways are taking place in Switzerland, the United Kingdom, Italy, and Canada. The company said that, based on data accumulated so far, it is confident that it will be able to certify operations from these types of runways by the end of this year.

The first PC-24 test aircraft rolled out of the hangar on Aug. 1, 2014, and made its first flight in May 2015. The first two years of production quickly sold out. Pilatus has temporarily stopped accepting new orders at 84.

The aircraft combines light jet operating economics with super-midsize jet capabilities and comfort and is aimed at more conventional offerings from Cessna and Embraer. Like the PC-12 single-engine turboprop, the PC-24 retains


Pilatus PC -24


Embraer 300 E

an aft cargo door and the capability to operate from unpaved and unimproved fields—with the PC-24 as short as 2,690 feet at an mtow of 17,650 pounds.

Power comes from a pair of Williams International FJ44-4A engines rated at 3,435 pounds of thrust each. The engines have unique features including automatic thrust reserve, passive thrust vectoring nozzles, quiet power mode in place of an APU to provide ground power, integral pre-cooler to condition bleed air and reduce drag losses, and an anti-ice and noise suppressing inlet. They have a 5,000-hour TBO and a hot section time of 2,500 hours. The engines help propel the PC-24 to FL450 in less than 30 minutes and achieve a high-speed cruise speed of 425 ktas at FL300. Range with four passengers is 1,950 nm and at mtow the maximum payload is 2,500 pounds.

Up front, the customized avionics suite dubbed PACE—Pilatus Advanced Cockpit Environment—is based on the Honeywell Primus Apex system and features all the latest advances.

The voluminous passenger cabin provides more overall space than either the Cessna XLS+ or the Embraer Phenom 300 and has a flat floor, which means less headroom in the aisle. The aircraft will come with seven different interior options for layouts that include executive, commuter, combi, and quick-change configurations as well as options for an externally serviced lavatory, in either forward or aft, and galleys. Like the PC-12, the PC-24's dominant feature is its rear cargo door that measures 4.1 feet wide and 4.25 feet tall.

In June 2016 Pilatus Business Aircraft broke ground on a new dedicated 120,000-square-foot facility for both PC-12 and PC-24 completions at its base in Broomfield, Colorado, that will be formally dedicated later this year.

LIGHT TWINS

Embraer 300E

Embraer delivered its first Phenom 300E in March. The updated edition (E for "Enhanced") of its best-selling Phenom 300 features a cabin designed with a new shell that yields more interior space, wider and deeper seats with retractable outboard arms that increases aisle width by three inches, a reduced profile valance for improved headroom, and a centerline tech panel. The sideledge passenger service unit also has been redesigned. Embraer designers also increased the sense of space by receding the ceiling upwash edge. The 300E is available in a variety of new upholstery stitching patterns and the snap-on seat coverings themselves can easily be replaced without removing the seats from the aircraft. Seats for the 300E are being built at Embraer's new company-owned 50,000-sq-ft seating plant in Titusville, Florida. Price for the refreshed model starts at $9.49 million.


HondaJet Elite

DAVID McINTOSH

HondaJet Elite

Honda Aircraft began deliveries of its new HondaJet Elite in August. The updated and improved HA-420 variant expands the light jet's performance envelope while adding interior improvements and significant updates to the Garmin G3000-based flight deck and will become the baseline for new aircraft production of the model. The aircraft gets an aerodynamic clean up, a slightly wider elevator, 16 gallons more fuel capacity, a 200-pound payload capacity increase, and a 17 percent maximum range boost to 1,437 nm (four passengers). Other improvements include interior and exterior noise reduction via a new perforated honeycomb-sandwich engine inlet engineered to cut fan blade passage noise.

The lavatory seat now is available for takeoff and landing with its own seatbelt, preserving the seven-seat capacity when the galley is installed. The optional galley is fitted with a coffee maker, and the galley replaces the side-facing seat opposite the cabin entry door.

Thicker carpets are part of the Elite interior, and buyers can now opt for two-toned executive leather seats, a Bongiovi audio system with speakerless transducer-based immersive audio, and new "premier signature" exterior paint.

Improvements to the G3000 flight deck include faster display processors, performance planning for all phases of flight, and takeoff/landing distance computation for runway length, V-speeds, and climb/approach gradient. The autopilot now offers stability and protection with roll and angle-of-attack functions and coupled go-arounds with underspeed protection.

SyberJet SJ30i and SJ30x

MSC Aerospace is planning two new versions of the SJ30 light twinjet: The $8.3 million SJ30i will feature an upgraded "Sybervision" avionics suite incorporating the Honeywell Primus Apex 2.0 system with 12-inch displays and a new interior. The avionics and interior are lighter than their progenitors and take an estimated 200 pounds out of the airplane. A follow-on aircraft, the $8.8 million SJ30x, will feature all the SJ30i improvements along with uprated Williams International FJ44-3AP-25 engines with dual Fadec and is expected to provide a variety of performance benefits including higher cruise speed at altitude, faster climbs, more payload, and better high and hot performance. It will also feature single-point refueling. Deliveries of the SJ30x are expected to begin in 2021.

The company has completed engine runs and is currently completing ground functional tests on the SJ30i flight-test aircraft (N50SJ) in preparation for first flight in the coming weeks. It expects to complete certification of the SJ30i cockpit and new interior by the end of 2019. The delivery of SN 009 will be coincident with certification. SN 009 is currently in work at MSC San Antonio. SyberJet also plans to complete retrofits of the four current SJ30-2s with the new Honeywell Apex 2.0 cockpit being certified for production and the new interior developed for the SJ30i. This work will be completed either at MSC San Antonio or its main facility in Cedar City, Utah.

The SJ30 program began in the late 1980s and the airplane, the SJ30-2, received FAA certification in 2005. Since then, the company has had several different corporate owners and produced eight examples of the 0.83 Mach, 2,500 nm, seven-seat jet. The aircraft is designed with a 30-degree swept wing for high speed and efficient cruising and with leading edge slats and flaps that are optimized for low speed approaches. The SJ30 has a service ceiling of 49,000 feet, maintains a sea

level cabin to 41,000 feet, and is approved for single-pilot operations.

ENTRY-LEVEL TWINS

One Aviation/Eclipse EA700

The company is currently undergoing a financial restructuring and the future of this program depends on the results of that exercise. In mid-2017 a senior company official said it was seeking $100 million to restructure the enterprise and $50 million to complete the EA700 program. The company encountered a cash flow problem earlier this year and came close to eviction from its New Mexico headquarters. While that immediate problem was resolved, the company has had little to say about its longer-term prospects.

The first EA700 testbed aircraft flew in September 2017. One Aviation's original plan was to fly three prototype aircraft, each testing different components for the 700. In July 2016, One announced the new variant of the Eclipse 550 with a four-foot longer wingspan, a 14-inch fuselage stretch, and improved performance and range, as well as a higher gross weight.

The $3.6 million Eclipse 700 twinjet will also have an integrated Garmin G3000 suite and switch to Williams FJ33-5A-12 turbofans (derated to 1,200 pounds of thrust each). The engines will provide a maximum cruise speed range in excess of 1,470 nm. The more powerful engines will shorten required takeoff runway lengths, quicken climb times, and boost the aircraft's service ceiling to FL430.

The EA700's Garmin G3000 avionics suite will include synthetic vision, GFC 700 autopilot, Garmin ESP protection system, and LNAV and VNAV, as well as be ADS-B and RVSM compliant.

Aside from Garmin and Williams, One has also selected other suppliers for the program, including Acme Aerospace lithium-ion battery system and PPG Alteos for electronically dimmable interactive cabin windows using Nuance V2 shading by Vision Systems.

SINGLES

Stratos 716X

Stratos Aircraft will make a new, larger, six-seat version of its Model 714 single-engine personal jet proof-of-concept (POC) aircraft available as a builder-assisted kit beginning in the fourth quarter, the company announced this summer. The new Model 716X features seating for six and is larger and wider than the 714, with a fuselage that is 31 inches longer and two inches wider than that of the 714. It will be powered by a 3,000-pound-thrust Pratt & Whitney Canada JT15D-5 turbofan and feature an electronic engine control.

Stratos 716X


SyberJet SJ30x


Flaris LAR 01

MARK WAGNER

The 716X's instrument panel will feature a variety of Garmin products, including dual G3X EFIS, GTN 750 GPS/com, and integrated autopilot. In addition, the jet will have air conditioning, a fully automated pressurization system, custom switch panels, and several Mid-Continent products, including a Standby Attitude Module with backup battery and a pressurization monitor.

The Redmond, Oregon company has already sold the first kit and the company's goal is to sell three kits per year and to put the aircraft into certified production four to five years in the future. Kit build time is approximately 2,500 hours. The company said that because the 716X is slightly larger than the 714 it would likely be slightly slower than the 714's projected 415 knots. Stratos expects to have price and performance data for the 716X available later this year.

Flaris LAR 01

The Poland-based aviation newcomer unveiled its $1.5 million five-seat, single-engine light jet at the 2013 Paris Air Show. Certification has slipped multiple times as the company grapples with a multiple of engineering problems including a powerplant change from the originally envisioned 1,460-pound-thrust Pratt & Whitney Canada PW610F to the Williams International FJ33-5A (1,900 pounds of thrust). In June 2018, the company said that it had completed all ground tests of the FJ33-5A on the aircraft and was moving the aircraft to Wroclaw airport for first flight.

The LAR 01 is fitted with dual Garmin G600 avionics. Other features include rear-hinged main cabin doors reminiscent of 1960s Lincoln Continentals, detachable wings and stabilizers, a fuselage fuel tank, electric deicing, and an in-the-nose whole aircraft ballistic parachute. The aircraft's target performance includes maximum cruise speed of 380 knots, stall speed of 62 knots, 1,400 nm of range, a 45,000-foot ceiling, and the ability to take off from short grass strips. The company said a second airplane is nearly complete and construction is under way on two more fuselages.

Last year Flaris announced that it had completed ground run tests with the Williams engine and in late August said the first flight "will take place in the coming weeks." Ground tests were continuing on gearbox-driven accessories. Initial test flights will be conducted with the fuselage unpressurized, although the company claims good progress with the ventilation and pressurization unit. Work also is continuing on the aircraft's multi-stage whole aircraft parachute system.■