Issue 2

WEDNESDAY
18 October 2023

FLIGHT DAILYNEWS

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and away!

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The 2X soars silently over Henderson airport yesterday

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Volocopter plans five routes initially, but Reinhardt will not reveal the number of aircraft that will be operating those services.

Most advanced air mobility companies see the USA as the most lucrative market for the vehicles, and Volocopter will not take long to be set for prime time on this side of the Atlantic too.

"We will be ready soon and have a clear pathway to certification here in the USA also," he says. "Right after our type certification in Europe, we expect to get a validation over here and be able to operate here."

"Here at NBAA we are looking for the possibilities, for the markets, and we clearly need partners in this country too," he adds.

Volocopter is scheduled to fly again at the static today and tomorrow at 10:00.

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Up, up and away!

Volocopter shows off quiet air taxi in flying display first

Pilar Wolfsteller

German electric vertical take-off and landing (eVTOL) vehicle developer Volocopter's 2X prototype made its NBAA flying debut yesterday, continuing a charm offensive to convince the public of the appeal of advanced air mobility.

"We are here to use the opportunity to showcase our aircraft to the public, as this is something completely brand new and nobody has seen before," says the company's chief risk and certification officer Oliver Reinhardt.

"It's part of building the public perception and showing that this is a really good thing."

The multi-rotor aircraft lifted off from the ramp at Henderson Executive airport at about 12:05 and traced a path over the northern end of the airfield's taxiways for about 6min. The large crowd watching the display barely heard a thing.

"It's absolutely silent, it flies smoothly and it's something convenient that really fits into every city's landscape," Reinhardt says.

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BillyPix

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Hat trick

AB Jets signs show deal to take Challenger 3500 trio

Pilar Wolfsteller

US charter operator AB Jets is adding three super-midsize Bombardier Challenger 3500 jets to its fleet, with the option of ordering a fourth aircraft by the end of 2023.

The company officially signed the deal at the static display yesterday.

"This fleet expansion represents a milestone in AB Jets' history," says Andrew Bettis, founder and co-owner of the company.

"We're pleased to meet our clients' demands with a new category of aircraft in the Challenger 3500. These super-midsize jets will bring an extended range and comfort to our fleet, increasing our ability to service our clientele."

The company, headquartered in Memphis, Tennessee, currently operates a fleet of nine Learjet 60s. It was looking to upgrade its fleet with a "luxury top-notch jet experience", adds Jean-Christophe Gallagher, executive vice-president of aircraft sales and Bombardier Defense.

The Challenger 3500 entered service in 2022, replacing the Challenger 350. It has a modernised cabin with features normally found on Bombardier Globals, including a reduction in the cabin pressure altitude by 2,000ft, and an auto-throttle.

AB Jets has been operating Bombardier aircraft for more than 20 years.

"Our experience has given us confidence in the quality and performance of the product and the team who delivers it," adds AB Jets' director of operations David Turner.

Meanwhile, Bombardier is celebrating a major milestone for the Global 7500 programme, with the Canadian airframer having handed over the 150th example of the ultra-long-range jet.

Delivered in September to an undisclosed customer, the landmark was reached almost five years after the twinjet entered service in December 2018.

Eric Martel, Bombardier chief executive, praises the delivery milestone, adding: "It is performing amazingly well."

To date, the in-service fleet of Global 7500s has racked up a little over 100,000 flight hours.

Cirium fleets data records five deliveries of Global 7500s in September – MSN150 to MSN155 – to customers including NetJets. Bombardier retains the programme's first five aircraft.

Meanwhile, the in-development Global 8000 remains on track for service entry by the middle of the decade, says Martel.

"I am repeating that commitment because right now we have no reason to believe that we will not be in a position to deliver that airplane in the second half of 2025," he says.

The certification prototype has accumulated 150 flight hours so far, plus 1,000h of rig tests, Martel adds.

Launched in May 2022, the Global 8000 can fly another 300nm (555km) over the 7,700nm-range Global 7500 on which it is based.

Bombardier's Jean-Christophe Gallagher and Frank Vento, vice-president US sales (front), with AB Jets' Andrew Bettis and David Turner (left and right), and Mark George, chairman of acquisition partner IMC (centre)

BillyPix

Tecnam sets out its STOL

Italian airframer Tecnam is nearing European certification for the short take-off and landing (STOL) variant of its P2012 Traveller, with first deliveries slated for January next year.

Approval from the European Union Aviation Safety Agency is expected by year-end, Tecnam says.

Already in production, the 11-seat piston-twin has been specifically engineered to operate at the world's most demanding commercial airports, the company says.

The baseline variant of the P2012 already has impressive take-off and landing characteristics, and the new STOL version will allow it to connect even more remote areas, on even shorter runways.

"This is already a short take-off and landing airplane; it can take off in about 2,000ft," says Francesco Sferra, the company's P2012 sales programme manager. "The STOL version can do it in a little more than half of that."

According to the aircraft specifications, the new STOL variant requires just 425m (1,394ft) to take off, and 360m to land.

"We achieved that with a larger wingspan, different engines, different propellers, same horsepower. So it's not a matter of power, it's a matter of aerodynamics," Sferra says.

Following initial certification in Europe, he says that Federal Aviation Administration validation could take between five and seven months. He hopes to show off the new aircraft at next year's NBAA.

Tecnam says the P2012 is the only piston-twin with STOL capabilities that complies with the latest certification changes. It has a maximum gross weight of 3,680kg (8,110lb), and a useful load of 1,290kg.

The aircraft is available in passenger or multi-mission configurations including for cargo and air ambulance services.

Tecnam has built just over 60 Travellers so far, with about 45 of those currently operating in the USA. Regional airline Cape Air is the largest operator in the country, with 30 examples in service.

Sferra: A matter of aerodynamics

BillyPix

VoltAero charges to first flight

Botti: We are still marching for 2025 certification

BillyPix

Dominic Perry

VoltAero continues working towards a maiden sortie of its initial Cassio 330 prototype but supply chain issues have pushed back the milestone by around six months.

However, the French start-up insists the delay will not force it to shift its 2025 service-entry target for the five-seat hybrid-electric aircraft.

Speaking to *Flight Daily News* yesterday, chief executive Jean Botti said VoltAero now expects to fly the aircraft, a mock-up of which is prominently displayed in the entrance hall, by mid-2024, a delay of around six months from its previous end-2023 goal.

Supply chain issues, particularly relating to the availability of aluminium for the aircraft's fuselage, have forced rescheduling, says Botti: "The supply chain is an issue for us like everybody."

But Botti remains confident that there will not be knock-on delays: "We are still marching for certification in 2025," he says.

Botti's conviction stems from VoltAero's plans for flight testing. The initial prototype will be used to validate the aircraft's configuration and new Duc Helices-supplied propeller and will run solely on its Kawasaki thermal engine.

"The first bird will not have batteries or electric motors on board," he says.

Additionally, the test asset – to be known as the Cassio 21 – will fly as an experimental aircraft under the supervision of French regulator DGAC rather than certification authority the European Union Aviation Safety Agency (EASA).

In the meantime, programme partner Akira will validate the full hybrid-electric powertrain though a series of ground tests, enabling the flight of a second prototype equipped with that propulsion system in the second half of next year.

That aircraft's arrival will effectively kick-off the flight-test portion of the EASA certification campaign.

"This is what we thought would be the best way to speed up the process," says Botti. "What seems to be a delay is no impact for us."

A critical design review should be completed by April 2024, he adds.

VoltAero's hybrid-electric module combines the Kawasaki four-cylinder thermal engine, a Safran EngineUs 100 electric motor and a gearbox from French transmission specialist Akira. Batteries are supplied by US firm Electric Power Systems.

Taxi, take-off, climb and landing are performed solely using electric power, while the thermal engine serves as a range extender, recharging the batteries during cruise. It also provides a back-up in case of an electrical system failure.

A follow-on aircraft, the Cassio 480, will use the same fuselage as the initial production aircraft but will use a high-power, six-cylinder Kawasaki engine and will be able to accommodate five passengers and a single pilot.

First flight of the Cassio is scheduled for 2026 and will be approved as an evolution of the baseline model via a supplemental type certificate. A third member of the family, the Cassio 600, should make its test debut in 2028.

However, Botti is not ready to disclose what the Cassio 600 will look like. "What we can say is that the 600 will build on all the elements developed for the 330 and 480," he says. "It's an aircraft that will look almost the same but will not be the same."

Backlog across the Cassio family stands at around 220 commitments and Botti says that figure may soon increase: "There is nothing we can announce yet, but we are closing on an important [firm order]," he adds.

Future developments include investigating the potential for the Cassio family to use liquid hydrogen as the energy source for the thermal engine. Flights using the fuel will be performed by the Cassio 21 testbed in the second half of the decade.

Meanwhile, a Series B funding round is set to close this year with VoltAero's target to raise €32 million ($33.8 million).

360 hits 100

Textron Aviation yesterday marked delivery of the 100th Beechcraft King Air 360, which the company calls an "exciting milestone" for the latest edition to the family of business turboprop aircraft.

Delivered to longtime Textron Aviation customer Comprehensive Blood and Cancer Center in Bakersfield, California, the aircraft will be a "game-changer for us in terms of productivity", says medical director Ravi Patel.

The twin-engined King Air 360 features an updated airframe, avionics and interior. The company made its first delivery of the variant in late 2020 and a further 16 of the type are currently on order, according to Cirium fleets data.

The company says it is approaching 7,800 deliveries of Beechcraft King Air turboprops since the type was introduced in 1964, "making it the world's best-selling business turboprop family".

Textron delivered its first 360 variant in 2020

Textron Aviation

Wisk set for take-off

Howard Hardee

US air taxi developer Wisk Aero is assembling the production prototype of its sixth-generation aircraft in California and plans to fly the fully autonomous vehicle next year.

The company, which is displaying its latest aircraft in the lobby of the convention centre, will likely assemble the "first several" of its electric vertical take-off and landing (eVTOL) vehicles at its facility in Mountain View, chief marketing officer Becky Tanner said at the show yesterday.

Seeking to become the first autonomous, passenger-carrying commercial aircraft certificated by the Federal Aviation Administration (FAA), Wisk is "designing this aircraft to meet the highest levels of commercial aviation safety", she says. "When you're flying in urban areas, that's essential."

The aircraft will seat four passengers, with no pilot. Wisk envisions a vehicle supervisor who monitors and communicates with multiple aircraft from the ground.

Wisk's air taxi will operate primarily at altitudes of 2,500-4,000ft and fly short routes with flight times of less than 15min.

Wisk's prototype at the show

BillyPix

Wisk has completed some 1,600 flights with its fifth-generation aircraft, Cora, and earlier this month launched a flight-test programme at Long Beach airport in Southern California using the technology demonstrator.

"It's really about strengthening our team and our flight-test capabilities in those commercial aviation environments," Tanner says.

The programme is preparing Wisk's team for future operations and also the ins and outs of working with a commercial airport, she adds.

The 12-rotor aircraft is designed to take-off and land vertically, and transition to forward flight for cruise. It will take-off "literally at the push of a button" and follow a pre-programmed flightpath.

Notably, the air taxi will be unable to operate in icing conditions and will have "very specific" wind limits, Tanner says. "But this will be safe to fly in most conditions."

Wisk will soon announce where it plans to construct its full-scale production facility where it will build its sixth-generation aircraft "in the tens of hundreds", Tanner says.

Following the path of fellow Bay Area air taxi start-ups Joby Aviation and Archer Aviation – which are building large-scale manufacturing facilities in Ohio and Georgia, respectively – Wisk's facility will be constructed somewhere in the USA outside of California.

"The cost of hiring people in California is expensive, compared to other states," Tanner says. "And a lot of other states are really [offering] incentives that make it interesting for companies like ours.

"Of course, California is very technically strong from an engineering perspective, and a lot of software engineers are needed for an autonomous aircraft, so we'll continues to have our [headquarters] in the San Francisco Bay Area," she adds.

Wisk is engaged in a type certification programme with the FAA and is "making great progress" on its certification basis, Tanner says. She declines to provide a specific timeline for certification but adds that the Boeing-backed start-up is "on track to begin operations within this decade".

During the Paris air show in June, chief executive Brian Yutko acknowledged that the 2028 Summer Olympics in Los Angeles were "very interesting" as a potential showcase for the USA's eVTOL technology. His comments suggest that Wisk's aircraft could enter commercial service within five years.

ACH160 SU debut nears

An ACH160 over Manhattan

Airbus Helicopters

Airbus Corporate Helicopters is confident that it will hand over the first ACH160 in the USA in early 2024 following certification of the medium-twin by the Federal Aviation Administration (FAA) in June this year.

Speaking at an NBAA press conference, Treg Manning, vice-president of sales and marketing North America for Airbus Helicopters said it has five ACH160s "on the ground waiting for delivery" to customers in the USA and Canada.

Pilot training is ongoing, he says, "and we expect it to be in service [in the USA] in the first quarter of 2024".

Transport Canada certification should also be wrapped up by year-end, he adds.

In a further sign of confidence in the market appeal of its newest helicopter, the manufacturer has also brought an ACH160 to the NBAA event for the first time where it is being showcased on the static display.

Customers in the USA have been patiently waiting for their new helicopters ever since the airframer received European approval for the rotorcraft in the summer of 2020.

US validation was expected to follow shortly afterwards but the process dragged out for three years as the FAA reacted to oversight issues exposed by the Boeing 737 Max crisis by slowing the certification process for all new aircraft. An issue with the H160's multi-function displays also contributed to the lengthy wait.

Frederic Lemos, head of ACH, says the new helicopter is the "perfect aircraft" to replace older in-service medium types, including the Sikorsky S-76C, Leonardo Helicopters AW139 and Airbus's own AS365 Dauphin. The airframer currently holds 30 orders for the ACH160.

Meanwhile, Manning also sees interest from the North American market for the bigger ACH175.

"We are seeing demand for it in North America: we started talking about getting FAA certification and immediately began getting calls," he says. US approval should come next year, he adds.

Airbus

Daher's electric dream

French firm poised to fly TBM 940-based EcoPulse demonstrator

Dominic Perry

Daher continues to prepare the ground for a future hybrid-electric aircraft and will shortly fly the EcoPulse technology demonstrator for the first time using its electric motors.

Based around a TBM 940 airframe and its Pratt & Whitney Canada PT6 engine, the EcoPulse gains six 45kW Safran EngineUs electric motors on its wings, plus an Airbus-supplied high-voltage battery. The battery will power four of the six electric motors while a 100kW auxiliary power unit supplies energy to the other pair.

While the EcoPulse has already flown to assess its handling characteristics following the integration of the electric motors and the rest of the distributed propulsion system, power has been supplied solely by the PT6 powerplant.

But, says Didier Kayat, chief executive of the French airframer, the project is now ready to move to the next phase having completed all the necessary ground and flight tests.

"The first electric flight will be in a couple of weeks in the south of France," he told a pre-NBAA press conference.

Daher and its partners have already "learned a lot" from the project, he says, including that it is "more complicated than we thought".

Significant hurdles it needed to overcome included the interference on aircraft systems from the high-voltage energy system and how to install six electric motors "in a place where we store all the fuel in the wing".

Daher in June this year announced plans to develop a hybrid-electric aircraft for service entry around 2027 and, says Kayat, the results of the EcoPulse flight-test effort will help the firm to "build the specification" of the follow-on programme.

However, he stresses that it is unlikely to look like the EcoPulse as that is "not a product, it's a technology demonstrator".

While the precise propulsion architecture will not be defined until next year, Kayat is clear that the aircraft will be built around one of its two existing products – the TBM-series high-speed turboprop or the Kodiak utility aircraft.

"We will need the best solution to demonstrate the hybrid plane and bring value to the customer," he says.

Running on battery power alone the EcoPulse will have endurance of "less than one hour", says Kayat; development of next-generation batteries will be vital if the airframer is to maintain its current timeline: "If we have the batteries we will have entry into service in 2027."

Meanwhile, Daher is celebrating the delivery of the 500th TBM 900-series aircraft, a milestone achieved in just nine years.

Daher says the landmark aircraft, a TBM 960, was handed over earlier in October to an undisclosed customer. Backlog for the TBM aircraft now stands at over 100 aircraft, around two years of production.

GJC's offset goal

Business aircraft finance company Global Jet Capital (GJC) has partnered with carbon-offset provider Azzera to study and help offset its carbon emissions.

An agreement between the companies involves Azzera completing annual audits of GJC's emissions and providing the finance company with access to carbon offsets, GJC says.

"Global Jet Capital intends to compensate for its... emissions by purchasing a carefully curated portfolio of high-quality carbon offsetting projects identified by Azzera," adds GJC.

With offices in Hong Kong, Mexico, Switzerland and the USA, GJC offers a range of aircraft leasing and loan programmes. Azzera has offices in Montreal and Zurich.

"With their deep industry experience and strong ties to the business aviation sector, coupled with their strategic presence in both North America and Europe, Azzera is uniquely positioned to support our global client base in achieving their sustainability goals," says GJC chief executive Vivek Kaushal.

Through the agreement, GJC is also offering its customers access to Azzera's services, giving aircraft operators a means to measure and offset their jets' emissions.

Global Jet Capital

Kaushal: sustainability goals

Perfect match

Tennis power couple Steffi Graf and Andre Agassi took to the stage on NBAA's opening day to stress the importance of giving back – and the benefits of business aviation. The keynote speakers – both Las Vegas residents and serial Grand Slam winners – say they found immense satisfaction by helping others. Graf launched Children for Tomorrow to help kids with mental-health issues and Agassi started a foundation giving Las Vegas-area kids access to better education.

The topic quickly turned to business aviation as the husband-and-wife team explained how air travel made their tennis successes possible.

"We have grown up in airplanes," says Graf, noting she flew around the world from a young age to various tennis matches. "Being on airplanes was something I always loved."

"For me, it's about efficiencies," adds Agassi. "Doing what I need to do and being home for dinner or to take the kids to school, has huge importance.

"I was always comfortable in an airplane... It was the only place [I] could shut down," he adds.

BillyPix

Aviation helped pair achieve success during and after their tennis careers

In brief...

Hobby lobby
Jet Aviation has completed a renovation of the lobby at its Houston Hobby FBO. The new design highlights the Swiss-based company's "refreshed brand standards with a minimal, light and elegant design".

Space saver
Becker Avionics has upgraded its AMU 6500 digital intercom to allow a single AMU 6500 control head for two operator positions through a split screen display. The feature will allow each user to access up to 10 programmable buttons, independent intercom and master volume adjustments, and individual VOX adjustments and transmit selectors, says the company.

ECTS adds two
Embraer-CAE Training Services (ECTS) – a joint venture between the airframer and training company – is to deploy two Phenom 300 simulators to meet growing demand for training on the light jet. The first will enter service in the first quarter of 2024 at CAE London in Burgess Hill, and the second at CAE Las Vegas.

Bolen: Everyone needs to know we are on a mission to net-zero

BillyPix

Climb with us

Bolen urges industry to back association's new sustainability campaign and bring politicians on side

Jon Hemmerdinger

NBAA yesterday revealed a new marketing initiative aimed at highlighting the business aviation industry's carbon-reduction efforts, with chief executive Ed Bolen urging attendees to get involved.

Bolen began the show's opening session by announcing the campaign, which is entitled: "Climbing. Fast."

The marketing push is "designed to underscore all the great things about business aviation and make clear that everyone knows we are on a mission to net zero", Bolen says.

In recent years, NBAA had been working under an advocacy strategy tagged "No Plane. No Gain". That campaign stressed the societal benefits of business aviation such as its track record of creating jobs and spurring economic development.

The new effort encompasses those messages. But it also stresses the sector's "leadership role in sustainability, underscored by a sharp focus on achieving net-zero carbon emissions from flight in the years to come", Bolen says. "The world needs to know we are climbing fast... to net-zero climate emissions."

NBAA has created the new website, Climbfast.com, where details about the new advocacy strategy are available. Bolen urged industry members to back the campaign.

"We need each and every one of you to get involved," he says, calling on leaders to contact "elected representatives and let them know this is a great, great industry. It's imperative they know we are on a mission to net zero."

NBAA says the campaign will also "emphasise business aviation's value as an incubator for innovation", noting emissions from today's business aircraft are 40% lower than four decades ago.

Also during the session two government safety officials discussed the need to address outstanding risks, including so-called near misses at airports. Several such incidents have made the news this year.

"What we saw earlier this year was an increase in close calls," Federal Aviation Administration deputy administrator Katie Thomson says. "It reminded us how important the focus on safety is."

National Transportation Safety Board (NTSB) chair Jennifer Homendy says her agency is investigating six runway safety events that occurred in the last year. The NTSB is also preparing to hire a data expert who will spearhead a data-driven effort to improve safety.

Honeywell and Hyundai team up on remote control for AAM

Honeywell and South Korea's Hyundai Motor Group will develop together a ground control station to enable pilotless operations for advanced air mobility (AAM) aircraft.

The collaboration will support Hyundai subsidiary Supernal's flight-test programme by "allowing remote pilots to safely monitor and command aircraft while also accessing real-time aircraft data", the companies disclosed at the show.

The ground control station is described as software for remotely operating aircraft beyond visual line-of-sight, featuring a "certified, decentralised and redundant architecture that offers persistent connectivity for remote operations", says David Shilliday, Honeywell's vice-president and general manager, AAM.

"Depending on the needs of an operator, Honeywell's ground control station technology could be scaled to manage hundreds or even thousands of vehicles across a series of stations," the company says.

The technology will be customised for Supernal, which is developing an eVTOL aircraft to be equipped with Honeywell's Anthem flightdeck. Such integration will reduce Supernal's technical and schedule risks, Honeywell says, "allowing Supernal to concentrate on building the aircraft".

Supernal's vehicle will initially have a pilot on board, but the start-up says it is also developing autonomous flight technology and creating an "integrated ground-to-air ecosystem", of which ground control stations are considered a foundational component.

"The collaboration with Honeywell brings unparalleled technological prowess to our flight test programme," says Adam Slepian, chief commercial officer of Supernal. "Their ground control station doesn't just meet our current needs but also offers scalable solutions for the future."

Supernal is working with more than 50 suppliers to develop its eVTOL for commercial use. In June, the start-up disclosed that it is partnering with GKN Aerospace to design and build "major aerostructures" and the electrical wiring system for its aircraft.

Rossi: Engines delivering continuous improvement

BillyPix

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Billion in the air

Flying hours milestone highlight of impressive year for P&WC as it marks PT6 anniversary

Jon Hemmerdinger

This year has been one of milestones for Pratt & Whitney Canada (P&WC), which is promoting several achievements spanning its line of business and general aviation turboprops and turbofans.

"We are celebrating a billion flying hours on our fleet, which is a significant achievement," says P&WC vice-president of sales and marketing Anthony Rossi.

This year also marks 60 years since service entry of the company's first PT6. That family of turboprops in the 500-1,900shp (373-1,417kW) output range power a long list of aircraft, including Cessna Caravans and SkyCouriers, Beechcraft King Airs, De Havilland Canada Twin Otters and Pilatus PC-12s.

Also in 2023 P&WC has achieved the benchmark of securing its 200th engine certification, passing that mark when Transport Canada approved the PW127XT-L, a higher-thrust variant for ATR's 42-600S. The Franco-Italian manufacturer expects regulators will certificate the 42-600S, a short take-off and landing variant of the turboprop, in 2025.

Rossi says P&WC is on the cusp of more achievements, noting Dassault Aviation's recently certificated Falcon 6X, powered by twin PW812Ds, is about to enter service.

Three aircraft already have PW800-family engines – the 6X and Gulfstream's G500 and G600 – and P&WC is now working on a fourth application, the PW812GA for Gulfstream's in-development G400.

It is also developing a new variant of the PW500 called the PW545D, which will power the Cessna Citation Ascend, an in-development update of the Citation Excel line.

"It's continuous improvement," says Rossi. "Annually, we are able to squeeze more power, more fuel efficiency" from the engines.

IBAC expands with new members

The International Business Aviation Council has welcomed three new members, as well as two companies renewing their ties with the organisation, which advocates for the industry on a global basis.

4Air, Daher and Metrojet have joined IBAC, while DuPont De Nemours and GCI Communications, also attending NBAA, have renewed their membership.

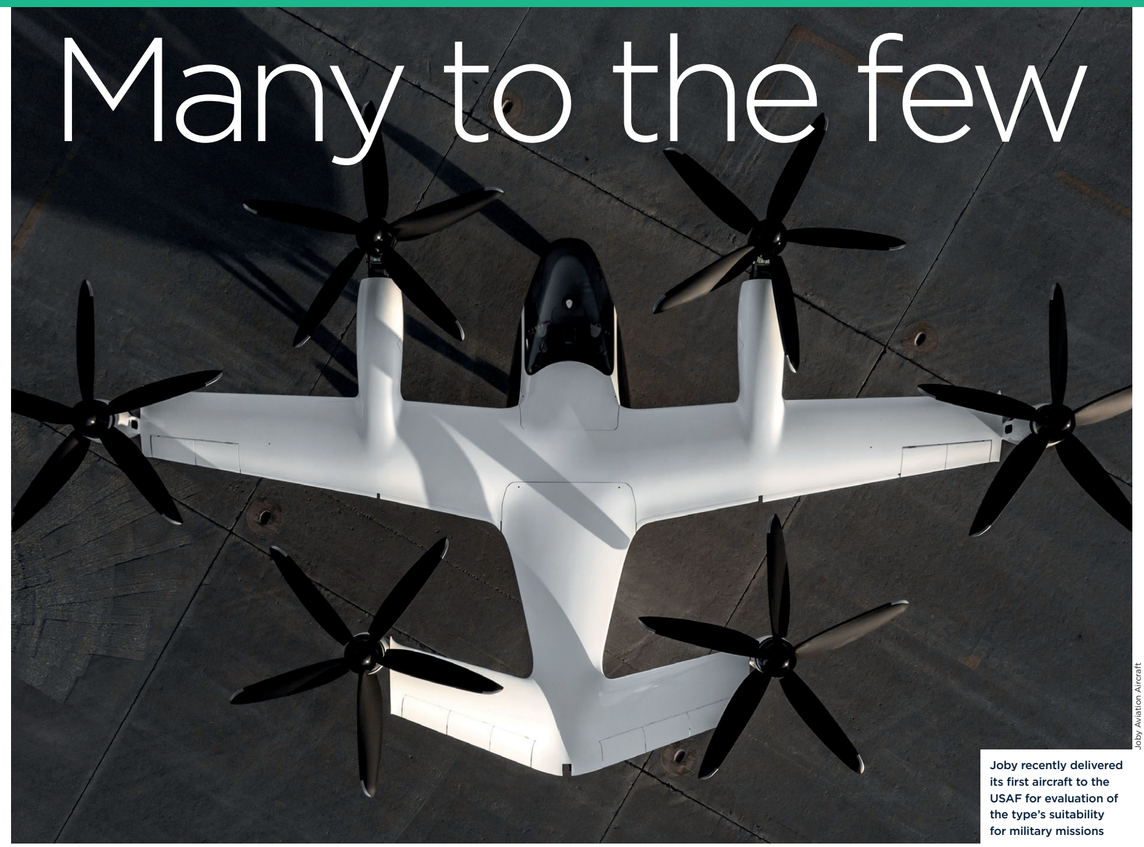
IBAC director general Kurt Edwards says: "We are excited to have these leading companies in the business aviation sector join the IBAC family and participate in our global efforts to promote business aviation growth, safety, and sustainability."

Pictured at the show (*l-r*) Leo Knaapen of IBAC, Elizabeth Dornak from Dupont, Metrojet's Dave Yip, Nancy Bsales from 4Air, Gary Dolski of Metrojet, GCI Communications' Ron Duncan, Jeff Lenorovitz from Daher and IBAC's Kurt Edwards.

BillyPix

Is the emergent eVTOL sector – a talking point at this week's show – ripe for consolidation? Speakers at a recent conference certainly thought so, as developers face tough reckonings

Many to the few



Joby Aviation Aircraft

Joby recently delivered its first aircraft to the USAF for evaluation of the type's suitability for military missions

Howard Hardee

Although the field of start-ups promising to revolutionise urban transportation with electric air taxis is increasingly crowded, it could start thinning by the end of next year.

That is according to Sergio Cecutta of SMG Consulting, who told FlightGlobal during the recent Air Taxi World Congress in San Francisco that some start-ups could exhaust their cash reserves within the next 12-14 months.

By then, it will become "extremely clear who's going to make it and who's not going to make it when it comes to certification", he says.

SMG Consulting's AAM Reality Index ranks electric vertical take-off and landing (eVTOL) aircraft developers based on "the likelihood of an OEM certifying their aircraft, entering service and producing it in thousand of units per year". The index ranks 24 of the top developers and tracks another 17 worldwide; it is certain that some, if not many, will fail to achieve certifications of their designs or to fly meaningful numbers of passengers.

For now, Cecutta considers it unlikely that frontrunners in the USA such as Joby Aviation, Beta Technologies, Archer Aviation and Wisk Aero – along with China's EHang and Germany's Volocopter – will collapse or consolidate. Those six start-ups appear to be in relatively stable positions with financial runways for launching operations at scale, according to SMG's analysis.

The California-based consultancy firm ranks Joby, Beta and Volocopter as the three companies most likely to clear the hurdles ahead, from the possibility of public pushback against eVTOLs to the astronomical costs of developing them. Archer's chief executive Adam Goldstein has estimated that getting one aircraft design through Federal Aviation Adminisration (FAA) certification could run as high as $1 billion.

Developers also face lingering uncertainty regarding certification, a situation Cecutta likens to "writing the rules of the game while you're playing the game". For example, the FAA recently proposed a requirement that air taxi pilots must be trained by a second pilot in the cockpit. Because most eVTOLs under development seat only a single pilot, such a requirement could force companies to develop separate models for training – a costly and time-consuming prospect.

Delays could prove problematic, as even companies with the greatest leads have only so much cash to burn. That is the opinion of McKinsey & Company's Robin Riedel, who leads the firm's Center for Future Mobility. He told FlightGlobal on 3 October that "Archer and Joby probably have the biggest cushion, but all of them are going to need more money".

"Our analysis would suggest that... companies still have good buffers through the rest of this year and early next year," he says. "But if you're not seeing additional funding flow into many of these players, you'll see some of them fail."

Leading eVTOL developers are entering an ambitious phase of rolling out their aircraft on the world stage, possibly starting with China's EHang.

In August, the company completed flight-testing of its two-passenger, fully autonomous EH216-S aircraft. On 13 October, the company announced that it had achieved certification from the Civil Aviation Administration of China.

Conor Chia-hung Yang, EHang's chief financial officer, describes a near-future in which "hundreds or thousands" of EHang's vehicles will fly pre-determined point-to-point routes throughout China, all controlled by a centralised operating system. The envisioned operations are "more like shuttle services" rather than air taxis, designed to complement the country's system of high-speed railways, he says.

Beta Technologies, is ranked among the most likely eVTOL makers to successfully scale production

Beta Technologies

Not far behind is Germany's Volocopter. "We are focused on the VoloCity for type certification with EASA, and we're on track for the second half of next year," Rohit Wariyar, the company's senior business manager, told the audience during the same discussion.

Volocopter is racing to achieve European certification prior to the 2024 Paris Summer Olympics, which the company views as a potential showcase for its one-pilot, one-passenger VoloCity rotorcraft.

"We believe that with the world's eyes on Paris, it [will be] a great time for us to take that real step toward public acceptance of eVTOLs in the air," he says. "We will have multiple aircraft which will allow them to see and hear and experience what each one can do."

Volocopter is also targeting certification in Japan with an eye on operating VoloCity at the 2025 Expo Osaka Kansai event.

Leading developers in the USA, meanwhile, have recently turned attention to scaling manufacturing capabilities.

Earlier this month, Vermont-based Beta opened a facility at Burlington International airport where it will manufacture and assemble its Alia aircraft. On a 16ha (40 acre) site with space for "significant expansion", the 17,500sq m (188,500sq ft) plant will eventually produce up to 300 aircraft annually.

The company is pushing for type certification of Alia in 2024 and hopes to launch operations with its conventional take-off and landing (CTOL) variant the next year. It will then seek approval of its eVTOL variant.

On the opposite coast of the USA, California Bay Area-based Archer announced a $65 million financing deal to support construction of a 32,516sq m facility in Georgia, where the start-up hopes eventually to produce up to 650 aircraft annually.

Additionally, Archer plans to launch test flights with six "fully conforming" Midnight aircraft early next year, ahead of the company's planned commercial launch in 2025, chief safety officer Billy Nolen told FlightGlobal on 27 September.

"One of those will go to the US Air Force (USAF) and the other five will be doing our for-credit and flight-testing programme – that is what we will spend the bulk of 2024 doing," he says.

Archer's aircraft has yet to get airborne but the company maintains that it is on track to achieve certification next year.

Fellow Bay Area eVTOL developer Joby – believed to lead the race to certificate an air taxi with the FAA – revealed plans last month to build a manufacturing facility in Dayton, Ohio to produce up to 500 aircraft per year.

Joby recently started flying its pre-production prototype with pilots on board at its California production facility, while autonomous aviation developer Wisk launched a test-flight programme with its fifth-generation autonomous aircraft in Los Angeles.

Which companies will realise their sky-high ambitions remains to be seen, but McKinsey's Riedel is optimistic some will deliver.

"I'm very bullish on the industry; I'm very bearish on every individual player," he says. "Advanced mobility is going to happen and it's going to be something exciting. However, every single player has hair on them. For one reason or another, I worry about each one."

Illustrating the incredible costs of developing an entirely new class of aircraft, Joby lost $399 million in the first half of 2023. However, as of 30 June, it still held nearly $1.2 billion in cash and short-term investments – about as much as it had last year at the same time.

Archer lost about $294 million during the same period, which it attributes to investing in advanced technology, aircraft parts and material. At the end of June, the California company held about $408 million of cash and equivalents.

Since then, in August, San Jose-based Archer said it padded its cash reserves with another $215 million in investments, including from Boeing, Stellantis and United Airlines, and it settled its lawsuit over intellectual property rights with rival Wisk, a wholly owned subsidiary of Boeing. As part of the deal, Archer and Wisk agreed to work together on developing autonomous systems for future variants or Archer's Midnight aircraft.

But Archer still faces another court challenge. In September, an investor filed a class-action lawsuit against the air taxi developer, claiming it and top executives mislead investors about business prospects and certification progress. Archer has denied the allegations.

Both SMG's Cecutta and McKinsey's Riedel agree that major consolidations are unlikely in the burgeoning eVTOL sector, as developers making similar-but-competing aircraft would not benefit from tie-ups.

"A lot of these companies are developing perfect substitutes," Cecutta says. "The differentiation is not as big as it could be... Why would you want to bring someone else's product in house when you already something that does exactly the same thing?"

"If a lot of companies were to fail, I'd see it as more of an IP [intellectual property] and talent grab," he adds.

Riedel agrees that "most of these players have a pretty strong view on the aircraft configuration they build" and therefore would not be keen on joining forces with competitors.

"Buying another player doesn't get you much," he says. "It's not like they have manufacturing capabilities yet. What's the big asset all these players have? Well, it's their talent, which can leave – and that's already happening."

Despite major challenges, the world's leading eVTOL developers are largely tracking their targets, and none appear on the verge of collapse, Riedel says: "We would have thought there would be much more faltering to this point – companies missing deadlines and more curve balls from a regulatory perspective."

"So far, it's actually still fairly smooth sailing," he adds, "and that make me less convinced that we'll see a lot of exits in 2024."

Gogo is offering demonstrations of its exciting new LEO broadband service at the static

gogo BUSINESS AVIATION

Why not give Galileo a go?

Gogo Galileo, the new low-Earth-orbit (LEO) global broadband service from Gogo Business Aviation, is on display and available for you to take for a test drive at the static display at this year's show.

Gogo has an aircraft at Henderson Executive Airport where it is conducting live demos throughout the event, and Gogo is actively scheduling appointments for in-person demos.

"We want people to come out and try the service for themselves," says Sergio Aguirre, Gogo's president and COO. "The demonstrations are on the Eutelsat OneWeb network, which is live today, and we're using our exclusive electronically steered antenna (ESA). You don't need to take our word for it. We conducted similar demonstrations at EBACE earlier this year and the system wowed."

Gogo Galileo is designed specifically for business aviation with two antenna options that will fit virtually any size business aircraft from large turboprops like a Pilatus PC-12, or a Beechcraft King Air 350, and light jets such as a HondaJet or an Embraer Phenom 100, to the largest ultra-long-range large-cabin aircraft. The Gogo Galileo HDX antenna has a small form factor that will fit on smaller aircraft, and earlier this year Gogo announced the FDX antenna with a larger form factor.

"The FDX antenna is a premier solution offering all the benefits of the more compact HDX antenna, while offering fast data speeds, higher throughput, and lower latency than current geosynchronous (GEO) satellite systems," Aguirre says. "It will perform as well or better than anything else in the market today, supporting multiple unique VPN, interactive video, and gaming sessions simultaneously."

Gogo Galileo is one of a couple of new LEO-based offerings that will deliver low-latency performance comparable to terrestrial broadband services, but Gogo's offering has some distinct advantages. The Gogo Galileo network is enterprise grade so service-level agreements will be offered, and the system, including its exclusive ESA, is being built by business aviation experts.

"We are focused solely on business aviation versus other LEO networks which are serving a general consumer base on a massive scale on the ground," says Aguirre. "Business aviation is different. It requires a high level of service and a personal touch. We believe we have the best network for business aviation, an onboard system that is sustainable for the long haul with easy upgrades to new technologies, and a customer support organization that is second to none."

Eutelsat OneWeb, Gogo's network provider, has completed its full LEO constellation and the network is operational today. It is expected to be aero-ready in early 2024 compared to other LEO network constellations that are still being launched.. In addition, Gogo and its antenna provider, Hughes, completed preliminary design review of Gogo's exclusive electronically steerable antenna (ESA) assembly earlier this year.

"We're on schedule thanks to the work being done by our team in conjunction with the teams from OneWeb and Hughes, and testing with the antenna prototype on the AVANCE platform is underway," says Aguirre.

The Gogo Galileo system is compact, requiring just one AVANCE line replaceable unit (LRU) inside the aircraft, and the ESA antenna assembly, with a single cable in for power, and a single ethernet cable out for data.

That's a significant difference from today's geosynchronous satellite (GEO) systems which are big and heavy, require multiple LRUs, and a large antenna. And compared to other LEO offerings, with Gogo AVANCE customers can also take advantage of Gogo's air-to-ground network in North America – delivering improved performance and redundancy – with controlled costs from a single provider.

"We are focused on serving all of business aviation with Gogo Galileo, just like we did with our ATG network in North America several years ago," says Aguirre. "The majority of midsize and smaller aircraft operating outside the USA have no viable broadband solution today and Gogo Galileo will give everyone in business aviation the ability to have an exceptional inflight Wi-Fi experience."

Gogo Galileo brings broadband to many more small and midsize jets

GoGo

Change means operators of older systems must act soon to stay connected

Gogo updates to LTE

Gogo is moving its Gogo Biz air-to-ground (ATG) network to LTE technology and if you own an aircraft that uses a "legacy" Gogo system (ATG 5000, 4000, 2000 or 1000) you will be impacted and need to take action.

Gogo expects to transition to the new LTE network, which stands for long-term evolution, early in 2026, and at that time anyone using a legacy Gogo system will lose their inflight connectivity unless they upgrade to an AVANCE L3, L5 or LX5 system before then.

And while 2026 might seem like a long time down the road, demand for shop space at MROs is already becoming limited, and with more than 3,000 aircraft flying with a legacy system on board today, a change to AVANCE should be scheduled soon before space gets even tighter.

Those who wait and don't act sooner than later are at risk of losing their ATG service before they receive the upgrade to AVANCE.

"The migration to LTE technology for our network is great news for our legacy customers," says Sergio Aguirre, Gogo's president and COO. "When operators put an AVANCE system on board, they'll see an immediate impact, and when the LTE network is turned on, they'll see another boost in performance. The key here is to get the upgrade done as soon as possible and we're offering significant incentives to make it affordable and as easy as possible."

GoGo

Customers are being urged to make the move to LTE as soon as possible

The incentives being offered to customers who upgrade to AVANCE are significant: $50,000 for an upgrade to AVANCE L5 and $25,000 for an upgrade to AVANCE L3 (MAX and PLUS configurations only).

"The incentives will expire, though, and there will be limitations on dealer availability," Aguirre explains. "Getting the upgrade completed sooner than later ensures you'll get space at a participating MRO. The closer to the deadline we get, the less likely you'll get a dedicated slot."

As it relates to aircraft downtime, Aguirre says that the company's engineers have worked hard to develop installation guidelines for AVANCE systems so that upgrades can be completed as quickly as possible.

"It's not a difficult installation," he says. "For the AVANCE L3, you change the LRU, add some additional I/O, and, in some cases, may need to and change cabling. AVANCE L5 also requires that you change the belly-mounted antennas to bidirectional units.

"Once the AVANCE hardware is in the airplane, then future upgrades will be as simple as downloading new software," Aguirre continues. "The simplicity of the installation is a big reason why we are encouraging customers to upgrade when their aircraft is in for routine maintenance or inspections. It's not extensive; it just takes planning."

Gogo has been planning for the move to LTE for a few years now.

"About seven or eight years ago, we recognized that a few things were going to happen that would have a big impact on our industry," says Aguirre. "We recognized that our ATG network was getting a little long in the tooth and we were going to need to plan for an upgrade to LTE."

As a point of clarification, there is nothing wrong with Gogo's current network, which thousands of Gogo customers rely on today for their inflight connectivity, but Gogo says the transition to LTE was necessary because the global telecommunications industry is leaving 3G connectivity comprehensively.

That is why there's the need to upgrade to AVANCE. AVANCE systems come equipped with an LTE air card already installed so they'll be ready to operate when the new network goes live.

Gogo raises bar with Vision 360

Gogo has set a new standard for inflight entertainment (IFE) in business aviation with Gogo Vision 360 – a premium IFE service that features a compelling and comprehensive suite of services, including the leading Hollywood releases and TV programming, news, digital magazines and a stunning 3D premium moving map.

No other connectivity provider in business aviation has a similar offering.

The service offers unlimited streaming and all of the content is stored on an internal server in an AVANCE LRU, so it doesn't require any network connection to use in flight, and therefore doesn't gobble up valuable bandwidth.

Another big benefit: all Gogo Vision content is updated automatically each month through an over-the-air delivery via Gogo Cloudport, either in a customer's own hangar or at Gogo Cloud locations throughout the U.S. and in Europe. No other IFE service delivers content updates over-the-air.

GoGo

There are 30 digital magazine titles available on Gogo Vision 360 from well-known titles including Golf Digest, Forbes, Wine Spectator, Newsweek, Wired, People, and Town & Country. Customers onboard will get the most current issue as well as the previous issue for each publication.

Gogo Vision 360 is available for activation via a call to Gogo customer care as a new service or as a free upgrade for existing Gogo Vision customers with a Gogo AVANCE L5, L3 or SCS system installed on their aircraft. Activation will occur automatically over the air with no downtime required.

Pilots and operators cannot get enough of Gogo's latest system

AVANCE delivers the benefits

Gogo has been on a mission for the past three decades to continuously deliver the best inflight connectivity solution for every business aviation aircraft, regardless of the size of the aircraft or where it flies.

As part of that commitment to provide the best inflight connectivity experience, Gogo will be migrating its network to LTE, expected to be completed in early 2026.

Anyone flying with one of Gogo's legacy ATG systems (5000, 4000, 2000 or 1000) will need to upgrade to an AVANCE system by early 2026 – that is when the network will switch completely to LTE and the old network will be shut down.

The upgrade to AVANCE will deliver immediate benefits for legacy ATG customers, and another boost when the LTE network is turned on. Some customers have already made the switch and they are already noticing the advantages AVANCE provides, including an immediate boost in performance.

Jason Talley is a pilot who flies a Citation CJ2+ primarily for his multiple business ventures. He recently upgraded from a Gogo ATG 5000 to the AVANCE L3 and talked about the benefits he is enjoying as a result of the upgrade.

"I was blown away by the difference," Talley says. "I'm not easily impressed and the L3 is so much more than I was expecting. The ATG 5000 was adequate, but with the L3 it's a night and day difference. The AVANCE upgrade was 100% worth it. I was wholly unprepared for the difference in performance. Even the upgrade time was minimal, just five days."

AVANCE also provides several exclusive features that bring benefits other systems in business aviation can't provide, such as Gogo DASH and Gogo Vision, the leading inflight entertainment service in business aviation. Both are standard with all AVANCE systems.

With DASH, operators receive staged updates via email or through the DASH app. When a notification arrives, they need do little more than click to receive the latest update, just like you do on today's smartphones.

"With AVANCE, we utilize the DASH tool to configure roles, show coverage maps, contact support, and monitor bandwidth," says Ryan Johnson, who is the pilot of a Dassault Falcon 900EX with an AVANCE L5 installed. "I fly a family-owned aircraft and at any given time there may be different generations on board from grandparents to young children. Sometimes there are as many as 15 people a flight. When the younger generations are on board, we notice the digital consumption increases tremendously and the L5 meets those needs."

Johnson also sings the praises of Gogo Vision. The family he flies takes several international trips a year, and when they leave the shores of North America, they are limited to very slow GEO L-band satellite service, for only low-bandwidth uses like email. But with Gogo Vision on the AVANCE L5, they can choose from hundreds of current and classic movies, TV shows, and e-magazines – all without using any bandwidth and it's available anywhere in the world the family flies.

GoGo

Talley says L3 is 'so much more than I was expecting'

"I used to go and buy a bunch of specific DVDs before flights and sometimes I would often need to bring 15-20 of them on the aircraft with me," Johnson says. "Gogo Vision eliminated all of that. The family loves it and it works well. And because we fly outside North America, I can't wait to get Gogo Galileo installed."

Since the AVANCE L5 is already installed, adding Gogo Galileo satellite service to the existing ATG service on the aircraft will be a relatively straightforward addition.

All that will be required is a single, small fuselage-mounted electronically steered antenna (ESA) and just two cables – one for power in and the other for ethernet out.

And with ATG and satellite service both being provided through a single provider, Johnson will be able to manage costs and simplify operations with a single bill.

GoGo

Johnson: Aircraft owner's family can access hundreds of movies

Duncan Aviation describes itself as an international MRO provider with the friendly service of a neighbourhood family firm. How is it responding to the OEMs wanting to get in on its market?

Independent thinking

Duncan Aviation

Duncan is adding capacity to its Battle Creek facility

Murdo Morrison

Duncan Aviation's Ryan Huss is undaunted by the OEMs' relentless march into MRO. "We've positioned ourselves as friend rather than foe of the manufacturers," says the vice-president of sales and marketing at the family-owned business aviation maintenance provider. "It's our job to support them and their brand and provide solutions for their customers."

Decisions by Bombardier, Dassault Aviation, and Gulfstream to step up investment in company-run service facilities in the USA and abroad might appear to threaten independents such as Duncan Aviation, which serves operators of all big five business jet OEMs from sites at Lincoln, Nebraska; Provo, Utah; and Battle Creek, Michigan, as well as around 30 satellite shops.

Although the size of the market in North America means there is a mature and experienced independent MRO sector, airframers see the vertical diversification as a way of tapping into a lucrative revenue and profit stream, enhancing their brands, and maintaining a relationship with owners throughout the life of an aircraft.

In the USA alone, there has been a spate of moves. Bombardier last year opened a service centre at Miami-Opa Locka Executive airport, while Dassault will launch a facility in early 2025 up the Florida coast in Melbourne. Gulfstream has invested in Fort Worth and Phoenix and is expanding its Savannah customer support facility, with the new building open for business in 2024.

The bricks and mortar investment is mirrored overseas with the three large-cabin jet manufacturers recently opening or announcing new MRO centres in Abu Dhabi, Dubai, Melbourne in Australia, Malaysia, Singapore, and both Farnborough and Biggin Hill in London, UK – the latter replacing smaller facilities.

However, Huss believes there is room in the aftermarket for the OEMs and brand-agnostic providers like Duncan Aviation, despite the increased competition the new centres will bring. "Maintaining relationships with all the OEMs is important. We can be a good partner to all of them," he says. "It can't be a one-sided relationship."

Lincoln-based Duncan Aviation, founded in 1956, claims to be the world's largest privately owned business jet service provider, with a workforce of 2,800. It specialises in airframe, avionics and engine overhaul and maintenance. While MRO is its core activity, it also provides brokerage services for those buying or selling used aircraft.

Each of the three main sites offers a full range of capabilities, says Huss, with Provo, Lincoln and Battle Creek tending to cater for customers on the West Coast, Midwest and Northeast, respectively. However, a fifth of Duncan Aviation's revenues come from overseas. "Last year, we had customers from 83 countries," says Huss. "For many operators who are flying to the US anyway, it makes sense."

The company has recently added to its London-based team that focuses on aircraft brokerage in Europe, Middle East and Africa. "We were at EBACE this year and we think we can attract more business from this region," says Huss. However, he is adamant that Duncan Aviation will not be establishing a physical presence outside its home market.

One of Duncan Aviation's chief selling points is its range of in-house expertise. "We pride ourselves on never turning anything away. We do pretty much everything ourselves, except plating, and rarely send anything out or use contractors," says Huss. "Many of our technicians have been here for 20 to 40 years and have grown into each new technology as it comes along."

After a difficult Covid-19 period "for everyone", the rebound from the slowdown has been rapid, with 2022 a "particularly good year across the company", says Huss. Despite some slowing in "discretionary spending" so far this year, Duncan Aviation's backlog of maintenance bookings "remains as strong as it has ever been".

As for all companies that rely on experienced staff and a global supply chain, the recovery has come with challenges. "We carry a large parts inventory, but certain segments have been impacted," says Huss. "Labour too was really tough through 2022 and we were turning away work." However, the company is "turning a corner and we're back at the headcount we want to be."

One of the ways the company has been offsetting the impact of parts shortages and delays has been through its machining division, Duncan Manufacturing Solutions (DMS). Although it launched the business pre-Covid, it has come into its own in the past 18 months. With capabilities in both composites and metals, it produces everything from "shim plates to large flight controls", says Huss.

Duncan Aviation has invested more than $4 million in DMS, which occupies a 1,900sq m (21,000sq ft) building next to its turbine engine overhaul shop in Lincoln. The idea is not to be a volume parts manufacturer but to meet the specific internal needs of the business as well as some third-party customers. "It has gone pretty well so far, and we continue to grow," says Huss.

The company is also adding capacity with new 4,000sq m hangars in Lincoln and Battle Creek, confident that, despite workforce issues and the OEMs' incursions, Duncan Aviation can continue to win market share. Its ethos, according to its web site, is being able to combine "vast resources" with the "friendliness and responsiveness of a small-town company".

It has been a busy few months for Clay Lacy Aviation, which is about to open its first FBO in the Northeast, and has added nine Bombardier and Gulfstream jets to its charter fleet

Building on a big reputation

Clay Lacy Aviation

Aircraft management and charter is one of the business's main activities

Murdo Morrison

One of US business aviation's oldest names, Clay Lacy Aviation, arrives in Las Vegas with major infrastructure in the works and having this year boosted its mostly large-cabin charter fleet with nine managed aircraft.

The Los Angeles-based company is hoping to add to the customers who have signed letters of intent for long-term parking in the three 3,700sq m (40,000sq ft) hangars it is building at Waterbury-Oxford airport in Connecticut as part of a $40 million development.

The move will give Clay Lacy Aviation – founded in 1968 by the eponymous renowned aviator – its third FBO to add to its Californian sites at Van Nuys and John Wayne Orange County. The Connecticut FBO is due to open early next year.

Clay Lacy Aviation already has a maintenance facility on the other side of Waterbury-Oxford airport, as well as another Part 145 operation at Van Nuys. Additionally, it manages some 160 third-party aircraft across 40 US cities, around 70 of which are on its own Part 135 certificate.

Having the four business lines is a company strength, asserts Scott Cutshall, senior vice-president for development and sustainability. "It provides agility for our management customers as they have flexibility over their maintenance schedules. It also gives us a degree of resilience," he says.

That was illustrated during the initial months of the Covid-19 pandemic when demand for charter took a hit, but the MRO side of the operation prospered, as owners took advantage of the downtime to schedule upgrades and heavy inspections, says Cutshall.

The slump in charter did not last long, and 2021 saw surging pent-up demand as lockdowns lifted. "In 2021, 35% of our charters were first-time customers, and that continued into 2022, as international flights began again. That was one of our best years from a demand standpoint," he says.

As the impact of higher inflation has kicked in, 2023 has seen some "downward pressure on flying activity", says Cutshall. That has hit charter, which is a discretionary spend that is "easy to turn on and off again".

However, he is confident that the industry will stave off another downturn as inflation slows and business confidence returns. Underlying indicators are good, he believes. "Aircraft ownership is still very high and numbers of aircraft for sale is below average."

Clay Lacy Aviation chose rural Waterbury-Oxford for its newest FBO not because it is a "destination airport" for those travelling on business. Instead, its location, midway between New York and Boston, taps into one of the biggest markets in the USA for covered airport parking, says Cutshall.

"Airports in the Northeast are so full and there is so little hangar capacity – no one wants their airplanes outside in winter," he says. "We are also seeing planes getting wider and taller, so there is a need for hangars that are large enough. Ours will have 29ft (8.8m)-high doors."

Waterbury-Oxford is not Clay Lacy Aviation's only FBO development. The company plans to break ground this year on a $110 million two-stage refurbishment of its Orange County FBO that will see its two hangars replaced with larger versions, with the first one complete by early 2025.

The nine additions to its charter fleet comprise two Bombardier Challenger 300s and seven Gulfstreams – a G500, two GIVSPs, a G650, a G450, a GV and a G550 – and are based at Clay Lacy's three locations as well as Bozeman, Montana and Tacoma, Washington.

Cutshall maintains that the company's strategy of offering only third party-owned aircraft reassures customers. "When you charter with us, you are chartering a private airplane with a dedicated crew," he says. "The service is distinctly

A rendering of the new facility at Waterbury-Oxford

Clay Lacy Aviation

different from a more branded operation."

He adds: "When a charter customer gets on one of our planes, they feel they are getting on their own plane. They know the crew, and the plane stays with them for the entire charter. When you fly with one of our competitors, you might go to Miami on one plane and be picked up by another."

One of Cutshall's roles is leading the company's sustainability strategy, a path he says he and Clay Lacy Aviation embarked on at the 2019 show in Las Vegas.

"In the corner of a stand there was a little kiosk that said World Connect, a division of our fuel provider World Fuel Services [now World Kinect Corporation], that specialised in helping companies to start sustainability initiatives," he says.

Curious, he investigated, and began a journey that has put himself and his firm in the vanguard of US business aircraft operators pursuing sustainability.

"I knew the definition of the word, but I didn't know what it looked like in action at our facilities and with our operations, which started a learning process for me," says Cutshall, who is one of the few executives in business aviation with sustainability in his title.

"Then I went to our CEO and shared that I thought this is only going to grow in importance, and I think we would be wise to start early for three main reasons.

"Number one, we felt regulation would eventually come. Second, if we start early, I think it could be a competitive advantage for us in the marketplace," explains Cutshall. "Third, it's the right thing to do, which falls into the culture of Clay Lacy."

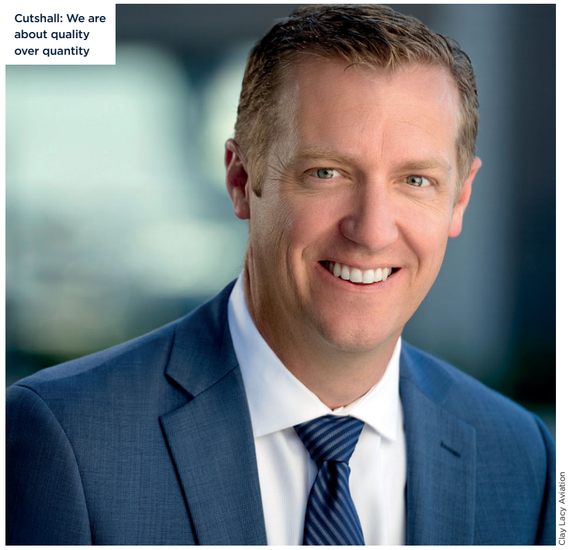
Working with World Connect, and later 4AIR for carbon offsetting, Cutshall started developing the firm's first sustainability strategy, which arrived in 2021.

"The first thing to do is measure your carbon footprint. It's like when you want to lose weight you first must know where you are today," he explains.

For Clay Lacy, it has two parallel paths on carbon: the first to reduce the emissions from its facilities; and second, to provide tools and resources for its customers to measure and reduce the emissions related to their flying activity.

It has taken dozens of actions, small and large, to reduce its footprint, for example installing solar arrays and electric vehicle chargers, replacing fluorescent light bulbs with LEDs, transitioning ground service equipment to electric, implementing waste management systems, using renewable diesel instead of regular diesel, and then buying offsets for the remaining emissions that cannot be eliminated until a measure comes along that can reduce it, explains Cutshall.

"Looking at the measures we've taken, we calculate we have grown our facility footprint by 33% and reduced our emissions by 16%," he says.



Cutshall: We are about quality over quantity

Clay Lacy Aviation

Clay Lacy began offering sustainable aviation fuel (SAF) at its two FBO locations in California in April 2021, obtaining supply from its fuel provider World Energy, making it one of the first 10 FBOs in North America to offer this fuel.

Uplift of SAF has been slow because the price is higher than regular Jet A-1. However, "as the green premium comes down, more will buy it because I think a lot of people want to operate more sustainably," he says.

Whichever approach business aviation players take on sustainability the important thing is to get started, even in a small way, believes Cutshall.

"I also believe that people need to take off their political hats [on the issue of sustainability]," he says. "I encourage everyone to think of this as a business imperative. If we all take proactive steps now, we will avoid bans and we will avoid regulation because we are doing our part."

Clay Lacy Aviation is owned by Brian Kirkdoffer, who was taught to fly by Clay Lacy himself. He joined the company in 1990 as a Bombardier Learjet pilot, became president 13 years later, and bought the business in 2012.

Aside from hoping to sign up tenants for its Connecticut FBO, the company – which has a kiosk in the World Fuels stand and is also part of the International Aircraft Dealers Association representation – will be stressing its "bespoke" approach to business at the show this week, states Cutshall.

"We are not the biggest, but we like to think that we are all about quality over quantity," he says.

Additional reporting by Mark Pilling

We take an in-depth look at Dassault's newest production aircraft, the Falcon 6X, which is at the show after a five-and-a-half year development that concluded with certification in August

Dassault Aviation

The pandemic arrived two years after development of the 6X had begun

Wide at heart

Dominic Perry

Dassault Aviation's Falcon 6X arrives at this year's edition of NBAA as a fully certificated aircraft.

Approval for the ultra-wide-cabin jet was received from US and European regulators in August, following a development programme that kicked off in February 2018.

Chief executive Eric Trappier says the European and US approvals are a "remarkable milestone" for the company, adding that the 6X is the first brand-new business jet to comply with the latest safety regulations from the authorities.

The certifications conclude a test campaign which ran for more than two years and accumulated some 1,500h of flight. Maiden sortie for the twinjet came in March 2021.

Initial 6Xs are undergoing final completion ahead of entry into service, says the manufacturer.

"The Falcon 6X combines the best qualities of Dassault Aviation's world-leading business and fighter aircraft expertise to create the longest-range jet in its class with unparalleled passenger comfort and maximum mission flexibility," says Trappier.

The company has completed preparations, including training and establishment of maintenance centres, for 6X entry into service.

While behind Dassault's original service-entry target of 2022, the Falcon 6X has faced unprecedented obstacles along the way, notably the lingering, industry-wide disruption from Covid-19.

That had an immediate impact in 2020, when businesses across the world were shut down to prevent the spread of the virus. At that point, the programme was beginning to accelerate and the first pre-production aircraft had just entered final assembly.

But the Falcon 6X was born out of adversity in the first place, having been launched as a response to the cancellation of the Falcon 5X in December 2017.

While the unforeseen effects of the pandemic came from left-field, the end of the 5X programme was a deliberate decision – but one that needed to be navigated nonetheless.

That aircraft was due to be powered by a pair of Safran Silvercrest engines, but persistent problems with the powerplants caused delay after delay and eventually forced Dassault to axe it.

In its place, the Falcon 6X was launched: conceived as a 5,500nm (10,200km)-range jet with the largest cabin in its class, the aircraft features numerous technological advances designed to bring significant benefits to owners, operators, customers and crews, as befits the airframer's new flagship.

The 6X is powered by a pair of Pratt & Whitney Canada PW812 engines – a variant of the PW800 series already selected by Gulfstream for its G500 and G600.

While the P&WC powerplants are more powerful and heavier than the Silvercrests, requiring some structural redesign to the Dassault-built empennage, they also deliver an additional 500nm range over the already impressive 5,000nm planned for the Falcon 5X.

P&WC sister company Collins Aerospace supplies an integrated engine system, which includes the composite inlets, cowls, nacelles,

Dassault extended the forward fuselage of the 5X by 50cm, increasing cabin volume

Dassault Aviation

thrust reversers and engine build-up system.

However, it is worth emphasising that the Falcon 6X is not simply a new pair of engines bolted onto an existing airframe design.

Dassault stresses that the jet is not an "evolution" but a "major redesign" of the previous aircraft.

Aside from the structural modifications required by the new engines, the most significant change over the Falcon 5X is an extension of 50cm (20in) to the forward fuselage, contributing to increased cabin volume of 52.2cb m (1,840cb ft), against 50cb m for the 5X.

However, the Falcon 6X retains the rest of its predecessor's class-leading cabin dimensions of 2.58m (8ft 4in) wide by 1.98m high – 25cm wider and 10cm higher than the 7X – and a full 12.3m long.

Dassault boasts that the twinjet "offers the most interior space in the 5,000nm segment and features the highest and widest cross-section of any purpose-built business jet".

Up to 16 passengers can be accommodated within the cabin, with individual seating in three different lounge areas. In addition, the ultra-wide-cabin credentials are highlighted by the additional 13cm of aisle width available.

The impressive size of the cabin has been put to good use. "Thanks to the extra space available, and based on extensive input from customers, Dassault's in-house design studio completely rethought and restyled the cabin interior. Their solution features flowing, uninterrupted lines that enhance the feeling of spaciousness," says the airframer.

The cabin also boasts a hugely impressive 30 windows – two more than planned for the 5X, which itself offered 30% more window area than the venerable 9X (and, if quantity is everything, is more than double the 12, admittedly larger, windows on Gulfstream's G650).

Speaking of transparencies, the 6X also features an industry first: above the entryway/forward galley sits a roof-mounted skylight, introduced following feedback from flight attendants.

Dassault says it wanted to do something different with the space and compares the experience to "walking into the foyer of your office or the hallway of your home".

For added comfort, the cabin pressure altitude at 41,000ft will be equivalent to 3,900ft.

As with all modern business aircraft, the cabin features the latest in connectivity – in this case via a Ka-band network. On top of that, passengers can control all the cabin functions via a mobile app or cabin interface. Smart-control mood lighting varies colour patterns in accordance with the type of activity, time of day and season.

Passengers sit in what the manufacturer calls an "ergonomic cocoon", with all the required electronic functions within easy reach. Recessed controls light up when a hand is near and dim when not in use. Side-panel charging pockets accept personal devices of all types and sizes.

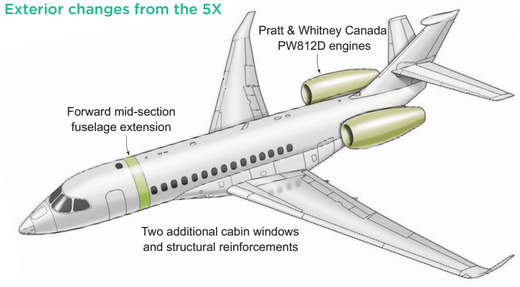
While maximum range is given as 5,500nm, that metric is achieved with eight passengers and three crew. While travelling at its long-range cruise speed of Mach 0.8, the figure is 5,100nm. At long-range cruise, nonstop missions like London to Hong Kong or Los Angeles, or Moscow to Singapore are possible, while at M0.85 nonstop flights from Moscow to New York or Paris to Beijing are within range.

A large part of the Falcon 6X's efficiency comes from its new-generation wing, which is also another structure that has seen significant redesign over the 5X, with significant weight-saving applied to the internal components. Dassault assembles the wings at its Martignas facility near Bordeaux, adding GKN-supplied control surfaces to its own primary structure.

With a span of 25.9m, the structure is equipped with three slats on the leading edge on each side, and features a curved trailing edge with inboard flap, flaperon and outboard aileron.

While a flaperon is more usually seen on high-speed military aircraft, Dassault has leveraged its experience building the Rafale fighter to translate the control

Exterior changes from the 5X



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Dassault Aviation

Wider fuselage allows for a spacious cockpit, with increased window area

surfaces onto the Falcon 6X – their first appearance on a business jet.

Although this adds complexity, the flaperon brings significant performance benefits, increasing control and capability.

Steep approaches are also aided by their presence; the ailerons can be deflected upwards while the flaperons act as an additional pair of trailing edge flaps. The ailerons and flaperons meanwhile combine to provide roll control. The result is a significant increase in drag with no lift degradation, helping to maintain a low approach speed.

In fact, the approach speed can be as low as 109kt (202km/h) with eight passengers and three crew, and the 6X is able to fly steep approaches of up to 6°, enabling access to airports such as London City, Lugano, and St Tropez. Short-field performance sees the Falcon 6X able to land on runways of just 760m.

In some senses, though, it is in the cockpit where the biggest advances have been made. Described by Dassault as "the pilot's new office", on a basic level the larger fuselage allows for a more spacious cockpit – more headroom than any other aircraft, says Dassault – alongside 30% more window area. Seats recline to 130° and the wider cockpit allows entry and exit without the need to clamber over the centre console.

Dassault's FalconSphere II electronic flight bags are integrated into the console. On top of which, there is more storage space for the flightcrew.

While pilots will welcome these changes from a comfort perspective, it is the numerous technological advances that really set the Falcon 6X apart and will make their working lives simpler and, crucially, safer.

Dassault's next-generation digital flight-control system (DFCS) provides better manoeuvrability and protection on the primary and secondary flight controls. The DFCS commands all flight-control surfaces, including slats and flaps. The system also integrates nose-wheel steering for safer runway handling in strong crosswinds or on wet runways.

Digital flight controls have been present on Dassault business aircraft for over a decade – again aided by the company's experience in military jets – but the Falcon 6X's system "represents the next generation of DFCS refinement", it says, "further simplifying the pilot's workload for optimised, safer performance.

"Even the streamlined starting sequence for the Falcon 6X is more automated, requiring fewer actions by the pilot other than monitoring the systems as they come on line."

Accompanying the sophisticated flight controls is the latest iteration of the FalconEye combined vision system (CVS), which was developed in conjunction with Elbit Systems. Already selected by most customers for the 8X, FalconEye will be standard on the new twin.

The CVS blends synthetic terrain images with those from infrared and low-light cameras into a single view on the head-up display. This provides an "unprecedented level of situational awareness to flightcrews in challenging weather conditions and all phases of flight," says Dassault. "The EVS function will eventually provide operational credits for bad weather approaches with 100ft minima, providing operators with a substantial operational benefit as well."

The HUD itself has a 30° x 40° field of view and is fed by a six-sensor electro-optical/infrared camera. Images from the camera are combined with three synthetic vision databases that map terrain, obstacles, navigation and airport runway data.

Rounding out the cockpit package is the third-generation EASy III flightdeck, based on Honeywell's Primus Epic suite. New features include an integrated controller-pilot datalink communication system and RDR 4000 IntuVue 3D colour weather radar that provides predictive lightning and hail detection as well as 60nm-range Doppler turbulence detection. Hazardous weather and the vertical definition of thunderstorms can be seen at distances up to 320nm.

While outside the cockpit, one other safety feature is also worthy of note: a fuel-tank inerting system that uses a blanket of nitrogen gas to stop the fuel igniting – another business aviation first, according to the manufacturer.

However, the fuel tank design is one area of temporary flux. Initial 6X deliveries will be in a preliminary configuration after the airframer applied for, and was granted, a temporary 'deviation' from EASA regulations regarding the resistance of the jet's fuel tanks to penetration by wheel and tyre debris.

A consultation document posted on EASA's website in July said "analysis and calculations performed by [Dassault], revealed that two areas of the lower rear 'T34' fuselage tank cannot sustain the wheel flange debris impact without fuel leakage".

This is not compliant with the certification regulations, the agency says, "making some redesign necessary".

However, it notes that as the issues were "picked up only at a late stage of the Falcon 6X [certification] project", the programme schedule and "industrial constraints" would not permit finalisation of the design changes, testing and their implementation prior to certification and service entry.

Those modifications will be incorporated later as retrofit changes, EASA says.

Counting as "mitigating factors" in Dassault's favour are the good in-service performance of current Falcon jets "equipped with similar wheels from the same manufacturer" and the fact that only a small percentage of "trajectories of wheel debris [is] impacting the fuel tanks in areas not sufficiently protected by structure or system layout".

EASA says "compliance on the concerned fuel tanks will be restored with a dedicated design change" and a plan for its implementation and retrofit "is to be defined to limit the exposure".

Elsewhere, onboard diagnostics have also been improved: a new integrated maintenance system called FalconScan monitors more than 100,000 parameters in real time to provide enhanced visibility for technicians.

Final assembly of the aircraft is performed at Dassault's Bordeaux-Merignac facility, with the fuselage delivered from the airframer's plant in Biarritz and the wing from nearby Martignas.

Selection of the PW812D engine was a sign that Dassault was determined not to – and could also not afford to – make any decisions that would delay the development of the Falcon 6X.

When the aircraft was launched in early 2018 PW800-family powerplants were yet to enter service, although variants had been chosen by Gulfstream to equip its G500 and G600 jets, which duly arrived later that year. All of which provided some level of certainty on the relative maturity of the engine by the 6X's service entry target of 2022.

On top of this, the engine shares core technology with Pratt & Whitney's PW1000G-series powerplants for commercial aviation, adding an extra degree of reassurance for operators.

Aside from the out-of-the-box reliability, what the 13,000-14,000lb (59-62kN)-thrust PW812Ds also promise is emissions and fuel burn that offer a claimed double-digit improvement over previous-generation engines, plus a 40% cut in scheduled maintenance.

See Cutaway P31

Passengers sit in what Dassault describes as an 'ergonomic cocoon'

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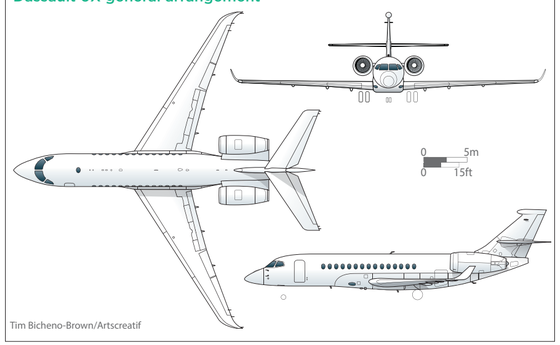
A skylight was introduced to forward galley area following crew feedback

Dassault Aviation

Dassault 6X general arrangement



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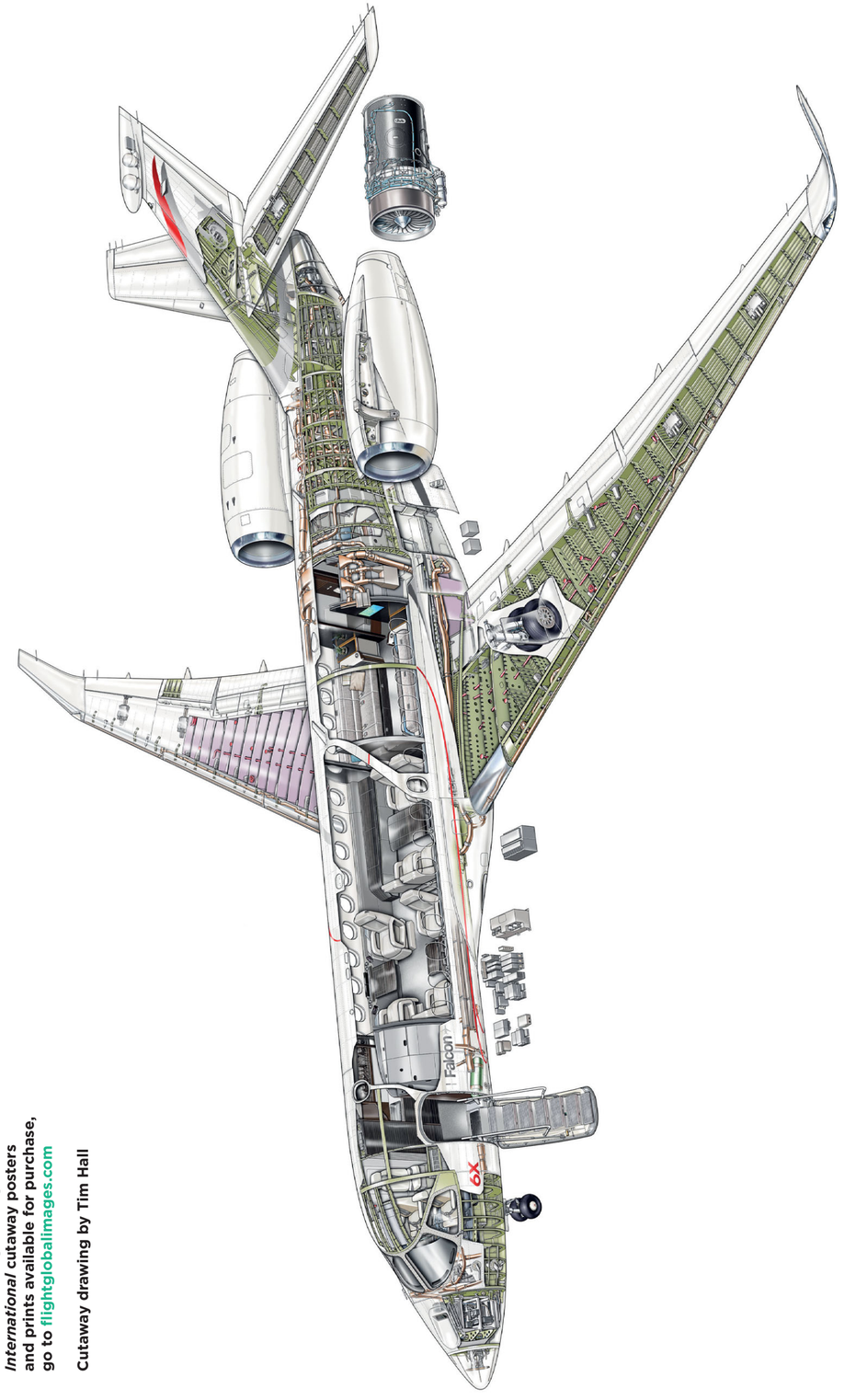
Dassault Falcon 6X



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Cutaway drawing by Tim Hall

Over the three days of the show, we are profiling two aircraft likely to be catching the eye of visitors on the static display

Denali debut, super Praetor

BillyPix

Textron Aviation Beechcraft Denali

The single-turboprop Beechcraft Denali is making its first NBAA appearance as it continues it long journey to certification. Revealed in 2015 and flown in 2021, the six-to-nine-passenger aircraft was meant to be in service by now, but has been delayed by certification snags with the GE Aerospace Catalyst engine, for which the 1,600nm (2,960km)-range Denali is the launch platform. The type, which Textron Aviation is pitching at the VIP and commuter as well as utility markets, is now expected to be in service in 2025. Features on the high-spec aircraft include Garmin Autoland and a FADEC.

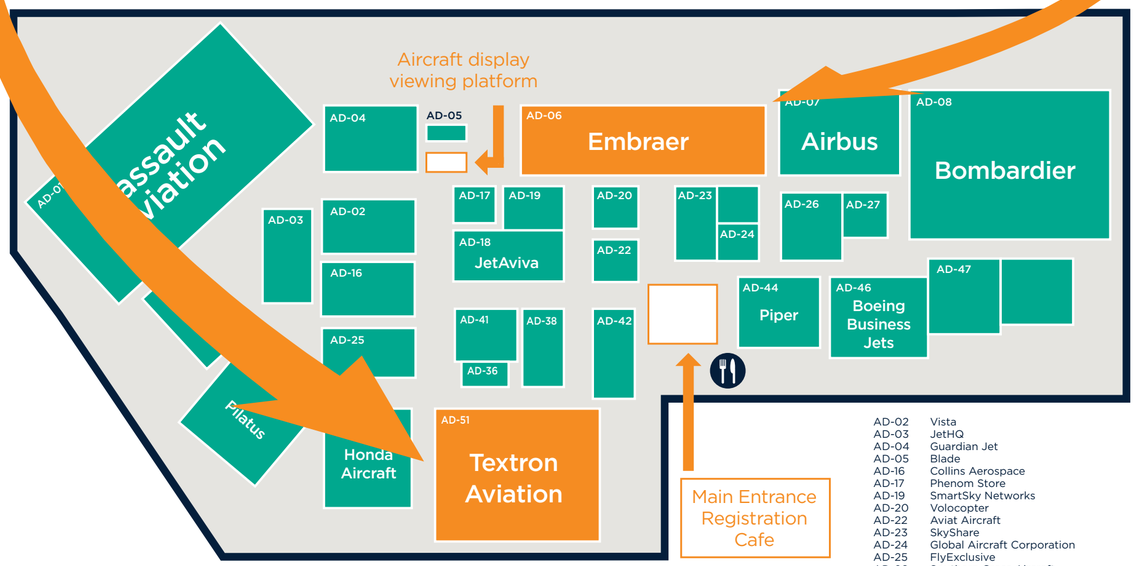
BillyPix

Embraer Praetor 600

Now firmly one of the big five business aviation manufacturers, it is hard to believe that just two decades ago the Brazilian manufacturer was taking its first baby steps into the sector with a corporate version of one of its early airliners. After stopping production of the Legacy 650 and Lineage, the super-midsize Praetor 600 is now Embraer's largest business jet. The Praetor 600 and the midsize Praetor 500 are successors to the Legacy 500 and Legacy 600, originally launched in 2008 and replaced with the Praetor pairing 10 years later. The Honeywell HTF 7500E-powered jet delivers just over 4,000nm of range (7,440km).

STATIC DISPLAY OF AIRCRAFT AT HENDERSON EXECUTIVE AIRPORT

Note: Details correct at the time of going to press



AD-02	Vista
AD-03	JetHQ
AD-04	Guardian Jet
AD-05	Blade
AD-16	Collins Aerospace
AD-17	Phenom Store
AD-19	SmartSky Networks
AD-20	Volocopter
AD-22	Aviat Aircraft
AD-23	SkyShare
AD-24	Global Aircraft Corporation
AD-25	FlyExclusive
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