Issue
2
Tuesday
18 October 2022

FLIGHT EVENINGNEWS

NBAA|BACE
OCTOBER 18-20, 2022 · ORLANDO, FL

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CAE

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Continued on page 3

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Sign of the times: Lisdero (*left*) with Marc Ausman, chief product officer at Electra

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World Cup heads-up

Next month's FIFA World Cup in Qatar will be a big win for private aviation operators, but the expected 1,300 daily charter and airline flights heading into the tiny Gulf emirate – the smallest country to host the four-yearly tournament – will present a major operational challenge.

Experts at a panel discussion at 15:00 tomorrow, hosted in its booth by flight support company UAS, will help operators avoid own goals. Pictured are speakers Matt Borie (*left*), chief intelligence officer with Osprey Flight Solutions, and Tim Ford, managing director of Myairops.

Emission possible

32-unit deal announced as carbon-cutting advanced air mobility developers land at show

Dominic Perry

Innovators aiming to revolutionise how business people fly and slash aviation's carbon impact have descended on NBAA's Emerging Technology Zone. Exhibitors including Boeing-backed Wisk and start-ups Jaunt, Overair, and Supernal have a range of models of their low- or zero-emission rotor and fixed-wing designs on display, hoping to catch the eye of potential investors and customers.

One of them, Electra.aero – making its show debut – now claims a 1,000-strong orderbook, worth over $3 billion, for its developmental electric short takeoff and landing (eSTOL) aircraft following the signature of its latest tentative agreement.

Revealed at the show this morning, the letter of intent from private air mobility provider Welojets covers the acquisition of 32 examples of the hybrid-electric aircraft.

"Welojets fully embraces the electric aviation revolution, and we are thrilled to work with Electra to deliver cleaner and cost-effective flights to our customers," says Alfredo Lisdero, president of the Madrid-headquartered operator.

"We plan to fly the Electra eSTOL aircraft into existing airports as well as use it to expand our operations into new markets that cannot be served currently with traditional fixed-wing aircraft."

Electra's design should be capable of taking off from runways as short as 90m (300ft) thanks to the use of blown-wing technology, yet cruise at 175kt (324km/h) and fly nine passengers 1,130kg (2,500lb) of cargo on routes up to 400nm (740km).

Continued on page 3

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Sign of the times: Lisdero (*left*) with Marc Ausman, chief product officer at Electra

Hats off: Thorne (*left*) and Aguirre

BillyPix

Gogo go for 5G network

Murdo Morrison

Connectivity provider Gogo has finished construction of its US-wide 5G network, celebrating the fitting of the final tower antenna in Oregon at a customer party in Orlando last night.

Sergio Aguirre, Gogo president and chief operating officer, paid tribute to the team behind the project who established the infrastructure in under 12 months.

"It's remarkable what they have accomplished," he told guests.

The 5G network, which comprises 900 installations, covers the contiguous USA, and will expand into Canada in early 2023. Gogo expects it to deliver 25 Mbps on average with peak speeds of 80Mbps.

The company says its Avance platform allows customers to upgrade to both the 5G product and Gogo's future low-earth orbit satellite-based service.

According to Gogo, the first supplemental type certificate (STC) for the 5G belly-mounted MB13 antennas and X3 line-replaceable unit has been completed. It will be amended once the 5G chip becomes available, expected in mid-2023. Gogo says it is working with OEMs and authorised dealers to develop additional STCs that will cover more than 30 types.

Aguirre marked the milestone with chief executive Oakleigh Thorne.

Continued from page 1

Power comes from eight wing-mounted electric propulsors.

"Our quiet, ultra-short-take-off and landing aircraft provides a step-change in fuel-burn and operating cost reduction and opens markets previously inaccessible to conventional fixed-wing aircraft," says John Langford, founder and chief executive of Electra.

Welojets joins a customer list for Electra's aircraft that includes urban and regional airlines, charter operators, VIP transport providers, and medical and emergency response operators.

In brief...

Textron's Love Field affair

Textron Aviation is to open a new satellite service centre at Dallas's Love Field airport this year, the company announced at the show. "Dallas is an expanding market for locally based customers flying Textron Aviation aircraft," says Brian Rohloff, senior vice-president customer support. "These customers now have access to local factory-direct, expert service and support."

FlightAware opens up its history books

Flight-tracking service provider FlightAware announced this morning that it will start providing users access to its historical flight data.

The recently acquired Collins Aerospace subsidiary has tracked more than 713 million flights over the past 17 years – "the single largest, most comprehensive repository of flight-tracking data in the world," says Tammy Bowe, product manager.

FlightAware's new query-based AeroAPI allows customers to search flight data back to January 2011, including aircraft positions from origin to destination reported for each flight, gate and terminal information, and flight plan versus route flown.

Notably, the tool will allow users to identify how a flight or aircraft performs over time.

"By taking a quick look at the flight history of the flight I was intending on taking," Bowe says, "I could see that over the past two weeks it was at least an hour late 20% of the time."

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Talking space with Tyson

NBAA attendees were treated this morning to a particularly far-reaching keynote address as astrophysicist and science communicator Neil deGrasse Tyson helped launch the show with a talk on UFOs, deflecting asteroids with spacecraft and flying a helicopter on Mars.

Prompted by aviation reporter Lisa Stark to explain why NASA's goal of returning to the moon is a worthwhile goal, Tyson responded: "We've been to six spots on the moon. Imagine going to six spots on Earth and saying we know Earth entirely."

There is much we have not explored, he noted, including "parts of the moon where the sun don't shine".

Forward progress was a theme of the keynote as acting US Federal Aviation Administration administrator Billy Nolen and Patrick Ky, executive director of the European Union Aviation Safety Agency, discussed the need to rapidly scale production of sustainable aviation fuel to meet zero-emissions goals on both sides of the Atlantic Ocean.

The safety administrators also previewed ambitious efforts to roll out advanced air mobility technologies ahead of the 2024 and 2028 Summer Olympics in Paris and Los Angeles, respectively.

"We're talking about probably having hundreds if not thousands of advanced air mobility vehicles" in the Los Angeles airspace by 2028, Nolen said. "It's one of our grandest challenges."

FlyExclusive to float in SPAC deal

Charter operator is latest industry player to take reverse merger route to market

Howard Hardee

Charter jet operator FlyExclusive is the latest aviation company hoping to benefit from a merger with a special purpose acquisition company (SPAC).

The Kinston, North Carolina-based ad hoc and block charter operator is set to become a publicly traded company through a business combination agreement with EG Acquisition, it announced yesterday.

EG Acquisition is a "blank check company" sponsored by EnTrust Global and GMF Capital. The combined business is expected to trade on the New York Stock Exchange and adopt FlyExclusive as the corporate brand. Jim Segrave, founder and chief executive of FlyExclusive, will lead the company.

FlyExclusive entered the fractional market in April with the order of 30 new Cessna Citation CJ3+ aircraft, greatly expanding its 90-strong charter fleet of mostly Citation aircraft, including the CJ3 and Encore.

The company also announced yesterday it has entered a purchase agreement with Textron Aviation for up to 14 more Citation business jets. FlyExclusive is set to purchase eight XLS Gen2 aircraft and six Longitudes to be delivered in 2024 and 2025, respectively.

Despite not expecting delivery of the first of the new Citations until the second quarter of 2023, the company recently reported being close to selling out of its fractional shares of the incoming aircraft. Early shared-ownership customers gain access to FlyExclusive's charter fleet.

BillyPix

FlyExclusive is exhibiting at the show this week

Segrave has been "stunned" by the sales of fractional shares, he told FlightGlobal in September. "It's remarkable, given that most of the planes are still nearly a year away," he says.

The company is following fellow fractional share ownership operator, Cleveland-based Flexjet, which on 11 October announced plans to sell public shares through a merger with Horizon Acquisition. It anticipates emerging in the second quarter of 2023 as a public company valued at $2.6 billion.

Competitor Wheels Up also became public by merging with an SPAC in 2021, while air taxi developers Archer Aviation, Eve Mobility, Joby Aviation and Vertical Aerospace have all struck similar deals.

FlyExclusive has a pre-transaction value of $600 million. The deal is expected to provide up to $310 million in proceeds – an immediate $85 million through committed convertible notes and up to $225 million of SPAC cash held in trust.

The company expects to use the $85 million primarily to acquire additional aircraft, it says. "The transaction, once completed, will provide FlyExclusive with significant additional capital to continue its growth, better serve customers and execute its strategic plan."

Rolls-Royce extends network

Rolls-Royce is growing its CorporateCare network of authorised service centres in North America with new members.

Canada's Skyservice, which has sites in Montreal, Toronto and Calgary, and Western Jet Aviation, based in Van Nuys, California, will support the company's BR710 and Tay 611-8/8C engines.

Duncan Aviation, which has facilities in Nebraska, Michigan, and Utah, has also extended its partnership with the engine maker.

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Attendees arriving for last night's pre-show celebration at the convention centre were able to pick up copies of *Flight Evening News* issue one. The event – the first of its kind – marked NBAA BACE's return to Orlando after four years, and the show's 75th anniversary.

A welcome read

BillyPix

Kliethermes: Growing pipeline of sales

CRJ200 ExecLiner conversions flourishing for Flying Colours

Canadian maintenance and completions specialist Flying Colours is seeing renewed interest in its VIP ExecLiner and corporate shuttle conversions of the CRJ200 – the 50-seat regional jet that was last produced by Bombardier in 2006.

"We have a growing pipeline of sales including a recently signed order from a fleet customer for a mix of ExecLiners and shuttles," says Flying Colours director of sales Kevin Kliethermes.

Demand for CRJ200 conversions is coming from private, commercial and corporate customers who have turned to business aircraft in increasing numbers, he says. However, with the shortage of used aircraft and long lead times for new business jets, potential customers are opting for converted CRJ200s as a solution, he says.

Flying Colours has delivered around 40 ExecLiner and corporate shuttles conversions to date. The latest example – a 29-seat shuttle – will be shipped later this year following a six-month upgrade. This marks Flying Colours' first CRJ200 conversion project since 2016. The 16-seat ExecLiner has a standard range of around 2,300nm (4,260km) which can be extended by 1,000nm with auxiliary fuel tanks. The Peterborough, Ontario-based firm has a site in St Louis, Missouri, USA, as well as an in-plant facility at Bombardier's service centre in Singapore.

Tamarack attacks hybrid opportunity

Jon Hemmerdinger

Tamarack Aerospace is partnering with Ampaire to offer its active winglets across a range of aircraft types being converted to run on hybrid-electric power by the Los Angeles company.

Idaho-based Tamarack is showing off its winglet system – which it calls the Performance Smartwing – on a Beechcraft King Air parked on the static display.

Ampaire is developing hybrid-electric propulsion modifications for King Airs and several other aircraft types, including the Cessna Caravan and De Havilland Twin Otter.

Tamarack is now offering its winglet system on Ampaire's hybrid conversions of those types, the companies said at the show.

The Performance Smartwing system involves composite winglets mounted on wing extensions, which are equipped with "automatically" deployed control surfaces.

The technology, which Tamarack has long offered on Cessna Citation CJ-series jets, "smooths flight", alleviates loads and improves efficiency, Tamarack says.

"Joint development work has already commenced, with analysis validating synergies between Tamarack's Performance Smartwing... and Ampaire's hybrid-electric propulsion technology," the companies say.

The upgrade "will offer customers the option of further enhancing performance and operating-cost savings".

"Tamarack's technology is a great match with Ampaire's hybrid-propulsion system," says Ampaire chief executive Kevin Noertker.

Ampaire has been developing novel propulsion systems for several years, having flown a hybrid-powered Cessna 337 Skymaster and secured orders for a hybrid-electric conversion it calls the Eco Caravan; first flight of the latter is due in the coming weeks.

Some 170 Cessna CJs have Tamarack's winglet system, and Tamarack is now working to bring the technology to the King Air. It is testing both the 200 and 350 variants of the twin-turboprop fitted with the modification and is close to landing three customer orders, Tamarack says, which will lead to certification within one or two years.

Additionally, Tamarack says it is in discussions with the US military about adding its winglets to Lockheed Martin C-130s, and is discussing an order with a European client covering the modification of Airbus A320s.

Tamarack's Citation programme stumbled in recent years following several in-flight upsets that investigators attributed to its winglet system, including a deadly 2018 crash. Tamarack disagreed that its system caused the accident but developed a fix to address a problem involving deployment of control surfaces.

Regulators have since lifted the grounding for modified jets. Tamarack entered bankruptcy protection in 2019 and emerged in 2021.

The winglet on display on a King Air at Orlando Executive airport

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AW609 takes a tilt at NBAA

Leonardo Helicopters is at the show with one of the most striking additions to the static: a VIP-configured AW609 tiltrotor.

This year marks the AW609's NBAA debut, reflecting the Italian manufacturer's interest in drumming up interest as it works toward achieving certification for the type, says head of tiltrotor marketing Bill Sunick.

"It is truly a point-to-point transport", capable of shuttling VIP passengers between existing heliports in major cities, says Sunick.

The AW609 on the static is one of three prototypes, with the other two located in Italy. Leonardo has also manufactured a production example, which completed its first flight last week, Sunick says.

Powered by twin Pratt & Whitney Canada PT6C-67As, the AW609 carries five to seven passengers in a typical VIP configuration, though it can fit up to 12 passengers in a high-density layout.

Leonardo stresses that the AW609's maximum cruise speed of 270kt (500km/h) is about twice that of a helicopter.

Leonardo is seeking US Federal Aviation Administration certification of the type, with service entry pegged for 2023. It intends to gain approval from European regulators about one year later.

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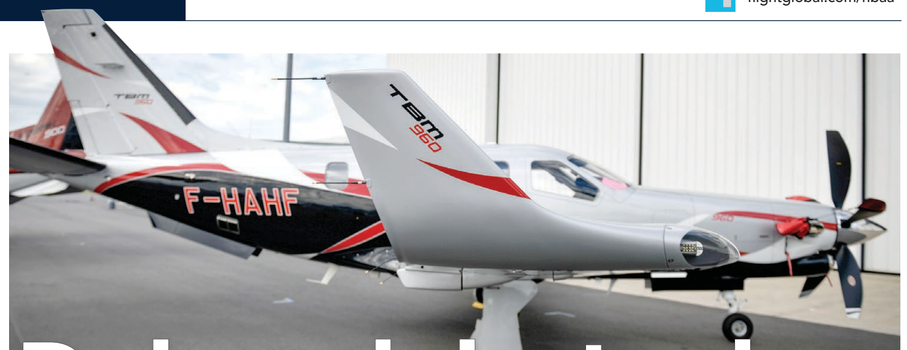

Daher debuts duo

Kate Sarsfield

Daher has returned to the show in bullish mood and with its two newest aircraft, the TBM 960 and Kodiak 900, making their debuts.

The single-engined turboprops are sold out until the third quarter of 2024.

"Demand is incredibly strong at the moment as people and companies are switching from unreliable commercial airlines to private aviation," says Nicolas Chabbert, senior vice-president of Daher's aircraft division. "This is reflected in this long lead time for one of our new Daher models, with 18 months the maximum waiting time until now."

The $5 million TBM 960 was introduced April as the fifth iteration of the 900-series since its arrival in 2014. Key features of the six-seat aircraft include a Pratt & Whitney Canada PT6E-66XT engine, a fully digital e-throttle and a digitally controlled cabin. The first aircraft was handed over in June and the backlog totals around 90 aircraft, says Chabbert.

The $3.5 million Kodiak 900 was launched at the Air Venture show in Oshkosh, Wisconsin in July as a faster, larger and more comfortable complement to its "robust and rugged" Kodiak 100 Series III stablemate.

Daher has secured 20 orders for the 10-seat PT6A-140A-powered Kodiak 900 – including seven sales directly after its Oshkosh unveiling – and many more are lined up, says Chabbert. The first Kodiak 900 is scheduled for delivery before the end of the year. To date ,Daher has delivered 1,114 TBM-series aircraft – with over 75% based in the USA – and the global fleet has logged over two million flying hours.

The Kodiak fleet stands at 313 aircraft worldwide which have amassed nearly 330 million flying hours. "This year's NBAA enables us to bring together our top-of-the-line Kodiak and TBM versions, underscoring the improvements that we have incorporated for efficiency, operational safety and comfort," says Chabbert.

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CAE grows with Gulfstream

CAE is expanding its Gulfstream aircraft training programme in response to growing demand for business air travel, rolling out new simulators in Las Vegas, Savannah, Georgia, and Singapore.

Training operations on a Gulfstream G650 full-flight simulator began 14 October at CAE Las Vegas. The facility will add full-flight simulators for Gulfstream G550, Bombardier Global 7500, Embraer ERJ145 and Phenom 300 aircraft by the end of 2022.

Construction of the CAE Savannah facility – which will feature full flight simulators for G650, G500, G600 and G280 aircraft – is scheduled to open in mid-2023. Meanwhile, CAE has begun hands-on maintenance training at Savannah Technical College, the company says.

Training on a G650 full-flight simulator is set to begin at CAE Singapore's existing facility in November.

"The expansion of our network is part of our commitment to be close to where our customers operate their aircraft and to help meet the global requirement for pilots and maintenance technicians," says Nick Leontidis, CAE's group president, civil aviation.

The global business aviation industry will require some 44,000 new pilots and 66,000 aircraft technicians over the next decade, CAE estimates.

Aston Martin milestone

Airbus Corporate Helicopters has delivered the first ACH130 Aston Martin Edition to a US customer and sold another example of the high-end rotorcraft to a client in Latin America.

The latest sale, announced at a pre-NBAA press conference on 17 October, is the 17th order for the special edition of the light-single, which features interior and exterior finishes created by British automotive designer Aston Martin.

The luxury rotorcraft is marketed at "helicopter owners who appreciate the thrill of piloting and the pleasure of driving luxury sports cars," ACH says.

In its fifth year of operation, ACH maintains a strong presence in Latin America with 268 helicopters in service, or 35% of market share. In August, a Brazilian customer became the first in the world to purchase the new ACH160, which is still awaiting certification from the US Federal Aviation Administration. ACH has also this year rolled out a "facelift" for the ACH145 Mercedes-Benz Style Edition – the company's latest collaboration with the luxury automobile maker.

In 2021, ACH sold 104 helicopters, which ACH head Frederic Lemos describes as "an impressive record number for our company".

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Airbus is showing an ACH130 on the static

Pearson: Several deliveries planned into next year

BillyPix

Why BBJs are a bargain says Boeing

Jon Hemmerdinger

Boeing comes to this year's NBAA highlighting the reliability and performance of its 737 Max-based Boeing Business Jet, while stressing that the airliner-derived twinjet costs significantly less to operate than traditional large-cabin business jets.

BBJs do cost more to acquire, but Boeing Business Jets director of marketing Alex Fecteau says operators can expect to pay about $5,000 hourly to operate 737-based business aircraft.

By comparison, traditional large-cabin, long-range business aircraft, like the Dassault Falcon 8X, Bombardier Global 7500 and Gulfstream G650, cost 20-25% more, with hourly operating costs upward of $6,000, Fecteau says. "Your actual operating costs are significantly lower on our BBJ than they are on those airplanes in the category just below."

Those savings partly reflect the BBJ's relatively cheap service requirements, says Fecteau, who claims the Boeing jets can cost half as much to maintain as the competing types. The 737 Max's CFM International Leap-1B powerplants, for instance, need overhauling once every roughly 17,000 cycles. But turbofans on dedicated business jets need such treatment around every 3,500 cycles, Fecteau says.

Boeing has not shipped any BBJs this year but plans to deliver two BBJs this month. Both are 737 Max derivatives, and are going to North American customers, says Boeing Business Jets president Erika Pearson.

"We have several other deliveries that are planned into the first half of next year," she says.

Boeing holds orders for both Max 8- and Max 9-based BBJs and has seen interest from customers in a Max 7-based version, adds Pearson. Boeing aims to achieve certification of the Max 7, which has more range than any Max variant, in 2023.

Boeing returned the Max to service in November 2020 after the US Federal Aviation Administration lifted what had been an 20-month grounding. Since then, the type has logged about 2.5 million flight hours and close to one million flights. The Max has delivered a reliability rate exceeding 99%, Pearson says.

Of the 117 airliner-derived business aircraft operating in North and South America, 111 are Boeing Business Jets, the company says. Of those, governments operate about 40%, private companies operate one-third, and corporations and charter companies operate another quarter.

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Bombardier's SAF bet

Bombardier has agreed to a multi-year deal to purchase sustainable aviation fuel (SAF) from aviation services company Signature Aviation.

The agreement will cover all the Canadian business jet manufacturer's flight operations starting in January 2023 and reduce its greenhouse gas emissions from in-flight fuel use by about 25%, the company says. Bombardier has set a 2025 goal of reducing its emissions from all its operations by a quarter of 2019 levels.

"Bombardier already has a unique environmental advantage as our production facilities in Quebec are powered by cleaner hydroelectricity," says Jean-Christophe Gallagher, Bombardier's executive vice-president of services and support, and corporate strategy.

"We will drive our environmental stewardship even further by covering all our production flights SAF through this new agreement with Signature Aviation."

The deal will use the book-and-claim system, which allows air travellers to pay for SAF and claim the benefits, even if SAF is not available at the airport of their departure. SAF goes instead into another aircraft at an airport where it's available.

The book-and-claim programme is "business aviation's most pragmatic approach to making SAF quickly and easily accessible," says Tony Lefebvre, chief executive of Signature.

Over the past two years, Signature has expanded its global number of supply points for SAF to 17 airports – about 10% of its FBO network, the company says.

GE Honda completes eco-power tests

Propulsion joint venture GE Honda Aero Engines (GHAE) has completed ground testing of its HF120 turbofan for the HondaJet using 100% sustainable aviation fuel (SAF).

Trials were conducted at GE Aviation's Peebles, Ohio test facility using HEFA-SPK – a fuel made from cooking oil, waste fats and greases.

Results were "very favourable", says the manufacturer, "with engine performance equivalent to Jet A fuel during the SAF run".

Currently, the HF120 is authorised to run on blends of up to 50% SAF.

"As our testing shows, the HF120 engine can operate on approved SAF today and in the future. Our customers can be confident that the HF120 engine can help them meet their sustainability goals to reduce CO2 emissions in flight," says Melvyn Heard, president of GHAE.

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Used market robust: IADA

The market for used business aircraft remains strong heading into the end of this financial year, with the International Aircraft Dealer's Association (IADA) reporting a "flourishing resale market".

IADA's Third Quarter Market Report shows 331 completed sales transactions by IADA dealers, compared with 340 in the third quarter of 2021. Released at the show this morning, the report forecasts a "balanced outlook" for the next six months despite global economic tension.

"From the international perspective, stability in Europe and Asia are wildcards for the future," says recently appointed IADA chair Zipporah Marmor. "However, used aircraft sales were strong in the third quarter and the fourth-quarter outlook is encouraging."

IADA dealers have completed 929 deals so far in 2022, exceeding the "frantic pace" of 869 sales during the same period in 2021, according to the trade group.

The strong market is expected to continue in the fourth quarter, Marmor says, driven by "the phase-out of 100% bonus depreciation in the USA, airline cutbacks to smaller cities spurring first-time buyers and cash availability for most aircraft purchases".

Pilatus will deliver its 2,000th PC-12 next year

BillyPix

Pilatus stays strong

Kate Sarsfield

Pilatus is at NBAA with a PC-12 NGX and a PC-24 on the static display on the back of a strong year for aircraft deliveries.

For the nine months ended 30 September, the Swiss manufacturer of business and military trainer aircraft shipped 27 PC-24 light business jets and 47 PC-12 NGXs, the third and latest iteration of the single-engined turboprop introduced in 2019.

The Americas accounted for over 60% of the total deliveries. The aircraft were completed by Pilatus's US-based subsidiary in Broomfield Colorado. Last month Pilatus widened its aftermarket capabilities with the acquisition of its authorised sales and service centre Skytech. The firm has locations in Rock Hill, South Carolina and Baltimore, Maryland.

Pilatus has shipped 1,920 PC-12s since the first example was handed over in 1994 and is scheduled to deliver the 2,000th aircraft early next year. The recipient of this milestone aircraft is PlaneSense, the world's largest Pilatus operator, with a fleet of 41 PC-12s and eight PC-24s. The global PC-12 fleet has amassed over 10 million flight hours, says Pilatus. The 200th PC-24 is also earmarked for delivery in the first half of 2023.

Markus Bucher, chief executive of the Stans-headquartered company is confident demand for the business aircraft pair will remain strong regardless of the uncertain economic climate.

"Despite the current high inflationary environment, the rising cost of energy in Europe and the forecast economic recession, our global sales network remains optimistic that the very high demand for our unique aircraft will weather the storm," he says.

Pilatus has not been immune to supply chain challenges, Bucher concedes, and has experienced difficulties "ensuring a reliable supply of quality components to keep production running efficiently and customers flying without interruption".

Guardian Vaults into 21st year

BillyPix

It's a double NBAA celebration for Connecticut-based Guardian Jet with the business aviation brokerage and consulting firm unveiling the latest version of its Vault asset-management portal and also marking its 20th year of operations.

Don Dwyer, managing partner at the firm, says the secret to its success is openness with customers. "We have earned the right to transact business for the most sophisticated clientele in the world by providing great information and consulting."

Vault 4.0 – the latest iteration of the platform which went live on 17 October just ahead of the show – deepens the information available for users on different aircraft types, from performance characteristics to technical data and even legal issues.

Dwyer says the update builds on information that was originally compiled for internal use "but in the interests of transparency we want our customers to know everything that we know."

Aircraft data is not confined to high-end large-cabin jets either – Guardian Jet tracks everything from Daher TBM-series turboprop singles all the way up to ultra-long-range jets like the Bombardier Global 7500.

Rosanvallon honoured

Industry veteran and former head of Dassault Aviation's US arm John Rosanvallon will receive the NBAA's prestigious Doswell Award at the show this week.

"Throughout his 47 years in business aviation, John Rosanvallon has exemplified the finest attributes of leadership and a passionate commitment to making our industry stronger and safer," says NBAA president and chief executive Ed Bolen.

He has held senior roles with the General Aviation Manufacturer's Association, the NBAA's advisory council, the Corporate Angel Network and the French-American Chamber of Commerce. He joined the family-run manufacturer in 1975 and spent two stints in the USA, serving as an executive for the company in France in the period between. He is now a senior adviser to Dassault chief Eric Trappier.

Connectivity provider arrives in Orlando marking milestone for business aviation

gogo BUSINESS AVIATION

Gogo completes 5G nationwide network

This has been a big year for the leading provider of inflight connectivity, Gogo Business Aviation. The company has just completed construction of its highly anticipated 5G network, and announced a new global LEO broadband service for business aviation that will provide fast, low-latency connectivity on a global scale.

Gogo continues to work quickly on all elements of Gogo 5G, and the new high-speed, high-capacity experience is nearly ready for prime time. Meanwhile, the company is already making significant strides in developing its global LEO satellite service (see following page), which will be the first complete LEO experience built for business aviation by business aviation experts.

"Our team has been incredibly busy the past few months – there are some big things taking shape here and I'm as excited as I've ever been about Gogo's future," says Sergio Aguirre, Gogo's president and chief operating officer.

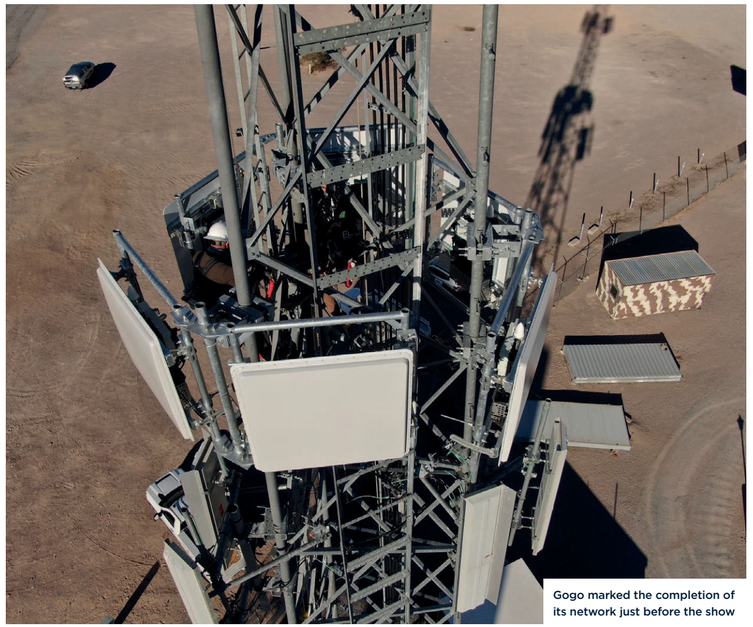
"On Monday just before the start of NBAA, we celebrated the completion of our 5G network," he continues. "We hosted a party with our OEM and dealer partners, and about a hundred of our key customers as we watched our network team – via a livestream – bolt the final 5G antenna on a tower in Oregon to complete the nationwide network."

Gogo's team was able to build an entirely new network for Gogo 5G and did so in less than a year. The 5G network covers the contiguous United States today, and Gogo says it will expand next into Canada beginning in 2023.

"It's remarkable what our network deployment and field operations teams have accomplished," says Aguirre. "Our teams overcame a host of issues including Covid-19, weather, the supply chain, and geopolitical concerns, to build a standalone network of 150 towers nationwide. To get that done in less than 12 months, with all those challenges, is truly remarkable."

While Gogo's network operations and field deployment teams were able to overcome those challenges, the manufacturer of the 5G chip needed for the service notified Gogo that it had encountered an issue in late-stage testing which will have an impact on full production volume until 2023. Gogo says customers can still provision for 5G, despite the delay.

"The good news though for customers who want 5G is that they can install the AVANCE L5 with full 5G provisions today, including the MB13 antennas, and operate on our 4G network while they wait for the 5G (X3 LRU) next year," says Dave Glenn, Gogo's SVP of customer operations. "That means once the X3 is ready they can get it installed and they'll begin getting 5G service immediately."



Gogo marked the completion of its network just before the show

Gogo 5G is expected to deliver 25 Mbps on average with peak speeds in the 75-80 Mbps range and has been designed to deliver high throughput with very low latency to address the increasing demand for data-heavy interactive services like video conferencing, live TV and gaming.

"AVANCE L5 is the key element and provides a fast upgrade path to 5G," Glenn adds. "If a customer has an L5 installed in their aircraft, to upgrade to 5G they literally add one small LRU and replace the antennas on the belly of the aircraft."

Gogo has completed the first-article supplemental type certification (STC) for the belly-mounted MB13 antennas and the X3 (5G) LRU. That STC will be amended once the 5G chip is available.

Gogo says it is working closely with business aviation manufacturers and several authorized Gogo dealers to develop STCs that will cover more than 30 aircraft models in the aftermarket and from the factory.

Known for its market leading North American air-to-ground network, connectivity specialist is taking it a step further – its industry-first satellite service is tailored for business aviation

Several users will be able to perform data-heavy online activities simultanously

Gogo goes global with new LEO experience

Gogo Business Aviation will launch the first global broadband service in business aviation to use an electronically steered antenna (ESA) to deliver a high-speed, low latency low Earth orbit (LEO) satellite experience.

ESA and LEO are terms that may not mean much if you are not familiar with those two technologies, but they are critical components for Gogo's new inflight connectivity service that will transform satellite connectivity's performance, accessibility and affordability.

The reason: they enable Gogo to build an antenna that is small enough to fit on virtually any business aviation aircraft including turboprops like a Pilatus PC-12, or a Beechcraft King Air 350, and light jets such as a HondaJet or an Embraer Phenom 100. That same system can also be used on the heavy-iron, ultra-long range large-cabin jets and every aircraft in between.

"Unlike other providers, we're focused on serving all of business aviation with our global broadband product, just like we did with our ATG network in North America several years ago," says Sergio Aguirre, Gogo's president and chief operating officer. "We want to give everyone in business aviation the ability to have an exceptional broadband experience regardless of where or what size aircraft they fly and our service will be fast and affordable."

The exclusive antenna assembly will be roughly 24 inches (61cm) long by 11.2 inches wide and two inches tall and is installed on the top of the fuselage of business aircraft. It will operate on the high-speed, low-latency LEO global network from OneWeb. Service launch is expected in the second half of 2024.

The Gogo AVANCE platform is at the heart of Gogo's new service. Gogo's LEO service will require just one AVANCE LRU [line replaceable unit] inside the aircraft, which means existing Gogo AVANCE customers will only have to install the ESA antenna, with a single cable for power in, and a single cable for data out. Today's GEO solutions are much larger and require multiple LRUs so they require larger airframes to accommodate the size and weight.

"We specifically designed AVANCE so customers could easily and effectively add additional features, functionality, and capacity to the system," says Aguirre. "We saw this wave of increased demand for connectivity coming several years ago and that's when we started building AVANCE. It was a strategic decision to give us the ability to add new networks and for upgrades to be done with minimal cost and little to no downtime."

The network will deliver improved performance with faster speeds and low latency that is significantly less than what geostationary satellite (GEOs) networks deliver today. The reason is the close proximity to Earth. LEO satellites are roughly 750 miles (1,200km) from the surface while GEO satellites orbit between 22,000 and 25,000 miles away.

"The LEO experience will be much better than a GEO network can provide and it's not only because LEO will be faster, which it will be, but the latency—or the time it takes for a signal to travel from satellite to ground to aircraft—will be greatly reduced," says Aguirre. "It's a matter of physics and LEOs are much closer to Earth so the signal gets there much faster."

A multitude of users will be able to perform simultaneously data-heavy interactive online activities such as conducting simultaneous live video conferences, accessing cloud solutions such as Office365, watching live TV, streaming video applications like TikTok, and much more.

Gogo's LEO service will include one fuselage-mounted unit with an integrated antenna, modem, power supply and RF converter; will only require 28 volts of DC power; will not rely on aircraft-positioning data; and will include an AVANCE router.

Aguirre concludes: "We have long delivered affordable, high-quality connectivity, and award-winning customer service to aircraft owners in North America, and now we will be bringing those same benefits to all aircraft owners on a global scale."

AVANCE is business aviation's only true connectivity platform

In 2018 Gogo introduced the AVANCE connectivity platform and the new technology represented a paradigm shift for inflight connectivity in business aviation. Since that time, AVANCE has been so well received that others in business aviation have caught the "platform" bug.

You see it in ads, marketing content, and sales pitches. Many technology players in business aviation are talking about the "latest and greatest platform" or "our new and improved (insert buzzword) platform".

But what, specifically, is a technology platform? What does it do and what benefits must it provide to warrant that term?

To answer that question, we asked Gogo to see how it defines "platform", and to explain how AVANCE meets the criteria.

"A technology platform is a group of individual components brought together to make a cohesive unity," says Jeremy Tyler, vice president of software applications engineering. "You bring in software, hardware and tools to create a consistent experience for the user. Apple is a great example.

"The Apple iOS operating system is the 'brains' across its hardware, but Apple created an entire digital ecosystem where everything can be integrated, automatically synchronized through the cloud, and even updated between any Apple device," he continues. "The result is a seamless, consistent Apple experience independent of what device you are using it on. AVANCE is very similar."

According to Gogo, AVANCE software is the "brains" on all of its systems – L3, L5 and SCS – and future products as well, such as global LEO broadband. Gogo uses one operating system that detects what systems and services it is connected to so every feature Gogo offers is available to every system.

"It doesn't matter if our system is on a Gulfstream heavy-iron aircraft or a turboprop like a Pilatus PC-12, the experience is the same," says Tyler. "And the benefit for aircraft owners, operators and passengers is that Gogo can get innovations and updates into their hands almost instantly: things that other providers have to do with hardware, which requires putting the aircraft down for a period of time for the change which takes time and is expensive, we can do over the air."

AVANCE software is the brains behind Gogo's product offering

In terms of hardware engineering, AVANCE is built modularly, and is designed to be what the company calls "plug and play", which makes it easy for customers to expand and upgrade their inflight Wi-Fi experience.

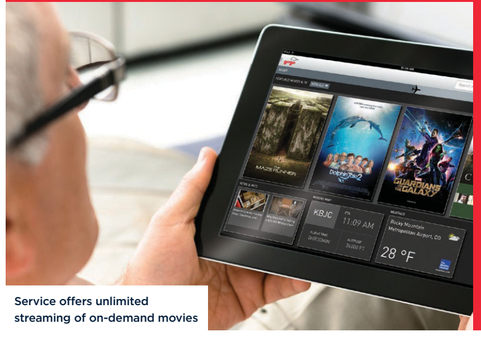
"When we create a new solution, we don't have to start from scratch, we can simply use our base set of features," says Chris Rippe, Gogo distinguished member of technical staff product development. "When we need to do an upgrade, we can design it once for the whole platform. 5G is a great example of this modular design. When a customer is ready to upgrade, they won't have to remove any hardware to add 5G speed to their AVANCE L5 system – instead, they'll simply plug a small Gogo X3 LRU into the AVANCE L5, much like how you'd connect a peripheral like a printer to your laptop."

AVANCE also gives operators comprehensive inflight connectivity and entertainment in a single LRU that has been designed to be future-ready right out of the box which allows Gogo to:

- Easily add new networks such as Gogo 5G and the new global LEO broadband system
- Instantly deploy new services over the air
- Remotely deploy support and software updates over the air
- Quickly connect to and enable new third-party applications

"When we lowered our service altitude from 10,000 feet AGL to 3,000 feet, every AVANCE customer received that update over the air," says Rippe. "Our customers never had to touch the aircraft or bring it down for that upgrade to be implemented, and Gogo is the only connectivity provider in business aviation with that capability."

Gogo Vision 360 captivates passengers



Service offers unlimited streaming of on-demand movies

Gogo set a new standard for inflight entertainment (IFE) in business aviation when it unveiled Gogo Vision 360 in 2020 – a premium IFE service that features a compelling and comprehensive suite of services, including an upgraded 3D moving map.

The service offers unlimited streaming of on-demand movies, TV programming and news, along with digital magazines and a state-of-the-art 3D moving map, all at a fixed monthly price eliminating the unpredictability and often high costs associated with inflight streaming video and audio.

All Gogo Vision content is updated automatically each month through a seamless delivery via Gogo Cloudport, either in a customer's own hangar or at Gogo Cloud locations throughout the USA and in Europe. Gogo Vision is the only IFE service that delivers content updates over-the-air.

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.

Wings of desire: Gulfstream's G700

King of the corporates: A320-based ACJ

Flight angles

Our photographer brings you a different perspective on the static display

A vision to behold: Cirrus SF50 G2

Still going strong: Douglas DC-3 is a veteran of the show... and the industry

In tune: Piper PA-28 Cherokee

Photographs: BillyPix

Bombardier has stepped up its research efforts into a future blended-wing-body business jet

Shape of things to come

Bombardier

An artist's impression of what a future 'EcoJet' might look like

Jon Hemmerdinger

Five months ago, at EBACE in Geneva, Bombardier revealed that it had begun flying an unmanned demonstrator to test sustainable technologies. Now the Canadian company has disclosed that it has begun flight-testing a second, larger example of the conceptual blended-wing-body aircraft, suggesting that the study could inform the design of a future, radically different large-cabin business jet.

Bombardier says findings from the initial flight trials prompted it to continue the programme using a larger unmanned demonstrator.

"We've flown a much-larger model, in the 20-foot-span size," Bombardier director of research and technology Benoit Breault told FlightGlobal at the International Aerospace Innovation Forum in Montreal on 6 September.

The latest model is about 20% the size of a large-cabin business jet, he adds. The earlier demonstrator is around 1.2-1.5m (4-5ft)-long.

Bombardier believes the radical new shape could enable a significant reduction in emissions and fuel burn. "With only changing the shape of the aircraft today, we believe we can reduce [emissions] by 17 to 20%," says chief executive Eric Martel.

Bombardier stresses EcoJet is not a development programme but an effort to understand the design and its impact on the environment.

"There is no rush at Bombardier right now," say Martel. "Eventually, we have to develop the next aircraft... I have people working on it today."

Breault says the cabin of a blended-wing-body aircraft would be too low for a smaller jet like a midsize Challenger but perfect for the large-cabin sector, in which Bombardier competes with its Global series.

Blended-wing-body aircraft are hybrids, sharing features of traditional designs and of ultra-efficient "flying wings", says NASA, which has studied the concept.

While traditional aircraft have wings mounted above or below a cylindrical fuselage, Bombardier's EcoJet has a wide non-cylindrical fuselage that curves smoothly to wings extending from the fuselage itself. "The wing line sits much higher than what you... see on normal aircraft today," Breault says.

Instead of a T-tail, EcoJet has a U-tail with two horizontal and two vertical stabilisers. It has two engines mounted on the top of the aft fuselage.

The shape means the fuselage generates 20-30% of total lift – versus 5-10% for a traditional aircraft, says Breault. That means the wings can be smaller, reducing weight and drag, and therefore requiring less thrust and fuel, he adds. That is how Bombardier arrives at an estimated 20% fuel savings. It says the design could use traditional turbofan engines or novel propulsion systems.

Many hurdles remain, but the airframer says it has solutions to technical and certification challenges. "We've found nothing that kills the concept," says Breault.

The EcoJet project comes as aircraft manufacturers face immense pressure to cut carbon emissions, a tall challenge considering the energy requirements of business jets.

Breault says Bombardier completed its original flight-test goals for the smaller model but will continue using that aircraft to evaluate technologies before moving them to the larger demonstrator. However, the company declines to say where it is conducting test flights, and will not provide funding or timeline details, saying progression depends on test results. It has partnered on the programme with unnamed Canadian universities.

The blended-wing-body concept was developed decades ago and was the subject of numerous studies. It has gained attention in recent years after Airbus said it was studying the concept.

Breault says technical challenges have kept the design from the mainstream. He cites flight control complexity and says the U-tail and wing location require "completely different control laws".

"The common knowledge of such an aerodynamic shape, in the world of flight sciences, has not been explored a lot," he says. "The stall [speed] of this vehicle is going to be unknown territory for Bombardier."

Additionally, non-cylindrical fuselages are more difficult to pressurise, tending to require more structural reinforcement, adding weight.

There are manufacturing hurdles. Unlike cylindrical fuselages that can be lengthened or shortened by removing sections, blended-wing-body designs are harder to stretch or shrink due to their non-linear fuselages, Breault says.

That creates challenges because aircraft manufacturers invariably create aircraft families around baseline variants, enabling them to squeeze maximum value from their investment.

But Breault says Bombardier has found a "solution" to that issue, without elaborating.

"We think we've got some fancy ways to make the economics work," he says. "I allow myself to believe... I'm going to put one in service before I retire."

Cirrus Aircraft is opening an innovation centre next to its headquarters at Duluth airport where it hopes to devise a new generation of general aviation aircraft and technologies

Ideas factory

Cirrus's reputation for innovation is epitomised by the SF50 Vision Jet, the only single-engine personal jet on the market

Cirrus

Murdo Morrison

Zean Nielsen used to work for Tesla. Now he is determined that the aerospace manufacturer he runs – Cirrus Aircraft – becomes as nimble and disruptive as Elon Musk's electric carmaker. Part of his solution: establishing an "innovation centre" at Cirrus's current campus in Duluth, Minnesota, that will bring all the company's 300 or so engineers under one roof and attract creative talent. "My ultimate goal is to accelerate the pace of innovation," he says.

The 17,600sq m (189,000sq ft) site, which Nielsen describes as his "Area 51" – the classified United States Air Force research facility in Nevada – is in a former AAR maintenance hangar on the opposite side of the runway at Duluth International Airport from Cirrus's assembly plant. Keeping the engineers apart from the manufacturing operation will also foster a culture of collaboration and focus when it comes to new product development, he believes.

Since its beginnings in a Wisconsin barn in the 1980s, Cirrus has been one of the most creative companies in general aviation, launching in the late 1990s the SR20, the first aircraft fitted with an emergency parachute. The founding Klapmeier brothers followed that with the SR22, the most produced GA aircraft this century, and the Collier Trophy-winning SF50 Vision Jet, the only single-engine personal jet on the market, the latest version of which is on the static display at BACE.

Nielsen took over from co-founder Dale Klapmeier as chief executive of the now Chinese-owned firm in 2019, and, despite the pandemic and concerns about the impact of inflation on consumer confidence, demand for Cirrus's products has continued to grow. The airframer shipped 211 aircraft in the first six months, compared with 195 in the same period last year, according to the latest General Aviation Manufacturers Association figures. It is on course to surpass 2021's total of 528.

In fact, like many aerospace executives, what keeps Nielsen awake currently is not lack of demand for his products, but shortages and delays in deliveries of parts. "We have more orders than we can produce – our backlog is two to three years deep. On pretty much every metric, from revenues to orders, we are going to beat the prior year," he says. "But my biggest headache in 2022 has been the supply chain, and I expect this to continue for another six months at least."

The difficulty getting hold of everything from silicon chips to composite materials makes it impossible to run an assembly line efficiently. "You are sometimes building aircraft with missing parts that then have to be taken apart to have the missing part inserted later," he says. To compensate, Cirrus, like other aircraft manufacturers, has to stockpile components when it can, but this adds to inventories at a time when funding these is becoming more expensive.

Another concern facing every aerospace firm, including Cirrus, is finding staff. With around 1,500 of its 2,400-strong global workforce in Duluth, the business is a major employer in the north Minnesotan city, and some of its staff have worked there from the early days of the company. However, to help develop the next generation of products, Nielsen wants to add another 80 engineers and other graduate professionals over the next three years.

"Virtually everyone in the US at the moment has a recruiting challenge," he admits. However, he believes that a stimulating working environment, with plenty potential for career advancement, helps lure and retain talented individuals. He also wants to see an end to the remote working of the pandemic. "When people work from home, it's really difficult to onboard them into your culture. When you are part of a team building something physical, it's hard to do it remotely."

So how does the company attract young professionals from university cities and aerospace clusters in the likes of Florida, Texas or California? Duluth's location – midway between Minneapolis and the Canadian border – is a factor. What the city lacks in year-round sunshine and cutting-edge culture it makes up for in access to the great outdoors. "Many of our employees are into these activities. Here, you can swim, ski, cycle, it's all on your doorstep," says Nielsen.

Cirrus also goes to great efforts to make its staff and their families feel connected with the company. It recently hosted a special showing of Tom Cruise movie Top Gun: Maverick, for instance, and runs a flying club and offers discounted flying lessons for colleagues, so they can themselves sample the aircraft they help build when they go on vacation. "We want to make working here more than just about collecting a paycheck. It's a community," says Nielsen.

Work began in September in renovating the former Northwest Airlines hangar, which has been without a tenant since May 2020. Engineers will work on two floors, overlooking the hangar floor, used for structural and material testing and other experimental work. "They will look down on their own creations," says Nielsen. Importantly, with rapid prototyping cycles, it will also reduce idle time, he says. "Now when they want to know something, they get up from their desk and walk 100 feet."

Cirrus has two SF50s and an SR22 on the static display.

The SR22 is the most produced general aviation aircraft this century

Cirrus

UK start-up Vertical Aerospace is among a small group of pioneers driving the development of eVTOL platforms for market entry later this decade – but can it maintain momentum?

Only way is up

Rolls-Royce

Start-up faces a busy period of testing as it aims for service entry in 2025

Murdo Morrison

The two prototypes in Vertical Aerospace's engineering centre in Bristol illustrate how the UK start-up – and perhaps the entire electric vertical take-off and landing (eVTOL) segment – has evolved in a few short years.

Tucked at the back is the VA-X2, a demonstrator that made several autonomous flights during 2019 and 2020. Approximately the size of a two-seat helicopter, the aircraft has six pairs of horizontal, coaxial propellers that sit in a circular formation above the fuselage.

In front of it – and fresh from its Farnborough air show appearance in July – is Vertical's latest iteration, the VX4. The contrast is striking. The aircraft is a replica – the real prototype is at the start of a flight test campaign at the nearby Cotswold airport in Kemble, Gloucestershire. However, with its sleek, fixed-wing design and cabin the size of a London taxi passenger compartment, the aircraft resembles something time-pressed travellers would happily step into to complete the first or last few kilometres of a journey.

The X2 itself represented a major reworking of Vertical's original 2018 concept, which used ducted fans, but in looks is typical of the first wave of quirky urban air mobility (UAM) platforms that emerged in the two years before the pandemic. During that time there were at least 100 ventures working on eVTOL designs – almost all of them searching for funding and talent to take their idea from blueprint to flight, certification, and eventually volume production.

Vertical, founded six years ago by UK entrepreneur Stephen Fitzpatrick, is one of maybe fewer than 10 UAM players to have survived that early gold-rush period (not to mention the pandemic), secured serious financial backing and customer commitments, and either flown or are close to flying something resembling a production-ready aircraft. Others include Embraer spin-off Eve, the USA's Archer Aviation, Joby Aviation and Wisk Aero, plus Lilium Air Mobility and Volocopter from Germany, and China's EHang.

Like Archer and Joby, Vertical is listed on the New York Stock Exchange, and it too has seen its share price trend downwards – in Vertical's case from a high of almost $13 just after its flotation in December last year to around $5.5 in mid-September. However, that is often the case with technology disruptors where initial hype turns to a more sober assessment of value and prospects once the inevitable challenges of taking a concept to market and turning a profit become clear.

Capital expenditure

In common with any start-up without a product to sell, Vertical continues to spend without making much revenue. It reported an operating loss of £39 million ($45 million) for the six months to end-June. However, it claims to have around £158 million in cash, enough to fund operating expenses and capital expenditure for at least 12 months. In addition, it has the option of issuing $100 million in additional shares, backed by an equity subscription line through Nomura.

It is also sitting on one of the UAM sector's most enviable of what it calls "pre-order" books – with commitments for around 1,400 aircraft from the likes of AirAsia, American Airlines, lessor Avolon, helicopter operator Bristow, charter provider Flying Group, Brazilian carrier Gol, Japan Airlines and Virgin Atlantic. American's contract includes an unspecified pre-delivery payment to secure delivery slots for its first 50 VX4s, out of a possible 350.

Like its competitors, Vertical faces a busy and uncertain 30 to 40 months as it pushes to take the VX4 from flight-testing this year to a planned service entry in 2025. Regulators in Europe, the USA and beyond still have to publish detailed certification roadmaps, training manuals, and operating guidelines for the new sector – and the jump from initial certification to volume manufacturing is where aircraft

1,400

Vertical has one of the largest 'pre-order' books in the UAM sector, with international customers lining up for the VX4

Vertical has secured validation from the CAA and EASA under SC-VTOL rules

Vertical Aerospace

developers often stumble, as they encounter regulatory challenges or run out of money.

It is still unclear too whether customers will take to UAM in sufficient numbers to make these new platforms viable. This will depend on operators coming up with profitable business models – whether that involves replacing ground transport as a way of getting air travellers to and from their final destination, providing on-demand air taxis, or using them for other purposes such as medevac or cargo. Passengers will also have to be convinced that they are safe.

Michael Cervenka, Vertical's president, is convinced that neither of these will be challenges for the company. Multiple redundancy will ensure that the VX4 is many times safer than a similar-sized helicopter with its single points of failure, he insists. He also expects that airlines looking to provide rapid, relatively cheap, and environmentally friendly "last mile" transport to their premium passengers will provide the bulk of customers for the aircraft, at least initially.

However, without naming anyone, he doubts whether all the current leading players will make it to the finishing line. "I can see the market consolidating to perhaps half a dozen or even fewer," the former Rolls-Royce executive told FlightGlobal at the Bristol site in early September. "When I joined [in 2019], I hoped we could be in the top 10, but I get the sense that number is reducing and I think we now have a good crack at being one of five."

Potential revolution

The UAM explosion has parallels with the excitement around very light jets (VLJs) two decades ago – another market that promised to change air travel habits by making private jet ownership and charter available at a much lower price point, and accompanied by a boom in provisional orders. The revolution ended badly, with the failure of several start-ups and retreat from the segment by a handful of established manufacturers including Cessna, Diamond and Piper.

However, Cervenka argues the UAM movement is different from VLJs in two ways. Technologically, VLJs did not adopt truly disruptive technology, but were simply smaller products that manufacturers believed they could produce in volume at a lower unit cost. Secondly, the potential market was largely people already using piston general aviation aircraft. UAM platforms such as the VX4, by contrast, offer a "genuine shift in transportation across a range of sectors", he says.

Vertical conceived its latest design over a year ago, with the company opting for high wings and a large V-tail – combined with four tilting front and four rear propellers – to obtain the necessary payload of four passengers and their luggage plus a pilot, says Cervenka. The additional lift provided by wings also reduces battery use, meaning that on a typical trip recharge times will be just 10 minutes. This turnaround will be crucial for many business models to be viable, he argues.

Improved visibility

The fuselage tapers to the front with room in the cockpit for just the pilot, providing better visibility than a helicopter, says Cervenka. A structural bulkhead separates the double-door, air-conditioned, comfortable cabin, although a glass panel on the final design will allow passengers to look forward. Behind the cabin is a 300l luggage compartment. The variable-pitch front propellers are five-bladed. The rear propellers have four blades and align in a "scissor" layout to reduce drag in cruise.

Building in safety has been paramount, says Cervenka. Fly-by-wire technology coupled with distributed electrics – each propeller is driven by two independent battery-powered motors – means "you can knock out multiple systems and the aircraft will still fly". Environmental friendliness is not just limited to a light carbon footprint. For passengers the noise generated will be equivalent to that of loud conversation in hover, and in the cruise, a domestic fridge, Cervenka claims.

The mock-up displayed at Farnborough and demonstrated to FlightGlobal in Bristol is essentially the same as the flight-test prototype and the final production design, although there will be a number of tweaks to the latter, including a slightly smaller cabin, he says. Discussions with suppliers on final specifications are also ongoing, including with electric motor provider R-R. "We will be in an optimisation phase with them over the next 12 to 18 months," says Cervenka.

After a series of ground tests, flight-testing on the VX4 was due to begin this autumn. Unlike some of its rivals, Vertical has opted to "do the hard job" and fly a full-scale prototype at Kemble, with a pilot in the cockpit much of the time. "The trouble is that technology does not scale," says Cervenka. "You can fly sub-scale but you're left with unknowns. On aircraft such as these the mass including the batteries are 85% of the overall weight, so if your calculations are out by 5% you lose a third of the payload."

Flight-testing will start with a series of tethered hovers, followed by thrust-borne and then wing-borne flying with full transition from vertical flight to cruise. Vertical has already secured concurrent validation from both the UK Civil Aviation Authority (CAA) and the European Union Aviation Safety Agency (EASA) for certification under SC-VTOL (special condition for vertical take-off and landing aircraft) rules. It hopes to follow that rapidly with approvals in key markets Brazil, Japan and the USA.

In addition to its household-name potential customers, Vertical has assembled a respectable array of programme partners, including Honeywell on avionics, Leonardo for the composite fuselage, R-R, and GKN, which is providing the wing and helped the company assemble the initial VX4 in its Global Technology Centre in Bristol. Vertical will deploy Dassault Systemes' 3DExperience cloud-based design platform for its flight-testing and certification campaigns.

Cervenka says Vertical's philosophy has been to focus on what it does best – integration – and trust the expertise of suppliers. "Building an aircraft company is a tough job, and certificating an aircraft is tougher. It is crazy to try to do it all vertically. There is no point in us trying to write critical software when Honeywell has been doing it for decades," he says. "We also get to leverage these companies' technology pipelines. Why would we invest in what they are already doing?"

An exception is the batteries, where, after failing to find a suitable supplier, Vertical has put together

Vertical Aerospace

"On aircraft such as these the mass including the batteries are 85% of the overall weight, so if your calculations are out by 5% you lose a third of the payload"

Michael Cervenka **President, Vertical Aerospace**

its own 23-strong engineering team, comprising largely former employees of Dyson, the household appliances company, and Jaguar Land Rover. However, it has signed up Taiwan's Molicel, a leader in lithium-ion technology, to supply the cylindrical cells that Cervenka says will be easier to certificate because their shape makes them less prone than a pouch design to thermal runaway.

Short-haul services

As well as airlines keen to provide end-to-end services for passengers, Vertical envisages orders for the 85nm (160km)-range VX4 coming from air taxi companies and those looking to provide ultra-short-haul services between cities, such as Manchester and Leeds or Dusseldorf and Cologne. There are also opportunities in the likes of Sao Paulo, the biggest urban helicopter market in the world, given that the VX4 will have a fifth of the operating costs of a similar-sized helicopter, says Cervenka.

"The pace will differ from city to city, and some will be pioneers, but this will be a mass transport mode, which helicopters have never been," he says. "It changes how we think about air travel." Even traditional helicopter operators may be thinking that way. At Farnborough, emergency medical services (EMS) specialist Babcock International signed with Vertical to investigate the potential of the VX4 for EMS, including civil first-responder operations and military casualty evacuation.

Cost benefits

At a list price of around $4 million, the purchase price of the VX4 will be around half that of a similar-size helicopter. However, add the extensive maintenance bills for gas turbine engines and gearboxes and the difference in running costs is marked, argues Cervenka. "A third of a helicopter's cost is maintenance. As the cost of running a battery is really low, we get rid of all that, and electricity is cheaper than kerosene," he says.

Vertical expects its first full year of production to be low volume but rising to 2,000 per annum by the end of the decade. With almost every aerospace manufacturer currently experiencing shortages of parts and raw materials as well as other logistical glitches, Cervenka anticipates readying the supply chain to be a major challenge, but hopes that, by the time Vertical ramps up production, the global supply situation will have improved.

VA-X2 demonstrator made several autonomous flights in 2019 and 2020

Vertical Aerospace

> "A third of a helicopter's cost is maintenance. As the cost of running a battery is really low, we get rid of all that, and electricity is cheaper than kerosene"
>
> **Michael Cervenka President, Vertical Aerospace**

Vertical, which employs 300 people, most of them engineers, has been strengthening its management team as it puts in place plans for volume assembly. It has appointed to its board Mike Flewitt, the former chief executive of McLaren Automotive and vice-president manufacturing for Ford Europe, to benefit from his expertise in volume production. "This isn't automotive, but there are many of the same principles," says Cervenka.

Vertical's headquarters – a leased unit on an unprepossessing inner-city industrial estate – is too small for a factory, but Cervenka is keen on staying in the area when Vertical establishes a production site because of its talent pool and proximity to industry partners and aerospace-focused universities. Airbus, GKN and R-R have a major presence in the region, as do many smaller suppliers. "There would need to be a damn good reason not to do it near Bristol," he says.

eVTOL manufacturers are keen to point out how easy their aircraft will be to pilot. The VX4's controls essentially comprise an inceptor – or joystick – on the right and a lever on the left to control speed. There are pedals to yaw, but the final model will likely dispense with these. "The commands the pilot gives are unified regardless of phase of flight, making it easy to manoeuvre," says Cervenka. "My seven-year-old daughter could fly this aircraft."

Will eVTOL aircraft such as the VX4 even need pilots? Many envisage a near future where they will fly autonomously, including several of Vertical's contemporaries. Cervenka sees that coming, but not until the late-2030s. "Our strong view is that these aircraft will need to be piloted well into the next decade," he says. This has an effect not just on perceptions of safety, but economics. "The minute you put a pilot on board, you have to carry four passengers to make money," says Cervenka.

Training programme

Initially, he says, pilots are likely to be qualified aviators who will undergo a type rating conversion, just as with any new aircraft. Vertical has selected CAE to design a training programme.

Some suggest a key reason airlines are flocking to the UAM sector is that it could provide a pipeline of pilots with 1,500h of experience. However, while Cervenka admits this could be a useful side benefit, "it has not come up in any conversations we have had with the airlines".

The next few years will be a critical time for the fledgling UAM sector. Will investors and customers keep the faith? Will supply chains hold up? Will regulators – and public opinion – play ball? Will passengers flock to this entirely novel form of eco-friendly aviation? Will infrastructure fall into place? It is unlikely that, even if all the above work in the sector's favour, there will be room for as many as 10 competitors by the second half of the decade.

A Darwinian race is already underway. Vertical is convinced it will be one of those surviving and thriving in this brave new world of air travel.

Vertical Aerospace

At $4 million, the price of the VX4 will be half that of a similar-size helicopter

Other developers hoping to rise above the competition

From more than 100 would-be disruptors in the years before the pandemic, the number of electric vertical take-off and landing (eVTOL) aircraft developers with a serious chance of bringing a commercially successful product to market has probably slimmed to high single figures. These are some of them.

Embraer

Embraer's Eve project has the backing of United Airlines

ARCHER AVIATION

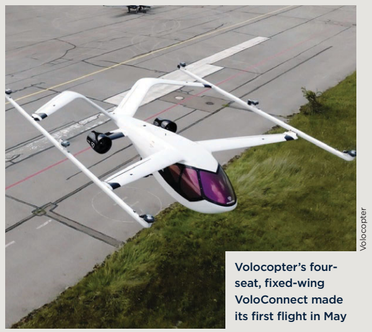
After completing its first hover test flight last December, California-based Archer Aviation said in June that it was confident of flying "full transition" sorties with its Maker urban air mobility prototype by the end of the year. In August, the business announced that it had completed a preliminary design review of the production version, the four-seat Midnight, which has two long wings, with three propellers mounted on each. Its early customers include United Airlines, which also in August made a $10 million downpayment on a conditional order placed in February 2021 for up to 200 of the aircraft.

EHANG

China's eVTOL champion, EHang, has been conducting demonstration flights of its EH216 prototype for a number of years, mainly in Asia, where it has been netting provisional orders in the likes of Indonesia and Malaysia. It also flew in the USA in early 2020. The EH216 has a two-seat bubble capsule supported on a frame from which eight retractable arms, each containing an upward- and downward-facing propeller, form a circle. It has been designed for autonomous flight from the start.

EVE

Embraer technology spin-off Eve has been one of the most commercially successful developers, with its most recent coup being a $15 million investment from United Airlines in September, with a conditional commitment to purchase up to 200 of its in-development four-seat eVTOL aircraft. This adds to letters of intent for almost 2,000 examples from 22 customers, says Eve. The company, which went public earlier this year but is still majority owned by the Brazilian airframer, is confident of delivering its aircraft, currently designed with fixed wings and a total of eight lifting propellers and pusher propellers, by 2026. It will offer 54nm (100km) of range.



Volocopter

Volocopter's four-seat, fixed-wing VoloConnect made its first flight in May

JOBY AVIATION

Another Californian start-up, Joby Aviation has taken the unusual step of working with the US Department of Defense (DoD) on one of its technology programmes. Disclosing the deal at July's Farnborough air show, Joby said an injection of cash from the DoD would help fund its efforts to launch a passenger ride-sharing service, based on its eVTOL design. The company has been flight-testing its five-seat prototype autonomously since last year, but in February experienced a crash during an "envelope expansion campaign".
A second aircraft had joined the flight test programme in January. The design features two tilting propellers mounted on each wing, with two more on the tail. Its range is 133nm with a top speed of 178kt (321km/h).

LILIUM AIR MOBILITY

In a market of mould-breaking designs, the Lilium Jet is one of the most unusual. Described by developer Lilium Air Mobility as the first eVTOL jet, the six-seat aircraft's unique feature is what the company calls ducted electric vectored thrust technology, with electric jet engines integrated into the wing flaps and aerofoils. Its range will be 135nm. In March 2022, the German company secured an agreement from fractional ownership giant NetJets to purchase up to 150 examples. At the Farnborough air show, it added agreements with AAP Group of Norway and helicopter operator Bristow. Its board includes former Airbus chief executive Tom Enders and airline entrepreneur David Neeleman.

Lilium Air Mobility

Lilium Jet has vectored thrust engines integrated into its wings

VOLOCOPTER

Volocopter is another German company with a former Airbus boss involved. Dirk Hoke, who formerly headed the airframer's defence business, became its chief executive earlier this year. The company is developing a family of eVTOL aircraft, with its latest design, the four-seat, fixed-wing VoloConnect, making its first flight in May. It was the third type to take to the air, joining the VoloCity and VoloDrone. It is targeting what it calls a "commercial launch" for the multirotor VoloCity in 2024, with the VoloConnect entering service in 2026. It says the range of aircraft will cater for different missions, with the VoloCity pitched at intracity routes, and the larger VoloConnect focusing on longer urban and suburban flights.

WISK AERO

The Californian company, which Boeing part owns, said at Farnborough that it would reveal this year its latest four-seat eVTOL air taxi, after displaying an earlier version at the show. The two-seat Cora has 12 wing-mounted lifting fans and one aft-mounted pusher propeller. It flew 400 times before it was decommissioned this year. Wisk Aero said in July that it had logged some 1,600 test flights across its aircraft since its first in 2017. It is one of a handful of eVTOL developers that expects their designs to fly autonomously from entry into service.

We profile two aircraft sure to catch the eye on the static display – Dassault Aviation's Falcon 10X plus Daher Aircraft's TBM 960

French connections

BillyPix

Falcon 10X

Dassault has a cabin mock-up of its largest jet on display, rather than the real thing, as it continues its development effort. The 10X will be powered by the Rolls-Royce Pearl 10X, a version of the engine family on the Gulfstream G700 and G800 and Bombardier Global 5500 and 6500. Launched in May 2021, production of the 10X is due to begin next year, with Dassault claiming that it will have the largest cabin of any traditional business jet. Cabin height is 2.07m (6ft 8in), and volume is 79cu m (2,780cu ft). The manufacturer has not disclosed a target date for first flight, but service entry is slated for 2025.

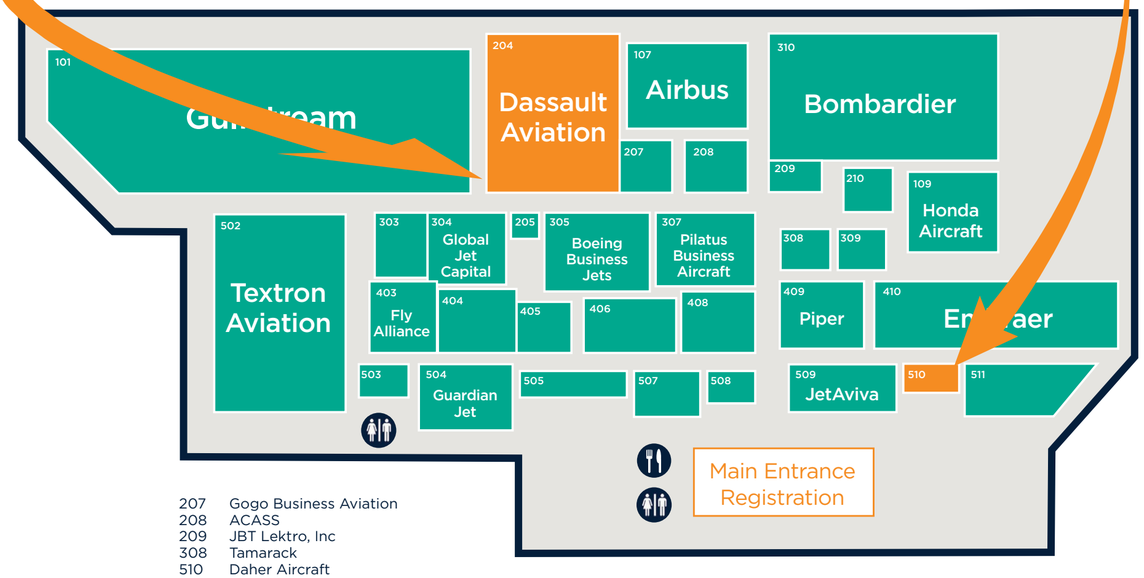
BillyPix

TBM 960

French manufacturer Daher began deliveries of the latest version of its top-selling TBM family in April, and said at EBACE in May that it had a backlog of orders to September next year. The Tarbes-assembled $4.6 million TBM 960 is the fifth evolution of the fast single-engine turboprop since the TBM 900 series' introduction in 2014. It replaces the TBM 940 in the manufacturer's line-up and is powered by a Pratt & Whitney Canada PT6E-66XT with five-blade Hartzell propeller. Other features include Garmin G3000 avionics and GWX 8000 weather radar. Maximum cruise speed is 330kt (611km/h) and service ceiling is 31,000ft. It has a range of 1,730nm (3,204km).

STATIC DISPLAY OF AIRCRAFT AT ORLANDO EXECUTIVE AIRPORT

Note: Details correct at the time of going to press



207 Gogo Business Aviation
208 ACASS
209 JBT Lektro, Inc
308 Tamarack
510 Daher Aircraft
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303 Vaerus Jet Sales
404 Freestream Aircraft
405 FlyExclusive
406 Collins Aerospace
408 Leonardo Helicopters
503 SmartSky Networks
505 Cirrus Aircraft
507 Tecnam
508 Aviat Aircraft

Accomplished aviators, from real life and silver screen, feature in a star-studded speaker programme at the show tomorrow

Day two's Top Guns

Murdo Morrison

An airline pilot who landed her critically damaged Boeing 737 to save the lives of 148 passengers and crew, and three people associated with the making of the movie Top Gun: Maverick head the speaker programme on day two of BACE.

Tammie Jo Shults was captain of Southwest Airlines Flight 1380 en route from New York LaGuardia to Dallas Love Field on 17 April 2018 when an uncontained engine failure ripped open the Boeing 737's fuselage and caused rapid decompression of the cabin.

Shults – one of the first women Boeing F/A-18 Hornet pilots in the US Air Navy, who has also worked as an aerial firefighter – and her co-pilot successfully landed the stricken airliner at Philadelphia. She later wrote about her actions that day – and her life up to that point – in the bestselling autobiography Nerves of Steel.

Since then, Shults – who appears in the keynote session from 09:30 to 11:00 – has been an advocate for women in the industry, and has received numerous awards including the Wings Club of New York's Outstanding Aviator accolade.

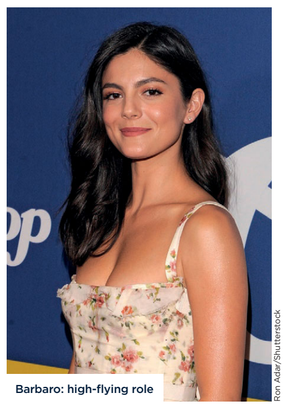
"Tammie Jo Shults has demonstrated extraordinary leadership in the air and on the ground," says NBAA president and chief executive Ed Bolen. "We are thrilled to have her with us to share her incredible story."

Also appearing in tomorrow's opening session are actress Monica Barbaro, cinematographer Kevin LaRosa II and stunt pilot Frank Weisser, all of whom worked on the Tom Cruise blockbuster, the sequel to 1980s classic Top Gun.

CMG Worldwide

Steel nerves: Shults today (*right*) and in her military flying days

CMG Worldwide



Ron Adar/Shutterstock

Barbaro: high-flying role

Barbaro plays "Phoenix", the sole female recruit in the film. She went through intense flight training for the role and qualified as a pilot during the making of the movie. With a string of successes behind her, she is due to star opposite Arnold Schwarzenegger, playing his daughter, in a new Netflix series.

LaRosa is a third-generation pilot and the second in his family to become an aerial coordinator and stunt pilot. As well as Top Gun: Maverick, he has worked on more than 100 films including The Avengers and Iron Man, and is one of the most sought-after professionals in the business.

Weisser, a former US Navy commander, is a Blue Angels pilot who saw combat in three campaigns. He flew in the front seat as pilot for some of Top Gun: Maverick's most memorable scenes, including the one where Cruise negotiates a twisting canyon.

Following the keynotes, there is a packed programme of educational workshops throughout day two covering topics from privacy in the ADS-B era to in-flight catering and employment law.

At 13:00, a one-hour session on how to prevent runway incursions, the most frequent type of accidents in business aviation, features speakers from Boeing, Textron and Advanced Aircrew Academy.

At 14:30, the focus is on urban air mobility and what needs to be done to create an operational infrastructure that will cope with potentially thousands of these new sustainably powered air taxis and cargo platforms.

At 16:00 a second session on the subject will ask if flight departments are ready for emerging aircraft technologies, making the case that these could change the industry for the good, but recognising that challenges have to be overcome, not least community acceptance and regulatory hurdles.

Alternatively, head for room S230GH at that time, where you can find out about strategies to overcome crew fatigue through good planning and operational practice.

You might instead want to hear about the industry's diversity, equity and inclusion efforts in an interactive panel, led by members of NBAA's DE&I working group, also at 16:00. "All voices are welcome and will be heard in an effort to answer tough questions and address feelings from various perspectives," promises the summary.

Full details in the BACE section of the NBAA web site

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