Issue 4

Thursday
22 June 2023

FLIGHT DAILY NEWS

With distribution supported by CAE

54th INTERNATIONAL
PARIS AIR SHOW
LE BOURGET
JUNE 19-25, 2023

Going the distance

Airbus says EASA agreement on A321XLR fuel tank clears way for certification

David Kaminski-Morrow

Airbus's long-range A321XLR is making its air show debut, as the airframer aims to certify the CFM International Leap-1A version by the end of this year.

Executive vice-president for programmes Philippe Mhun tells *Flight Daily News* that Airbus has agreement on the twinjet's technical configuration following discussions with the European Union Aviation Safety Agency – notably regarding the aft centre tank, critical to the XLR's range of up to 4,700nm.

Three flight-test aircraft – both Leap- and Pratt & Whitney PW1100G-powered models – are participating in the certification campaign, but the regulatory discussions on the XLR's modifications from the A321neo mean they are not identical.

"They're not completely, at the same time, reflecting the final configuration that we agreed with EASA," says Mhun.

Some of the prototype A321XLRs have tested extended belly fairings for aerodynamic assessment, which are not representative of the final material, while others have been fitted with the latest structural reinforcement and fuel-tank protection.

"We had to exchange with the authority, taking their inputs in terms of improving the technical baseline of the aircraft. We have agreement now on the technical baseline," says Mhun.

"The flight-test aircraft will reflect, at some point in time, the structural reinforcement and internal [fuel-tank] liner that we agreed on."

While the XLR has wing fuel capacity of 15,328 litres and standard centre-tank capacity of 8,200 litres, it features a high-capacity aft centre tank able to hold a further 13,100 litres. The aircraft also has options for an additional 3,120-litre forward tank.

The aft tank's size raised concerns over the potential for large fuel spillage and fire in the event of an accident.

Mhun says the protective liner is designed for the interior of the tank and its task is to contain the fire risk long enough for passenger evacuation.

"If you have a kind of puncture in the tank, [the liner is] a way to delay and reduce the leak rate to avoid getting fuel on the ground," he says.

Mhun says the principle resembles the fitting, two decades ago, of Kevlar lining to the inside of BAC-Aerospatiale Concorde tanks to protect against fuel spillage from debris impact.

"The spirit of it could be similar, but the content is different," he says, because the materials involved have advanced.

Rather than being puncture-resistant, Mhun states, the lining is soft and "optimises" such that "the hole in the liner would be smaller than the hole in the [tank] structure".

But he stresses that the XLR's range is not compromised by the liner's presence. "We're able to deliver on the mission agreed with the customers," he insists.

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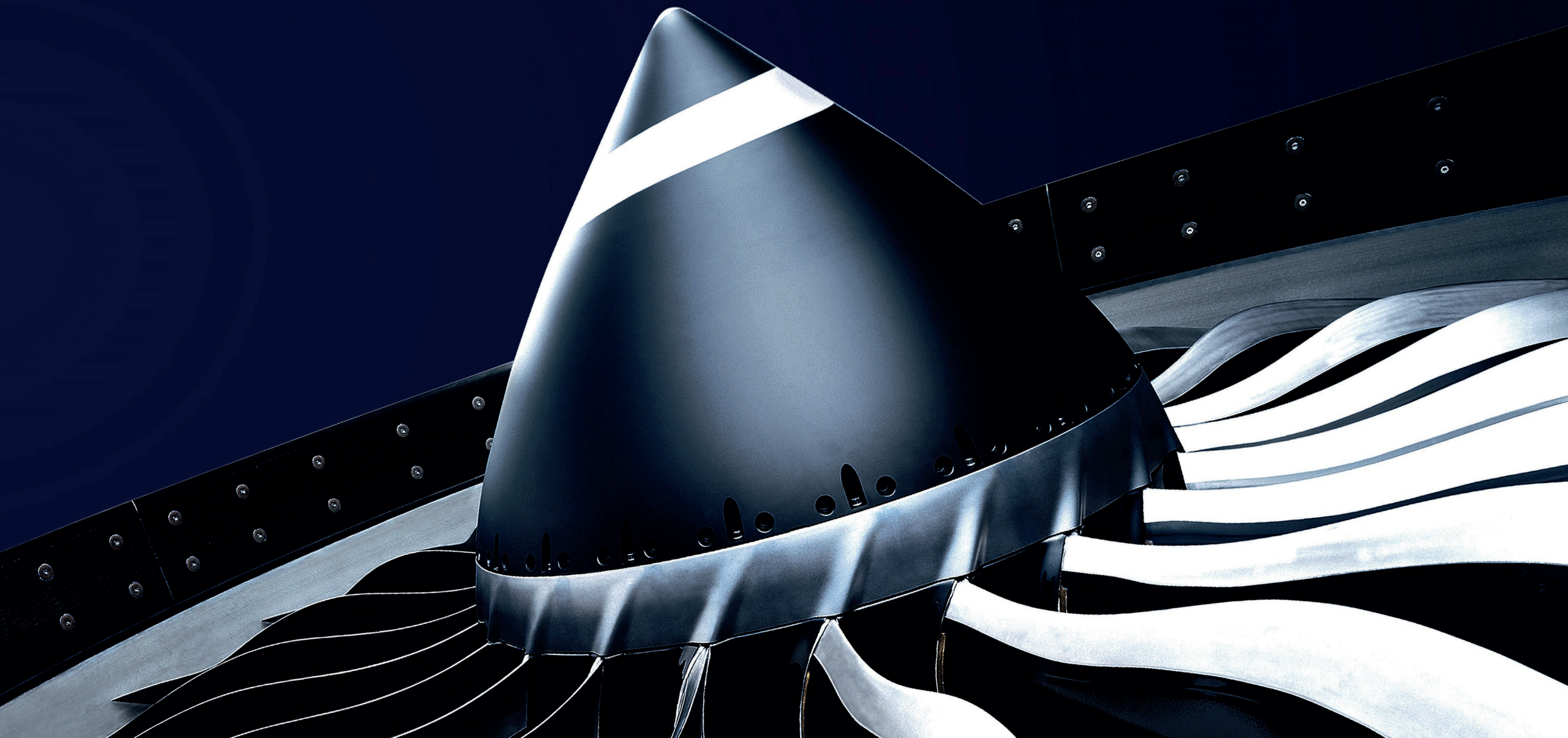

Scherer predicts widebody swing on quieter third day

Lewis Harper & **David Kaminski-Morrow**

Airbus chief commercial officer Christian Scherer foresees a swing in the supply-demand balance in the widebody sector which could be sharper than that affecting the single-aisle market, he said during an investor forum at the show yesterday.

His comments came as two widebody commitments from lessors were among the commercial order highlights on Wednesday: Avolon signing a tentative agreement for 20 Airbus A330neo twinjets, all of which will be the -900 variant, and Air Lease ordering two more Boeing 787s.

Indeed, Scherer says there is evidence of "very strong growth" in widebody demand.

"The transition from oversupply to undersupply is going to be, perhaps, even more violent – I say this carefully – but could be more violent even than on single-aisle," he says.

"I don't think we're quite there yet. The widebody demand is certainly coming – just this air show is proof of that, and the discussions we're having with our customers."

Wednesday's other order activity lacked the blockbuster deals seen on the show's first two days, when IndiGo and Air India dominated the aircraft count by committing to hundreds of jets each.

But there was still an Indian flavour to yesterday's agreements, with low-cost carrier Akasa Air announcing a relatively small commitment for four more 737 Max 8s.

Elsewhere, Boeing secured a European launch customer for the 737 Max 7, as Luxembourg's flag-carrier Luxair ordered four of the twinjets.

The deal brought Luxair's firm commitments for the CFM International Leap-1B-powered narrowbody family to eight, after it ordered four Max 8s earlier this year.

Boeing recently said that it expects the 737 Max 7 to be certificated this year.

Finally, De Havilland Canada identified Zimex Aviation as the third customer for its recently rebooted DHC-6 Twin Otter Classic 300-G, with a tentative commitment for two units.

The 32 orders and commitments recorded on Wednesday brought the show total to 1,266. That is the second-highest total at the two major air shows since the 1,526 orders recorded at Paris 2013. Since then, the only event to beat this year's total was Farnborough 2018, at which some 1,464 orders were recorded.

The trend for later order announcements at recent air shows means, however, that this year's event could still surpass previous highs.

Avolon's Andy Cronin with Scherer

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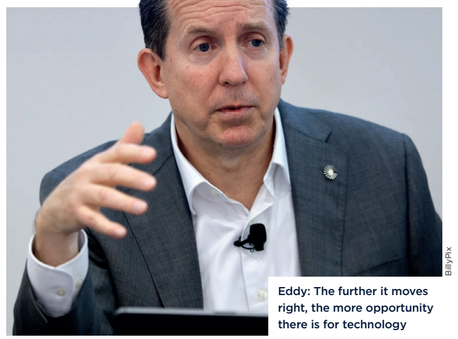

Eddy: The further it moves right, the more opportunity there is for technology

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A question of time

Pratt & Whitney thinks the aerospace industry might need a bit more time to achieve a broad goal of squeezing at least 20% more efficiency out of the next generation of narrowbody aircraft engines.

Executives at the Connecticut engine maker view that target as achievable, but likely not until between 2035 and 2040.

"We think that timing is moving to the right – 2035 or later, potentially," P&W president Shane Eddy said yesterday. "The further it moves right, the more opportunity there is to bring technology into the equation."

Airbus and Boeing are widely expected to begin developing new narrowbodies later this decade, for service entry around the mid-2035s.

Boeing executives have said their next jet must be at least 20% more efficient than the 737s it will replace – a goal that significantly depends on engine technologies.

Whether engine makers will be ready remains unclear.

"The capability to advance that technology for readiness in 2035 is perhaps a bit pushed," P&W chief sustainability officer Graham Webb adds. "We would see that phasing in... within the timeframe of 2035 to 2040."

The comments come as Raytheon-owned P&W and competitor CFM International pursue different strategies for achieving double-digit fuel-efficiency improvements from future engines.

CFM is developing an open-fan engine demonstrator under its RISE programme. Because open-fan designs lack nacelles, they are lighter than traditional turbofans and can have larger fans, meaning higher bypass ratios. CFM says its open-fan design "could be available by the mid-2030s".

By comparison, P&W is working under an EU-backed consortium to develop a version of its geared-turbofan engine equipped with hybrid-electric motors and water-enhanced technology (WET). Collins Aerospace is supplying electric motors for the project, while MTU Aero Engines is developing the WET system, which involves using exhaust-gas heat to vaporise water, which is injected into the combustor, improving efficiency.

"These are low [technology readiness level] technologies," Webb says. "There is a timeline to develop those, but its subject to the development ups and downs that inevitably occur."

Embraer and GKN hook up on hydrogen

Embraer and GKN Aerospace are to collaborate on development and integration of a hydrogen fuel cell powertrain that could result in flight tests aboard one of the Brazilian airframer's jets.

Announced at the air show yesterday, the partnership brings together two companies which have a "really good directional alignment" on their strategies for zero-carbon aviation, says GKN chief technology officer Russ Dunn.

GKN has been developing a 1MW-class fuel cell powertrain under the UK government-backed H2GEAR programme, which will result in full system tests by 2025.

Initially targeted at the sub-regional market for 19-seaters, the UK firm believes it can be scaled up to power an aircraft with at least 90 seats.

Embraer, meanwhile, has been working on future low-emission aircraft concepts under its Energia programme, including 200nm-range 19- and 30-seat fuel cell-powered models that could enter service in 2035.

"We always wanted to find a partner to move from a ground-based demonstration to a flight demonstration," says Dunn.

"We are now more and more confident about the capability of our system to move much more towards regional aircraft – Embraer is an absolutely ideal partner."

Dunn says he has seen "fantastic engagement" in the project from the Dutch and UK governments and is hopeful of securing financial support from both to advance the initiative. Flight testing would take place in the Netherlands, he says.

No decision has been taken on which Embraer aircraft the powertrain would be tested on: "There are options we have discussed," he says. "But there is more work we need to do together."

Dunn envisages testing the powertrain via a podded solution on the aircraft, with its existing engines remaining in place.

Flight tests would take place in the 2028-2029 timeframe to mature the technology for service entry in the mid-2030s, he says.

Deutsche cuts metal on D328eco

Dominic Perry

Deutsche Aircraft has begun cutting metal for the first parts to equip its initial D328eco prototype as it works towards a first flight of the turboprop in mid-2025.

Dave Jackson, managing director of the German airframer, says 90% of the aircraft's supply chain has now been "locked down".

The selection of Nordam to design and build the D328eco's nacelles, announced at the show yesterday, was the last of the major work packages to be allocated with just lower-tier suppliers still to be finalised, he says.

Deutsche Aircraft – which at the show is displaying for the first time its cockpit and cabin mock-ups to the public – will build two prototypes, plus a production-conforming aircraft for the certification campaign.

Although it will use pre-built structures - wings, noses and empennages - retained since the demise of the original Dornier 328 programme to equip the two prototypes, new centre fuselages will also be built.

These are 2.2m (7.2ft) longer than on the previous model, allowing passenger capacity to increase to 40 seats in a 1-2 layout.

The first stringers for the centre fuselage have now arrived at the firm's Oberpfaffenhofen headquarters near Munich: "We have started cutting metal," says Jackson.

He sees no problem in hitting a service entry goal of late 2026, despite the relatively short flight-test period, pointing out that will be achieved through an amendment to the Do 328's existing type certificate.

Deutsche Aircraft recently logged its first sale for the D328eco and Jackson is confident it can accumulate 150-200 orders – or three to four years of production – "between now and service entry".

Cockpit and cabin mock-ups are displayed at the show

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A3-skatey

Francois Jaubert demonstrates a skateboard made from A380 parts. The former naval architect is working with Airbus at the show to promote the recyclability of the manufacturer's aircraft. It is the first aviation venture for Jaubert, who set up his environmental skateboard company Trashboard during the pandemic to recycle the millions of cardboard boxes generated by the rise in online shopping.

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LXS for MHS

German aircraft management company MHS Aviation has ordered a Falcon 2000LXS business jet from Dassault Aviation.

The jet adds to MHS's previous two Falcon 2000LX aircraft, with delivery due in the second quarter of 2025.

"These are perhaps the ideal charter jets, considering their flexibility to carry large teams and to do so economically over short and long distances," says MHS Aviation chief executive Steffen Fries.

"Our clients love them."

Dassault's Carlos Branna (*centre*), with Axel Georg André (*left*) and Gerd Branecke of MHS

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AAM reality checks

Advanced air mobility (AAM) is going mainstream, but the futuristic vision is not without tricky and expensive challenges.

Safety, certification, pricing and consumer acceptance are just some of the obstacles the air taxi developers must address before the segment is ready for prime time, said the chief executives of electric vertical take-off and landing (eVTOL) aircraft developers Archer, Lilium, Volocopter and Wisk, at a panel discussion during the show.

"It's all about starting to crawl, then walk, then run," says Volocopter chief executive Dirk Hoke. "But if you look at the market, everyone agrees the market is huge, once the vehicles achieve certification. There will be thousands of applications," he adds.

Volocopter debuted its plans to fly at next year's Olympics in Paris next summer, paving the way for it to be the first in the world to begin flying commercial air taxi operations.

That service will, however, come at a price.

"In the beginning it will be expensive," Hoke says. Infrastructure costs, fees, and other initial investments will make it "affordable but more expensive than a taxi".

Lilium chief executive Klaus Roewe says that prices need to come down to about $3 per passenger-kilometre if the segment is to be successful. "If we want to scale this business, you need to come to this price point."

"We have to balance keeping operating costs as low as absolutely possible... to make it affordable for the masses," adds Archer chief executive Adam Goldstein.

While certification is certainly not easy for any of the vehicles, Wisk has an additional safety challenge – its aircraft is totally autonomous.

"We are not rushing to market," says Wisk chief executive Brian Yutko. "We think autonomy is the right thing for this market and we want to go directly there and want to do it in a safe way."

The technology is real, it works, and it's coming, the executives say.

The Sky Spear lands at show

Rafael has used the show to unveil a new long-range air-to-air missile named Sky Spear.

Describing the weapon as a "sixth-generation" design, the Israeli company claims it will provide operators "unparalleled operational capabilities in the complex arena of aerial combat".

"The Sky Spear is designed to engage targets at long ranges, ensuring that opponents are overwhelmed before they have a chance to launch," Rafael says. A new radar seeker and undisclosed additional technologies "allow for early lock-on, and a more accurate end-game".

Displayed on the company's stand, the Sky Spear is similar in size to the company's I-Derby ER beyond-visual-range air-to-air missile.

"Rafael is confident that this newest missile will provide the advanced capabilities that will provide users a qualitative edge over their most capable adversaries," says Brigadier General (Reserve) Pini Yungman, head of the company's air and missile defence directorate.

Eurofighter targets many Typhoon sales

Craig Hoyle

Eurofighter's new chief executive says opportunities exist to close multiple new Typhoon sales by the middle of this decade.

"There are really promising opportunities in front of us, both for additional aircraft for our core nations [Germany, Italy, Spain and the UK], but also on the export front," Giancarlo Mezzanatto says. These include planned follow-on purchases by Germany and Spain, plus export opportunities with nations including Poland, Saudi Arabia and Turkey.

"I see 150 to 200 aircraft as opportunities over the next two years in terms of new orders," Mezzanatto says. "What we are doing as Eurofighter is getting prepared, to fully support our partner companies on the export market in order to meet these demands,"

The Typhoon in the flying display

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he adds. "We are thinking about how we can sustain the production rate."

Saudi Arabia has long held an interest in acquiring a second batch of 72 Typhoons, but a deal has not progressed so far due to export restrictions imposed by the German government.

Mezzanatto says a three-year spares and repair contract for Riyadh's current Typhoons was signed in late 2022, and that "the political scenario has changed quite dramatically" under the new German administration of chancellor Olaf Scholz. "Now Germany is much more engaged than it was before," he says, adding: "I am quite optimistic."

Meanwhile, the updated P4E standard required to deliver Germany's replacement for the Panavia Tornado ECR electronic combat and reconnaissance platform is currently being defined, with the expectation of initial operational capability being delivered during 2028-2029.

"With this [configuration] we will show how flexible the Eurofighter system is," he says, with 15 aircraft to gain new systems including Saab's Arexis electronic warfare suite, via a preferred bidder selection announced by Berlin on 16 June.

Noting that the Eurofighter entered service in 2003 and is expected to remain in frontline use until 2060, Mezzanatto says: "If you are at one-third of your life, you are still very young."

Eurofighter partner companies Airbus Defence & Space, BAE Systems and Leonardo have so far delivered 589 of the aircraft to nine nations, against a current total order book for 680.

Having been engaged in the Eurofighter programme for more than a decade, Mezzanatto was previously closely involved in Leonardo's sale of Typhoons to Kuwait.

He says a 10-year plan for the programme was endorsed by the defence ministers of its partner nations in March, and that "there is a very good understanding between the core nations and ourselves where we are, and what long-term evolutions of the aircraft will look like."

Moshe Levy says the Heron Mk II is even more capable than its predecessor

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IAI's Heron Mk II is 'new kid in town'

Israel Aerospace Industries (IAI) is seeing strong interest in its unmanned air vehicle (UAV) product line, with the Heron Mk II front and centre at its Paris air show exhibit.

Already in operational use, the medium-altitude, long-endurance type – which can operate at an altitude of 35,000ft – is replacing the company's popular predecessor on the market.

"The [Heron] Mk I is an excellent plane, but now we are replacing it, because there is a new kid in town," says Moshe Levy, general manager of IAI's Military Aircraft Group.

"It was one of the best UAVs flying, but the years passed and there were things that we should improve, and there are new customer needs."

Equipped with a "much more powerful, fully-certified engine" and dual-redundant systems, the product evolution is suitable for a wide range of roles, using electro-optical/infrared sensors and radar payloads to performing communications relay and electronic intelligence duties.

"From a mission point of view, this UAV comes with the ability to carry almost every payload you can think of," Levy says.

In addition to delivering performance and reliability enhancements, IAI also has worked to improve data exploitation, including by using artificial intelligence technology which prioritises delivering the information needed by operators. The company also is seeing strengthened demand for vertical take-off and landing products in the 40kg (88lb), 80kg classes and above, where an operating endurance of up to 10h can be provided. "The role [for small UAVs] is getting bigger and bigger", he says: "for ground forces, what you really need is something with a very small footprint".

Meanwhile, IAI will "this autumn" deliver its first Heron TP to Heron Mk I operator the German military. The turboprop-powered model will deliver an interim intelligence, surveillance and reconnaissance capability until the Eurodrone system enters operational use by the end of this decade.

Ukraine war demand boosts Diehl Defence

Ryan Finnery


Rauch: 'Based on the security situation, our business is increasing'

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Amid a global boom in demand for precision guided munitions spurred by the war in Ukraine, the defence wing of German manufacturer Diehl sees opportunity to provide European forces with weapons made in Europe.

"Our business was running already quite well before the war," notes Diehl Defence chief executive Helmut Rauch.

Diehl is best known for its IRIS-T line of missiles, available for both air-to-air combat and ground-based air defence.

The high-intensity combat seen in Ukraine has reinvigorated interest in advanced air defence capabilities, producing new sales for Diehl.

"Based on the security and safety situation in Europe, based on the war in Ukraine, our business is increasing, there is no doubt about it," Rauch says.

Governments in Europe, North America and the Indo-Pacific are embarking on major expansions of defence spending, with many focused on building greater stocks of precision munitions.

In the USA, Raytheon Technologies and Lockheed Martin are expanding production capacity for existing systems and developing new weapons. Australia is attempting to build a domestic industrial base to eventually produce munition components at home.

Europe, according to Rauch, is in the more enviable position of having mature producers like Diehl already churning out advanced weapon systems.

"I think it's very important to have these high-tech companies in Europe," he says. "The capacity in the United States is limited, and if you look to the worldwide situation, I think the capacity in the US at the moment is not big enough."

MCH-101s for Japan

Leonardo and Kawasaki Heavy Industries (KHI) are to build an undisclosed number of additional MCH-101 naval helicopters for the Japan Maritime Self-Defence Force (JMSDF) as it marks the start of a mid-life update (MLU) on the service's current fleet.

A licence-built version of the Leonardo Helicopters AW101, Japan operates 10 MCH-101s for mine countermeasures and transportation missions and three utility-transport-roled CH-101s in support of Japan's Antarctic research activities. Japan also placed an order for a single example in 2022.

An initial batch of rotorcraft is covered by the MLU, although Leonardo declines to specify a quantity. They will receive avionics upgraded to the latest standard, says the manufacturer.

KHI is the prime contractor on the MCH-101 with Leonardo Helicopters providing technical support for the platform, while local distributor Marubeni Aerospace is responsible for spares, ground support equipment and services.

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Left-to-right: Chief executive of Embraer Services & Support Johann Bordais; Chen Zhiqiang, president of Lanzhou Aviation Industry Development Group; Mark Neely, vice-president freighter at Embraer; Guo Qing, managing director of Embraer China; and Mike Xu, chief operator officer of Embraer China

Embraer edges to Chinese P2F line

Embraer has signed a letter of agreement with Lanzhou Aviation Industry Development Group for 20 E-Jet passenger-to-freighter (P2F) conversions at the show, in a deal that could see it establish a conversion facility in China.

The agreement is a noteworthy milestone for the P2F programme, which was launched last year and had previously secured one order: 10 units from Irish lessor Nordic Aviation Capital, with Kenyan cargo carrier Astral Aviation later earmarked as the launch operator.

"We are honoured to be the launch customer of the Embraer E-Jet freighters in China," says Chen Zhiqiang, president of Lanzhou Aviation Industry Development Group.

The two parties are yet to define the terms of the agreement, Embraer says, with details such as the aircraft variant – the programme covers E190s and E195s – and the source of the jets still to be established.

But the chief executive of Embraer Services & Support Johann Bordais says he envisages aircraft covered by the potential order eventually being converted in China under a "great partnership" for the country.

Embraer is currently working on conversion of the programme's first aircraft in Brazil. It expects the aircraft to be handed over for certification with Brazilian authorities by the end of this year, with jurisdictions such as the USA and China to follow.

Business aviation's green fightback

Business aviation has been in the firing line from environmental activists for its supposedly disproportionate impact on the climate. In May, protestors briefly disrupted the EBACE convention in Geneva by breaking into the static display and chaining themselves to aircraft.

This week at the show, manufacturers' group GAMA brought a number of the industry's chief executives and other leaders (*pictured*) to debate how the sector should respond to the criticism.

Suggestions included stressing how huge improvements in technology mean today's business aircraft produce a fraction of the emissions of their 1960s predecessors, pushing for a massive increase in the availability of sustainable aviation fuel, and enlisting younger people as advocates.

"We have got to convince people we are a good, essential and sustainable industry," said National Business Aviation Association president Ed Bolen.

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Nusseler: Quicker route to maturity

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Meet Maeve's latest model

Dominic Perry

Dutch start-up Maeve Aerospace has taken the wraps off the latest iteration of its Maeve 01 all-electric regional airliner, having radically slimmed down the developmental type.

Originally launched in 2022 as the Echelon 01 when the company was still known as Venturi Aviation, the aircraft was previously pitched as a 44-seater with a maximum take-off weight (MTOW) of around 45t.

Thrust was to be provided by eight 1.2MW electric motors powered by batteries.

But following the appointment of Martin Nusseler as chief technology officer in March this year, the Maeve 01 – revealed at the show yesterday – has been put on a crash diet and undergone a marked configuration change.

Power now comes from four 1.2MW electric motors, while the fuselage is elliptically shaped – 2.8m (9.1ft) wide and 3.2m high – rather than the previous 3.6m-diameter cylinder; wingspan has also been reduced.

Combined, the changes have contributed to slash the MTOW down to 25.9t, says Nusseler. Batteries will weigh in at around 8t, allowing a payload of around 5t. In comparison, the ATR 42-600 against which the Maeve 01 will compete has an MTOW of 18.5t.

Nusseler has also ditched plans to fly a scaled demonstrator, instead intending to ground test a one-quarter-scale version of the entire propulsion system.

"Testing through three full cycles of hardware and software until 2028 is a much quicker route to maturity," he argues.

The wing and empennage are likely to be manufactured from carbonfibre, while the fuselage will be metallic "in order to keep things as simple as possible". Batteries are located in a bay under the passenger cabin floor and in the motor nacelles.

Nusseler says the company is working to bring suppliers on board ahead of the first flight of a Maeve 01 prototype planned for 2028. It has signed up Amprius to provide the aircraft's batteries and Dynamic E Flow the electric motors.

If all goes to plan, Maeve hopes to have the regional aircraft certificated and in service by 2030. To date, it has attracted interest from Dutch start-up airline Lucy and New Zealand's Air Napier.

Co-founder Jan Willem Heinen estimates the company will require around $2 billion to bring the Maeve 01 to market. "I think we have a good shot at closing the first $50 million by the end of this year," he says.

That will be sufficient to fund Maeve through to 2025 and the closure of the preliminary design review phase.

Range with 44 passengers on board is a claimed 250nm (463km) with a maximum cruise speed of 330kt (610km/h).

Spirit's composites vision

Aircraft structures supplier Spirit AeroSystems is using the show to call attention to research work it hopes will enable the next generation of narrowbody jets to have composite fuselages.

The Wichita company already has a significant composites-manufacturing business, supplying wings for Airbus A220s and fuselage sections for A350s and Boeing 787s.

But Spirit is now upping its game, working under a NASA-supported project to develop technology and processes required to manufacture large composite structures at much faster rates – a prerequisite for future Airbus and Boeing single-aisle jets.

"We have some very deep... design experience [and] structural optimisation experience," Spirit chief technology officer Sean Black says. "These are all pretty high-rate environments... We have a very good understanding of what it takes."

High rate output is key to the aerospace industry unlocking the weight-saving benefits of composite materials for future narrowbodies. After all, Airbus and Boeing will each likely want to produce 50, 60 – maybe more – of the jets monthly.

But composites require vastly different manufacturing than metals.

They also fail differently and require unique inspection and repair procedures.

Recent issues with composite fuselage sections on 787s – a comparatively low-rate programme – highlight such challenges.

Despite such hurdles, Boeing Commercial Airplanes chief executive Stan Deal says he is "bullish on composites" for use on Boeing's next narrowbody, which the airframer is expected to introduce in the 2030s.

FLIGHT DAILYNEWS

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Red everywhere

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Meet the team that have been delivering your favourite show daily this week, in their distinctive red flight suits with the logo of this year's distribution sponsor CAE.

Bossard fastens onto aerospace

Swiss-based fasteners company Bossard Group is to create an aerospace division, as it eyes opportunities in the sector. Speaking to *Flight Daily News* at the show, group chief executive Daniel Bossard says aerospace "is an interesting field because it's long-term contracts".

Plans to consolidate came after the 2019 acquisition of Munich-based fasteners producer Boysen Aerospace. The company also acquired Swiss firm Interfast and has presences in India, France and Germany.

"We [also] wanted to consolidate some of the activities with other parts of the Bossard Group to create a global platform to explore the market," he adds.

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Headlines

Not to be mist: Dassault Rafale's vapour show

Skies alive

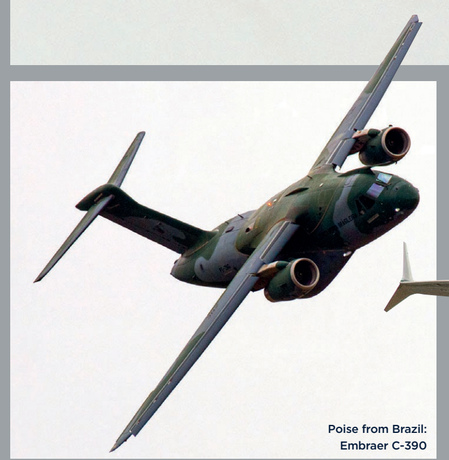
It may have been overcast for much of the week but Paris's airborne stars did not fail to impress

Roaring success: the Airbus Helicopters Tiger

Transport of delight: Airbus A400M

Different angle: Airbus Helicopters H160

Magister-estic: Fauga CM-170



Poise from Brazil: Embraer C-390

Big Boeing: 737 Max 10

Need for speed: Lockheed Martin's F-35

Marathon runner: Airbus A321XLR

Solid performer: NH Industries NH90

Dive got this: Eurofighter Typhoon

Winging it: Boeing 777X

Photography: BillyPix

Safran seals Patroller export deal

UAV was displayed with Thales guided rockets

BillyPix

Dominic Perry

Safran has secured its first export contract for the Patroller tactical unmanned air vehicle (UAV), with Greece signing a four-unit deal via the NATO Support and Procurement Agency.

To replace the Greek army's current Sperwer UAVs – manufactured by Safran Electronics & Defence predecessor Sagem – the Patrollers will be delivered from late 2024. Greece has also ordered three ground stations.

Fitted with a Safran Euroflir 410 electro-optical sensor, the UAVs will be used for surveillance missions, says Franck Saudo, chief executive of Safran Electronics & Defence.

Saudo says the deal expands the "long-standing relationship" between Greece and Safran.

He highlights the Patroller's export potential, citing its "world first" certification to fly over built-up areas, construction to NATO standards, and the performance of its sensors "to detect and identify" targets.

Lead customer France will receive its first Patrollers over the summer, says Saudo, with an initial pre-production example having been handed over in May to the army's 61st artillery regiment in Chaumont for evaluation and familiarisation.

France has an existing commitment for 14 of the domestically produced UAVs, but the draft version of the country's LPM military procurement law – to be finalised this year – provides for a further 14 units.

In addition, Safran is working with the country's DGA procurement body to arm the French Patrollers with Thales laser-guided rockets; the development will be "ready for 2026", says Saudo. Displayed on the company's outdoor exhibit, the Patroller is shown equipped with a pair of twin-rocket pods on under-wing hardpoints; a Hussar air-to-ground munition was also pictured alongside the UAV.

Rebranded ELT keeps it local

Italy's Elettronica may have rebranded to ELT Group, but the electronic warfare (EW) specialist is still stressing its Roman roots, alongside the importance of keeping indigenous capabilities within Europe.

Chief executive and chief operating officer Domitilla Benigni explains that the rebranding stems from a strategic rethink, consistent with its growing focus on EW and cyberwarfare.

"One of our key focuses is that all of the sensitive technology that ELT Group develops is native to Italy and Europe," says Benigni.

"We want to pursue sovereignty in technology for Italy and Europe – so that we don't buy sensitive technology from outside – as a strategic choice."

Benigni acknowledges that this is more expensive than acquiring off-the-shelf capabilities from overseas, but says that technologies purchased internationally can be subject to geopolitical and supply chain constraints.

ELT Group is involved in a number of high-profile aircraft programmes, including the Eurofighter Typhoon and Leonardo C-27J, and also sees opportunities in the Global Combat Air Programme, the joint fighter development between Italy, Japan, and the UK.

The company also focuses on anti-drone systems, specifically those that can jam drones using EW, but then employ a cyber capability to land it safely, a vital consideration when engaging a hostile UAV over a populated area.

Benigni: We want to pursue sovereignty

BillyPix

BillyPix

Flying Boeing's flagship

Boeing's in-development 777X is on the flight line at this year's Paris air show. The aircraft is one of four airframes that the US manufacturer has built for its flight-testing campaign.

Captain Heather Ross (*pictured*), deputy chief pilot for the 777X programme says the "vast majority" of the 777X's 2,800 flight-test hours have been accumulated by the airframe that is at Le Bourget.

The widebody is moving through US Federal Aviation Administration certification as the only next-generation 400-seat jet poised to enter the market this decade. Boeing sees the 777X family as the successor of its four-engined 747 jumbo jet and the Airbus A380 as the "large aircraft of the future".

Boeing holds 353 orders for its 777X family, which includes 777-9s, 777-8Fs and a third variant, the 777-8 passenger aircraft, development of which Boeing has paused.

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*Compared to 83% for competition, per third-party data.

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In brief...

Honeywell's HEM upgrade

Honeywell has unveiled a high-efficiency mode (HEM) upgrade for its 131-9B auxiliary power unit for Boeing 737 aircraft, providing fuel and emissions savings of 1-2%, and increasing time-on-wing by up to 1,500 flight hours.

Bluebox for Dash 8-400

De Havilland Canada is to offer Bluebox's Blueview digital systems platform on its Dash 8-400, it said at the show.

Envoy gets FlightSense

Collins Aerospace has announced a flight-hour contract with American Airlines affiliate Envoy Air for its FlightSense predictive maintenance product.

P&W makes Morocco move

Pratt & Whitney is to launch a subsidiary, Pratt & Whitney Maroc, in Casablanca, to make static and structural machined parts.

Fernandes promises big order... but not today

Alfred Chua

The AirAsia group of airlines "will definitely" be placing a large order for aircraft over "the next two years", although it will not be adding to the flurry of order announcements at this year's show.

Tony Fernandes, chief executive of AirAsia parent company Capital A, tells *Flight Daily News* in Paris that the group has other priorities at this stage.

"I think it's crazy for me to talk about orders now when I haven't got all my planes back [in service]," he says. "But this is a business and you need to plan quite a few years ahead, of course. I would say... over the next two years, we will definitely be placing large orders."

At the 2011 edition of the Paris air show, AirAsia made headlines when it placed an order for 200 A320neos. Then at 2019's event, it became the largest A321neo customer in the world after converting 253 of its A320neo orders to the larger variant.

With existing Airbus narrowbody commitments in place, Fernandes says the group is looking at "potentially acquiring" more widebody aircraft as an immediate priority – pointing to a robust recovery in the medium-haul market.

Low-cost medium-haul operator AirAsia X currently operates most of the group's widebodies, flying a fleet of Airbus A330-300s.

Moving forward, Fernandes says the group is "agnostic at the moment" about which airframer it would source its new fleet of widebodies from.

"You would think we would take the A330neo [as new aircraft]; we will see what is available. Growth in the medium-haul market has been very strong and AirAsia X is doing very well," Fernandes says, adding that the new aircraft would be a mix of leases and direct orders.

For the rest of the year at least, the group will remain "realistic" in its fleet strategy, as it moves from what Fernandes calls "survival mode" to the start of its "growth mode".

"We want to be sensible – we will definitely look at placing more narrowbody orders, but let's fully recover first," he says.

Fernandes says AirAsia expects to have put all of its aircraft back into service later this year.

Bilgin Sasmaz

Fernandes says AirAsia expects to have put all its aircraft back into service later this year

It is 50 years since the biggest tragedy of the Paris air show, when the Soviet Union's rival to Concorde broke up in mid-air, killing 14 people. We look back at an investigation that failed to identify a cause

The Tu-144S enigma

David Kaminski-Morrow

Le Bourget was the scene of gladiatorial supersonic spectacle 50 years ago when a Soviet Tupolev Tu-144S sought to outperform the rival BAC-Aerospatiale Concorde at the 1973 Paris air show, only to splinter into fiery rain over the suburb of Goussainville.

Cold War secrecy and reticence obscured the investigation. Eight months after the loss of the aircraft, its six crew and eight people on the ground, a brief communique stated that French and Soviet investigators had "unanimously concluded" that "no abnormality" had been found in the Tu-144's design.

"Intervention of the human factor is therefore most likely," it added, postulating possible scenarios but ultimately remarking that the cause should be "declared unidentified".

Allocated a display slot to fly after Concorde on 3 June, the Tu-144 was supposed to perform an 11min sequence, taking off from runway 03 and accelerating for a return pass, before a slower second pass with its nose and undercarriage lowered. It would extend its characteristic canards, behind the cockpit, to aid low-speed lift, then circle again to land.

But during the approach the Tu-144 crew – perhaps emboldened to end the tame sequence with a flourish, and steal some of Concorde's spotlight – cleaned the configuration, powered up the Kuznetsov NK-144 engines and thrust the airliner into a full-afterburner climb, levelling at about 4,000ft.

Wikipedia Commons

The Tu-144 at the 1973 show

David Kaminski-Morrow/FlightGlobal

Located near the crash site is a memorial to the Tu-144 accident

It then arched into a steep dive and, as the Tu-144 attempted to round out at 400ft, its entire left wing outboard of the left-hand engines broke away. The aircraft snap-rolled left and inverted, overload stresses fracturing its slender fuselage forward of the wing. Fuel vapour ignited and the supesonic jet disintegrated.

The joint inquiry offered scant detail on the circumstances, either unable or unwilling to explain the fatal dive or ill-fated recovery, resorting to a hypothesis that the crew had unexpectedly encountered a Dassault Mirage IIIR reconnaissance aircraft on the left as it climbed, and reacted instinctively with an evasive manoeuvre – even though there was no collision threat.

One unofficial theory for the Mirage's presence posited that it was tasked to photograph the canards, although this seems curious, given the canards were deployed in full view on the ground.

Similarly questionable was the inquiry's suggestion that one of the crew, engineer Vladimir Benderov, dropped a TV camera during the unexpected manoeuvre, which then jammed pilot Mikhail Kozlov's control column – hindering his arrest of the dive until the aerodynamic force required was too much for the airframe.

Benderov's son, Valery, pursued his own probe into the accident, expressing doubt about the official explanation to Russian publication *Kommersant* in 2000, arguing

A long-grounded Tu-144 on display at the MAKS air show near Moscow in 2019

ID1974/Shutterstock

that the negative-g physics of the dive would have thrown any loose object in the cockpit upwards and backwards.

The inquiry admitted its hypothetical scenario remained a theory, as it found no material evidence either to support or refute it, and the absence of clarity inevitably led to conjecture, including wild suppositions of sabotage in more extreme media circles.

Perhaps the most convincing analysis of the accident sequence appears in a Russian memoir, The Truth About Supersonic Passenger Aircraft, which features a collection of contributions from senior figures attached to the Tu-144 programme, including Valentin Bliznyuk, Yuri Popov, Vladimir Vul and Alexei Tupolev.

It refers to a flight-control stabilisation system which had previously been installed on a Tu-144S test aircraft, 77101, and was also fitted to the Le Bourget aircraft, 77102. The system, in a panel behind the pilot's seat, contained 20 toggle switches. One of them provided more lateral stability during roll through a signal to the rudder. An adjacent switch was intended for a future longitudinal stabilising signal but, on 77102, this channel was unprocessed.

The memoir indicates this system was not supposed to be used at Le Bourget, and had been covered and sealed. But in the cockpit wreckage the panel was found unsealed and open – not the result of impact – and both the lateral and the longitudinal stabilisation toggles had been switched on.

While the lateral toggle activation might have been deliberate, the memoir suggests the longitudinal toggle was switched on inadvertently, since the signal was unprocessed. It also points out, crucially, that this signal would have been inhibited while the Tu-144's canards were deployed – as they were when the lightly-laden aircraft entered its powerful end-of-display climb.

Just before levelling, the crew started retracting the canards. After a few seconds of horizontal flight the canards were fully stowed, and the longitudinal channel – with unregulated sensors set for maximum output – triggered instant deflection of the elevons a full 10° downwards, pushing the jet into a descent.

This caught the crew by surprise and the pilots' attempts to counter by pulling the control column were insufficient. As the aircraft neared the ground, the crew redeployed the canards – immediately inhibiting the stabilising system and causing the elevons to respond immediately to the pilots' commands by deflecting upwards.

With the aircraft travelling at some 350kt, this abrupt change in forces overloaded the wing structure and the Tu-144 began to break up.

According to the memoir, which backs up its account with flight data from the aircraft, the engines remained operational, contrasting with speculation that an evasive manoeuvre had interrupted the air or fuel flow to the powerplants. The stabilisation system was subsequently modified, it adds, reducing the elevon deflection severity, while measures were taken to improve the Tu-144's overall structural strength.

If this analysis has a convincing aura, it is nevertheless unlikely to satisfy everyone who, half a century on, still ponders the Tu-144's destruction. The memorial stone which stands on a quiet corner in Goussainville symbolises the persistence of an enigma as much as it commemorates one of Le Bourget's darkest moments.

David Kaminski-Morrow/FlightGlobal

This tree stands on the site where large sections of the Tu-144's wreckage struck houses

It is 20 years since Concorde's final, emotionally charged appearance at the Paris air show. It first thrilled attendees 34 years earlier. We look at the event's long association with the revolutionary supersonic airliner

Time travel

Concorde retired from service 20 years ago, after its last Paris appearance

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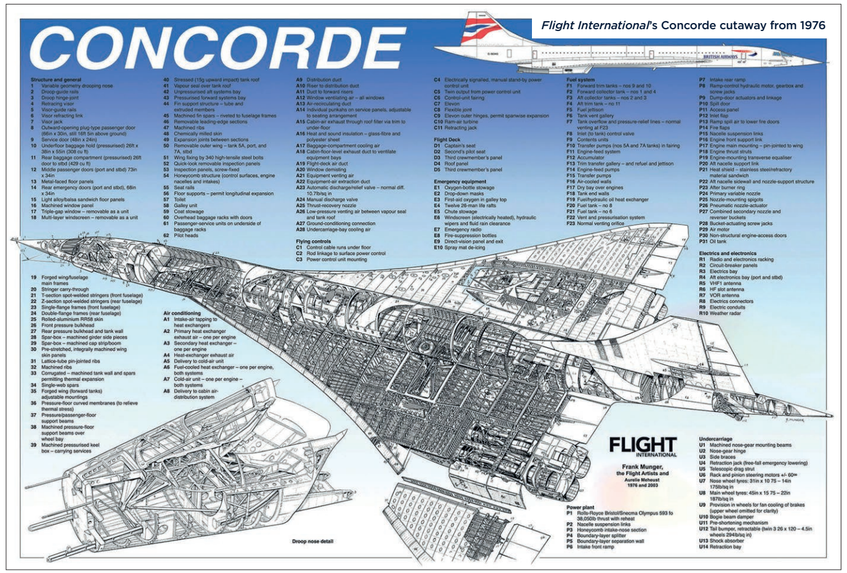
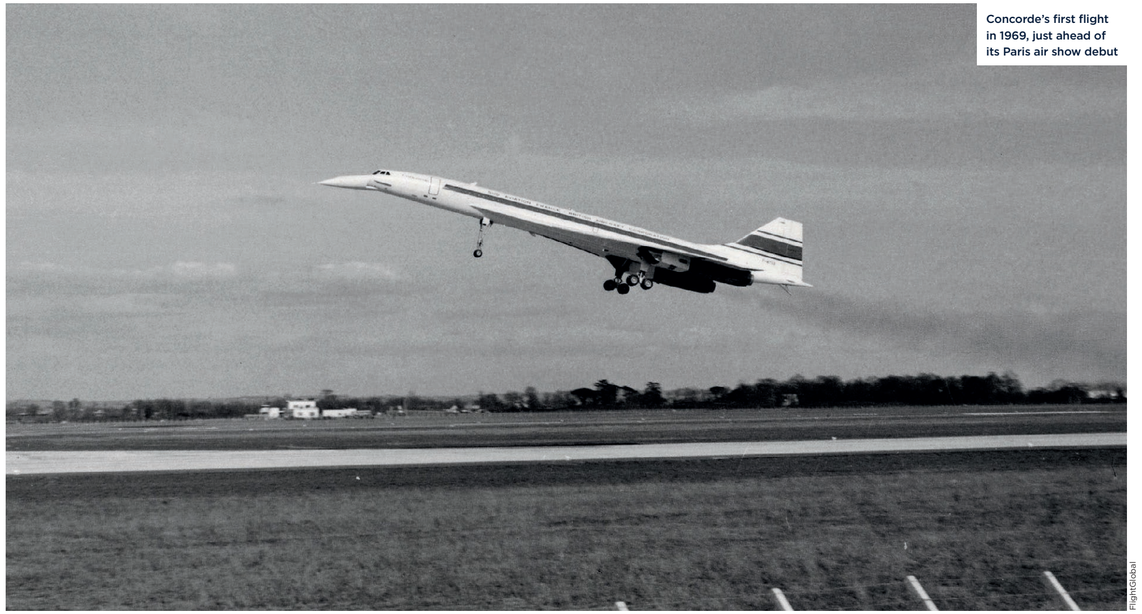
Murdo Morrison

The Aerospatiale/British Aerospace Concorde had a long relationship with the Paris air show, from its debut on the static display as a full-scale mock-up in 1967 to its swansong appearance 20 years ago. In fact, the supersonic airliner never departed Le Bourget. Air France F-BTSD, the example that made that farewell visit in 2003, resides in the airport's Museum of Air and Space, together with the first prototype, F-WTSS. Those attending the show this week can view both in a hangar next to the static display.

Five years after a treaty between London and Paris formally launched the Concorde project, and two since construction of the two prototypes had begun on opposite sides of the Channel, the aluminium-skinned mock-up in 1967 was the first chance for the world to see what the production version of this engineering marvel would look like. Although just a model, its presence caused considerable excitement among show visitors. However, that was nothing compared with the stir created two years later.

Flight International's Concorde cutaway from 1976





Concorde's first flight in 1969, just ahead of its Paris air show debut

FlightGlobal

The 1969 event must be the show most enthusiasts would return to given a time machine. Not only did French and UK Concorde prototypes take part in the air display but Boeing exhibited its 747 Jumbo Jet, which had flown just months earlier. The US firm, which had its own supersonic aspirations, was hoping to trump with scale its European rival's offer of speed. It was also the year of the lunar landing – which would take place a month later – and visitors could pore over an Apollo exhibit in the USA pavilion. Never before or since can the future have felt so full of promise.

Piloted by Andre Turcat, Concorde 001 had taken off for the first time on 2 March from the Sud Aviation plant in Toulouse (less than four weeks after the 747's maiden sortie). Its UK counterpart, 002, took to the air from the then-BAC factory in Filton 31 days later with Brian Trubshaw at the controls. This meant the flight test programme was still in its infancy when 001 made a ceremonial flight along the Champs Elysees before landing at Le Bourget. Concorde 002 joined it in the flying display later in the week.

Flight International reported of the debut of the industry's two most exciting programmes: "Soon after 2.30pm on Tuesday of last week, the Boeing 747 and the BAC/Sud Aviation Concorde rubbed shoulders for the first time when the giant from Seattle met the slim beauty from Toulouse on the apron at Le Bourget." However, in a sober appraisal of the respective programmes' prospects, the weekly magazine reflected: "While the 747 heads for home, hard work and hopefully commercial service before Christmas, Concorde still has long years of development ahead."

Tragedy touched Concorde's visit in 1973. The aircraft, still two-and-a-half years from commercial service, flew a flawless demonstration in front of 200,000 spectators. Then came the Tupolev Tu-144's turn. Dubbed "Concordski", the Tu-144 was the USSR's attempt to build a rival supersonic transport, and it had flown for the first time on 31 December 1968, two months before Concorde. The example at Paris was the second production aircraft, and, as with the Space Race, the Russians were determined to prove anything the West could do, the communist state could do better.

During that air display on the show's final day, the Tu-144 crew looked to be preparing to land, and had deployed landing gear. However, the aircraft then climbed rapidly to 2,000ft before appearing to stall and enter a steep dive. It broke up at 1,500ft, likely due to an overstressing of the airframe as the crew struggled to regain control. The subsequent crash – which destroyed 15 houses – claimed the lives of all six on board and eight people on the ground. The Tu-144 continued in sporadic passenger service until the late 1970s, but for Russia's supersonic dream it was the start of the end.

In 2000, Concorde suffered its own disaster – the fatal loss of Air France 4590 at the nearby Charles de Gaulle airport. Three years later, having returned to service in November 2001, the jet made its last, poignant Paris appearance. In front of President Jacques Chirac and other dignitaries, Air France F-BTSD touched down after performing a supersonic sortie over the Bay of Biscay, before taxiing to its final resting place at the Museum of Air and Space. F-BTSD had entered service with the flag-carrier on 9 May 1980 and made its final transatlantic commercial flight on 31 May.

Concorde went on operating commercially with British Airways until 24 October, with its only surviving example landing for the last time at Filton on 26 November, destined for the museum there. Many factors were behind the combined decision by Air France and British Airways to retire Concorde earlier that year. They included the Paris crash, the drop-off in transatlantic passenger numbers after 9/11, and Aerospatiale successor Airbus's decision to no longer guarantee parts for a type that last rolled off the production line in 1979, and only a dozen of which remained in service.

Moreover, for all its glamour, Concorde, with its cramped cabin from the era of flares, kipper ties, and sideburns, was increasingly looking like mid-century technology, especially compared with the likes of the just-launched A380 superjumbo from Airbus or Boeing's super-efficient 7E7 Sonic Cruiser successor. However, anyone glancing fondly at the two museum pieces at Le Bourget this week will acknowledge that in the 20 years since Concorde's last show appearance, the industry has not been able to deliver the supersonic jet's greatest gift to transatlantic travellers – that of time.

PARIS WEEK

A brilliant flying jubilee

Flight International's report from the 1969 show

Air France F-BTSD resides in the Museum of Air and Space next to the show site

Aleks49/Shutterstock

Governor Kevin Stitt is at Paris hoping to put Oklahoma even more firmly on the global aerospace map, attracting new players with a pledge to be the most business-friendly state in the USA

Oklahoma's open door

Q Why is it important for the State of Oklahoma to be represented here this week, and what do you hope to achieve?

A Oklahoma is a major player in global aerospace, making it both imperative and relevant for us to have a strong presence at the Paris show. Aerospace and defence is Oklahoma's second largest industry with a $44 billion economic impact, employing 120,000 Oklahomans statewide and consisting of over 1,100 companies. We are also home to the two largest MRO operations in the world – the American Airlines Maintenance and Engineering Center, the largest commercial MRO, and the Oklahoma City Air Logistics Complex at Tinker Air Force Base, the largest air depot maintenance facility for the Department of Defense. We will also be having many productive meetings with global aerospace companies interested in relocating to Oklahoma, the most business-friendly state in the USA.

State of Oklahoma

Q What aerospace companies are based in Oklahoma?

A While there are over 1,100 aerospace entities operating in Oklahoma, key players include Raytheon, Kratos, Lufthansa Technik, American Airlines, Northrop Grumman, and Boeing.

Q You have pledged to make Oklahoma the most business-friendly state in the union. How does that play when it comes to attracting aerospace companies and encouraging existing ones to invest and grow?

A We do a great job of attracting aerospace companies to the state. Last year, we welcomed Premium Aerospace Center from Mexico for a major investment at the Oklahoma Air & Space Port. And while I'm always excited to welcome new companies to the state, I'm thrilled when we get to see our existing companies grow and succeed. In March of this year, Pratt & Whitney announced plans to invest $255 million in a world class sustainment facility in Oklahoma City. In April, Kratos Defense and Security Solutions, one of our partner companies at this year's air show, celebrated the production of their one hundredth drone produced at their Oklahoma City facility. The company stated that the growth of their Oklahoma facility has allowed them to effectively double their total capacity. That's especially impressive considering the facility was announced in 2018 and was able to get fully operational (and remain that way) during a worldwide pandemic. I can guarantee the company's progress would have been halted had they been in any other state.

Q How good is the transportation infrastructure both in terms of domestic and international connections?

A Oklahoma is in the very centre of the USA, which is a strategic advantage, especially for manufacturing operations. Our location opens companies up to an expanse of customers and our transportation infrastructure provides easy access for getting supplies in and product out. Oklahoma has three intersecting interstate highways, but maybe even more impressive, we are home to four inland ports. One of which, the Tulsa Port of Catoosa, is one of the largest, most inland, ice-free river ports in the USA. From our state, companies can access 20 states and the Gulf of Mexico via waterways.

Q Aside from aerospace – and agriculture, obviously – what are Oklahoma's other main industries? What part does aerospace play in the economy?

A Oklahoma has an undeniable international dominance in aerospace and agriculture. We are also a world leader in energy. Frankly, you can't talk about energy without talking about Oklahoma. We are a proud oil and gas state but what many people don't know is that we're also leaning heavily into renewables. Oklahoma ranks second in wind energy and sixth in solar potential. Our 'More of Everything' approach has directly led to having some of the most affordable and reliable electricity in the country. On average, our energy costs are three times cheaper than in Europe. We are also a net exporter, meaning we produce more than we use. Oklahoma truly feeds the world, fuels the world, and protects freedoms around the world.

Bradley Casity/Shutterstock

American Airlines has a major maintenance centre in the state

Embraer C-390

Launched as the KC-390 and flown for the first time in 2015, Embraer's largest aircraft is now marketed as the C-390 Millennium. The IAE V2500-powered transport entered service with launch customer the Brazilian air force in 2019 and has won export deals with Hungary, Portugal and The Netherlands.

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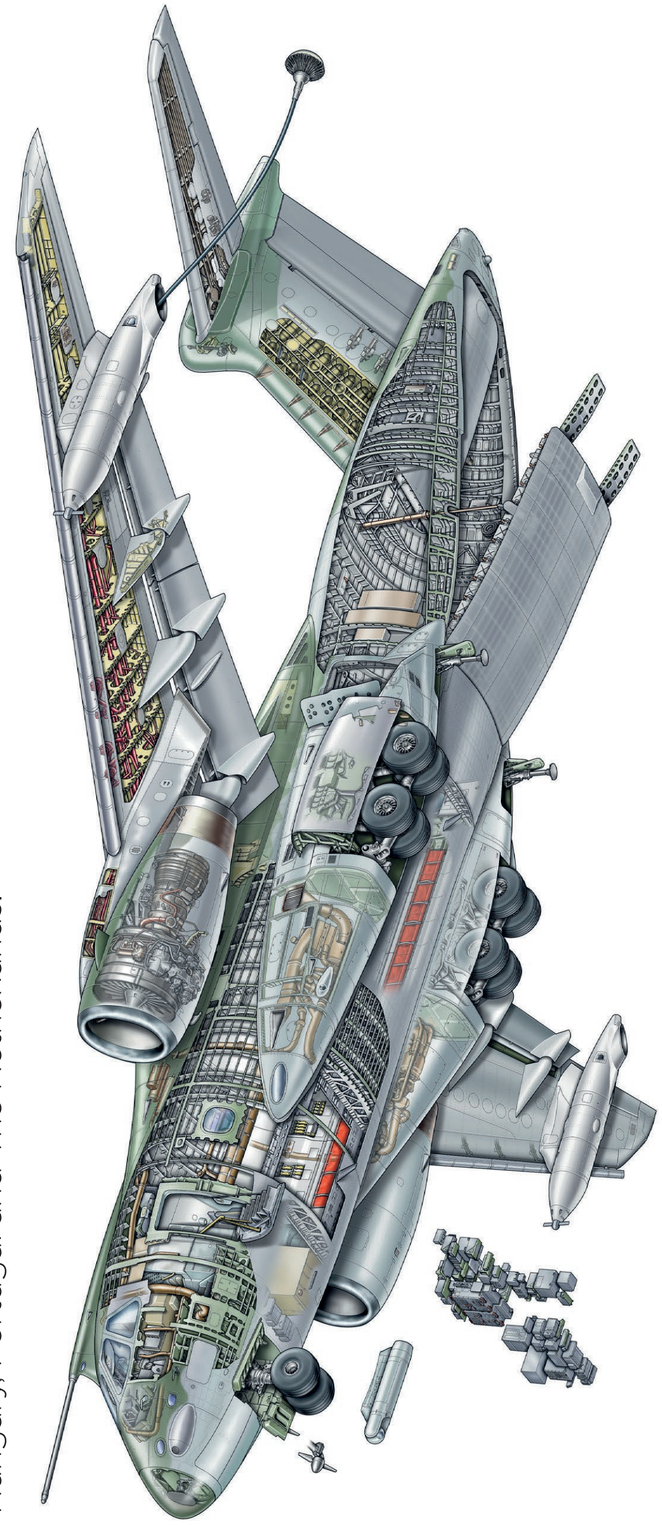
Cutaway drawing by Tim Hall



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