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25 April-1 May 2017 flightglobal.com

ROTORCRAFT

Ready for battle

Can Bell's Valor gamble hit US Army target?

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Bell Helicopter

COVER IMAGE
Bell Helicopter supplied this artwork of its V-280 Valor in US Army livery. The company says its lone prototype is 95% complete, and on track to fly in September P24

BEHIND THE HEADLINES
Greg Waldron (*pictured*) was at the Rotorcraft Asia show in Singapore (P20). In Seattle, Stephen Trimble saw Boeing's 737 Max 9 take flight (P8). Dahlewitz and Rolls-Royce welcomed Michael Gubisch (P23)

Aurora Flight Sciences

NEXT WEEK UAVS
In our Xponential preview, we look at Aurora's unique LightningStrike, and check on US airspace integration

NEWS

THIS WEEK

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Eurofighter

Eurofighter looks to updates for further sales P15

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FEATURES

REGULARS

Bell Helicopter; Cirrus Aircraft

Bell sees strong demand for 505 in Asia-Pacific P20. European approval in sight for SF50 Vision Jet P22

Image of the week

Taiwanese carrier Eva Air has unveiled the latest in a series of aircraft painted with cartoon characters from Japan's Sanrio, including the famous feline Hello Kitty. Called the "Joyful Dream Jet", the Airbus A330-300 will operate on routes from Taipei to Japan and China

View more great aviation shots online and in our weekly tablet edition:

flightglobal.com/flight-international

Eva Air

The week in numbers

23%

Flight Dashboard

In March, Beijing banned group tours to South Korea over its plans for a US anti-missile system; air traffic dropped sharply

$9,950

Flight Dashboard

Not wanting to do a United, Delta has raised the payout its supervisors can offer overbooked passengers, from $1,350

7

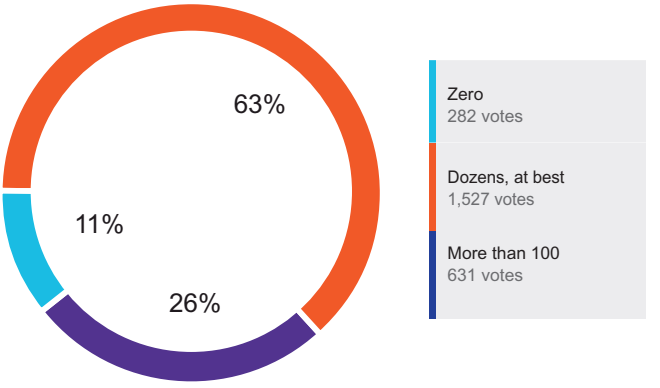
Orbital ATK

Orbital ATK's seventh ISS resupply mission success delivered a Cygnus cargo ship – named after late astronaut John Glenn

Question of the week

Last week, we asked: **Typhoon's future sales prospects?:** You said:

Total votes: 2,440



This week, we ask: **Supersonic business jets?**
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Slow and steady

The US Army is planning for the next generation of rotorcraft, which will be significantly faster than its current inventory of helicopters. But new technologies do not come without problems

It has not been a great week for the US Army's Future Vertical Lift (FVL) programme.

The Sikorsky-Boeing team has acknowledged that its SB-1 Defiant will not fly until next year, or several months after its rival in the army's joint multi-role technology demonstration (JMR-TD) effort – the Bell Helicopter V-280 Valor – completes its first flight in September (assuming that programme runs to schedule, of course).

In the complex arrangements for the FVL competition, the JMR-TD exists to help the army become familiar with the limits and capabilities of high-speed rotorcraft technology.

Sikorsky-Boeing is offering a coaxial rotor-pusher propeller configuration, while Bell is proposing a tiltrotor with several improvements over the technology used on the Bell Boeing V-22 Osprey. The Texas airframer remains confident it will maintain its September timeframe.

JMR-TD exists to help the army become familiar with the limits and capabilities of high speed

If the army wants to field a high-speed replacement for the Sikorsky UH-60 Black Hawk by 2030-2032, such delays at the demonstrator level are unhelpful.

For a total estimated cost of $1 billion, split between the army and industry, JMR-TD was supposed to help accelerate the development timeline by several years, maturing key technologies along the way.

It was conceived to allow the service to skip a multi-year step in the normal acquisition process – known in acquisition circles as technology maturation and reliability readiness (TMRR). But the Department of Defense officials who hold the army's purse strings have given no public indication as yet that the investment in JMR-TD will actually allow the service to skip the TMRR phase and yet another round of demonstrator aircraft.

Lockheed Martin

Defiantly maybe

And a delay to first flight for one of the probable FVL bidders does not help the army's case for avoiding the expense of a TMRR activity.

In the meantime, there are other helicopter fleets that also require replacement in the longer term – and not just the US Army's – with FVL intended to ultimately cover a range of weight classes via five so-called capability sets.

Delay to one part of JMR-TD, and any consequent hiatus for FVL, has the potential to send ripples further out to other potential programmes.

For the army, that means the future of high-speed military rotorcraft is likely to arrive much slower than it expected. ■

See Feature P24

Time is money

What price speed? That – as much as technology or the lack of it – will determine if a supersonic business jet reaches the market. Several start-ups have unveiled concepts, led by Aerion, a 10-year veteran of the sector, though still to cut metal. Boom Technology and Spike Aerospace are promising scaled subsonic prototypes this year; Aerion to name an engine partner.

The pioneers' holy grail has been a way to avoid or muffle the supersonic shockwave over land: the notorious boom that drowned out Concorde's prospects.

Rolls-Royce, which co-developed Concorde's Olympus engine more than half a century ago, has long been quietly studying proposals to power a business jet successor. However, the UK company admits a solution offering supersonic travel over ocean and sub-sonic speeds above continents is most realistic.

There are already fast business aircraft on the market, which convey their human cargo in comfort over vast distances at just under Mach 1. Even assuming a supersonic jet is feasible, such a development will only take place if engine and aircraft manufacturers alike are convinced that those who measure their success in minutes as much as money are prepared to pay a premium to win back more of their lives on the ground.

And unlike with Concorde, there will not be statist governments happy to fund a leap into a supersonic future. This time the risk will be industry's alone. ■

See Business Aviation P23

BRIEFING

KAI SECURES WING WORK WITH EMBRAER

AEROSTRUCTURES Korea Aerospace Industries (KAI) has been awarded contracts worth a combined W278 billion ($245 million) to supply aerostructures for Embraer's E-Jet E2 and KC-390 programmes. KAI will build wing bottom panels for the E190-E2 and E195-E2 regional jets, and top and bottom wing panels for the KC-390 tactical transport, until 2033.

ALMATY COMPLETES AIRLIFT DEAL

ORDER Kazakhstan's fleet of C295 medium transports will rise to eight aircraft later this year, under a follow-on deal signed with Airbus Defence & Space. Flight Fleets Analyzer shows six of the type are already in service with the country's air force.

ROLLS-ROYCE POWERS TO ITP TAKEOVER

ACQUISITION Rolls-Royce has received approval from the European Commission to acquire Spanish engine components firm ITP by taking a 53% stake held by Sener. Both are part of the Europrop International consortium, which produces TP400-D6 engines for the Airbus A400M tactical transport.

SEVILLE SELECTED FOR NEW RYANAIR HANGAR

MRO Ryanair is to conduct heavy maintenance checks at a new hangar in the Spanish city of Seville. Construction of the one-bay facility, which will be used for C-checks from early next year, will begin shortly. Ryanair is investing more than €8 million ($8.5 million) at the airport, and creating 150 jobs at the site – its first base maintenance facility in Spain.

SINGAPORE TO BOOST APACHE DEFENCES

SELF-PROTECTION Singapore is to enhance self-protection on its Boeing AH-64D Apache attack rotorcraft by installing a helicopter integrated electronic warfare system. The nation's defence ministry has not identified the contractor selected to provide the equipment, but says work will be performed "over the next few years". Flight Fleets Analyzer shows that Singapore operates a fleet of 17 AH-64Ds.

NEO ARRIVAL FOR MEXICO'S INTERJET

FLEET Interjet has taken delivery of its first Airbus A320neo, also becoming the first Mexican operator to field the type with CFM International Leap-1A engines. Flight Fleets Analyzer shows Interjet has 34 more A320neos on order. It follows VivaAerobus and Volaris in taking the re-engined narrowbody: both use Pratt & Whitney PW1100G geared turbofans.

EC CLEARS B/E AEROSPACE ACQUISITION

INTERIORS Rockwell Collins' acquisition of interiors firm B/E Aerospace has satisfied European competition regulators, who have cleared the deal. The European Commission says the $8.3 billion acquisition does not involve overlaps or "vertical links" between the two companies' product lines. The deal should close later this year.

AIRFRAMERS DEFIANT ON FLIGHT SCHEDULE

HELICOPTERS A combined Sikorsky-Boeing team has revealed that its SB-1 Defiant high-speed compound rotorcraft will not meet a deadline for first flight later this year. Instead, the technology demonstrator will make its maiden sortie in 2018.

Belgian air force

Brussels aims to retire fleet of aged Lockheed Martin F-16s from 2025

REQUIREMENT **LEIGH GIANGRECO** WASHINGTON DC

Boeing pulls out of contest to replace Belgium's fighters

Airframer withdraws Super Hornet from competition citing lack of "truly level playing field" in nation's acquisition effort

Boeing has withdrawn its F/A-18E/F Super Hornet from a process to replace Belgium's fleet of Lockheed Martin F-16s, and called into question the nature of the competition.

The US airframer announced that it would not participate in a bidders conference on 19 April, or respond to Brussels' request for proposals for a new fighter.

"We regret that after reviewing the request we do not see an opportunity to compete on a truly level playing field," Boeing says.

Its decision will enable it to "concentrate efforts on supporting our global customers, securing new orders and investing in technology required to meet the threats of today and tomorrow".

"Where there is a full and open competition we look forward to bringing the full depth and breadth of Boeing to our offer," the company adds.

Belgium had outlined a requirement to replace its 59 F-16A/Bs with 34 new fighters from around 2025 via a programme worth €3.6 billion ($3.8 billion).

Boeing's move leaves a competitive field including the Dassault Rafale, Eurofighter Typhoon, Lockheed F-35 and Saab Gripen E.

Boeing was rejected last year by Denmark, which selected the F-35A to replace its F-16 fleet. Boeing then made a legal challenge against Copenhagen's decision, claiming it was the result of a "flawed" evaluation process.

Last September, Boeing submitted a request for insight, seeking documents and information about the decision. "Since then, the [Danish defence] ministry has shared only a fraction of the documents that Boeing is entitled to review, and has not provided a complete list of all its documents as required by law," it says. A legal challenge was filed on 2 March, with a court hearing still pending.

Having previously appeared to be nearing the end of production, the Super Hornet programme has received several boosts in the past year, with Canada signalling its intent to purchase the type and the US Navy also to potentially acquire more.

Kuwait and Qatar are also interested in deals, and Boeing points to other opportunities via contests in Finland and Switzerland. ■

Boeing shifts gears as it plans two-pronged assault on Neo
This Week P8

DEVELOPMENT **MAVIS TOH** SINGAPORE

Comac picks up pace with C919 tests

Maiden sortie in first half of 2017 remains target, as airframer begins crucial high-speed taxi evaluations with narrowbody

First flight of the C919 narrowbody has moved a step closer after Comac began high-speed taxi tests.

The Chinese manufacturer began the evaluations on 17 April, as it scrambles to meet a first-half deadline for a maiden sortie of the indigenous twinjet.

A panel of 25 aviation experts, including from the Civil Aviation Administration of China and AVIC, conducted a technical review of the flight-test aircraft on 18 April. They concluded that a flight could take place pending the successful completion of ground trials, Comac says.

"This signifies that the C919 is one step closer to its first flight… and [high-speed taxi testing] is the last task that the C919 must complete before it can fly," the Chinese airframer says.

AirTeamImages

China Eastern Airlines will be first operator of new indigenous twinjet

Sources indicate that the target is for the Chinese narrowbody to make its maiden sortie in May or June, depending on the outcome of the taxi tests. A rejected take-off test, they add, could also pose a challenge for the developmental type.

Aircraft 101 – the initial flight-test article – started taxi tests on 28 December, but it has taken more than three months for it to complete low- and medium-speed evaluations. Its first low-speed taxi tests, sources say, threw up some "component-level issues", which, while not insignificant, did not present major roadblocks for the programme.

Comac is under tremendous pressure from the Beijing government to make progress with the C919. However, Comac chairman Jin Zhuanglong has stressed that he would rather the programme be "a little late" and ensure the safety and quality of the aircraft.

Comac was previously aiming for a first flight in late 2016, but this was pushed to the first quarter of 2017. State-owned carrier China Eastern Airlines will be the first operator of the jet. ■

Airbus

DELIVERY

A321neo debuts at Virgin America

Virgin America has been revealed as the first recipient of an Airbus A321neo, after the aircraft was formally delivered to the US carrier. The twinjet, leased from GECAS, is fitted with CFM International Leap-1A powerplants, the second of the two A321neo engine options to be approved. While the rival Pratt & Whitney PW1100G-powered A321neo was the first to achieve certification, none have yet been delivered. Airbus says the 185-seat Virgin America jet was handed over at a ceremony in Hamburg. Virgin America president Peter Hunt says the aircraft "will allow us to further reduce our unit costs". Virgin America, which has been acquired by Alaska Airlines Group, will put the aircraft into service on 31 May with a flight from San Francisco to Washington National.

SPECIFICATIONS **STEPHEN TRIMBLE** WASHINGTON DC

Wider cabin to broaden appeal of lowered 777-9

Boeing has published further preliminary details of the 777-9's configuration, three years ahead of entry into service, revealing a slightly lower aircraft with an interior resculpted to carve out a precious additional 10.2cm (4in) of internal diameter.

A 79-page document posted on Boeing's website offers the first detailed update on the 777-9's dimensions since a brochure version appeared in 2015.

Boeing released both documents to help airport managers prepare for the arrival of the stretched widebody with its extended wingspan.

Compared with the previous iteration, the update shows the 777-9's designers have made a few minor tweaks. For example, the height of the vertical tail above the runway is about 17cm shorter, although it remains nearly 1m taller than the 777-300ER.

The most critical dimensions for the 777-9 remain unchanged, with a 2.9m longer fuselage and 7m wider unfolded wingspan compared with the 777-300ER.

The folded wingspan of the 777-9 measures 64.8m, about 2.54cm wider than the 777-300ER.

Boeing also has worked to make the 777-9 more comfortable with a standard 10-abreast layout in economy class. The 777-300ER originally entered service with a nine-abreast economy cabin, but some airlines now offer a 10-abreast layout. The 777-9 shares an external fuselage cross-section with the 777-300ER, but the internal sidewalls have been carved out by about 10.2cm.

Boeing now lists the 777-9's standard two-class cabin as accommodating 414 passengers, with a three-class cabin holding 349 seats. ■

STRATEGY **STEPHEN TRIMBLE** SEATTLE

Boeing shifts gears as it plans two-pronged assault on Neo

Airframer outlines modifications for 737 Max 10X, with smaller sibling now in flight test

As the 737 Max 9 begins stability and control testing, Boeing's engineers are working to finalise a critical detail in the configuration of a proposed larger variant aimed at forming a two-pronged attack on the Airbus A321neo, which is currently dominating the market for large narrowbodies.

The 737 Max 9 opened a series of initial airworthiness tests four days after achieving its first flight on a breezy Seattle morning on 13 April. Following the validation of flutter prediction models, the prototype aircraft will enter a long series of performance evaluations, including a round of runway tests on the non-public runway at Edwards AFB, California, says Capt Christine Walsh, Boeing's deputy chief test pilot.

MARKETING TOUR

Within weeks, a second flight-test vehicle, equipped with a full interior, will roll off the assembly line, and Boeing then hopes to take the largest member of the re-engined 737 Max family on an international marketing tour this summer. Potential stops at air shows in Paris and Moscow are lined up in June and July, says Keith Leverkuhn, Boeing's vice-president and general manger of the 737 programme.

A dose of publicity might help the 188-seat-class single-aisle address the A321neo's nearly six-to-one advantage in firm orders to date. According to Flight Fleets Analyzer, Airbus has taken firm commitments for 1,325 A321neos, versus only 231 for the 737 Max 9, with United Airlines' deal for 100 of the type accounting for 43% of the total orderbook. The A321neo was launched with a roughly 10-month lead on the 737 Max 9, and is scheduled to enter service in May.

Boeing has chosen to release sales data only at the family level for the 737 Max and the 777X, departing from a practice of breaking out firm order totals by variant on previous commercial models. This shift in disclosure policy offers a new degree of flexibility selected by some customers to convert to smaller or larger variants closer to the date of first delivery, says Randy Tinseth, Boeing vice-president of marketing. In the end, Boeing expects 20-25% of all 737 Max family deliveries to involve aircraft larger than the 162-seat-class 737 Max 8, Tinseth says.

Boeing

Prototype of the 737 Max 9 made its debut from Renton on 13 April

However, the 737 Max 9 would need a historic wave of order conversions to achieve that standard alone. Of Boeing's 3,703 firm orders through March, only 6.24% are assigned to the Max 9 – nearly 700 short of the upper-range of Tinseth's forecast demand.

That disparity helps explain why Boeing now intends – assuming customers are supportive – to launch the 737 Max 10 with a further 1.62m (5.51ft) stretch, adding two more rows of seats.

Last summer, Boeing replaced the original design of the 737 Max 7 with a similar stretch. Instead of replacing the 737 Max 9 with the larger 737 Max 10X, Boeing intends to offer both aircraft against the still-larger A321neo.

> "It has to be as maintainable and reliable as the gear we've got on the 737NG"
>
> **Keith Leverkuhn**
> Vice-president and general manager, 737 programme, Boeing

Boeing's strategy depends on solving one engineering challenge posed by the 43.8m-long 737 Max 10X. Boeing already equips the 737 Max 8 and Max 9 with collapsible canisters on the aft fuselage to prevent damage from a tail-strike on take-off and landing. To give 737 Max 10X crews acceptable clearance, it has to effectively lengthen the main landing gear and increase the angle of the nose in pitch.

"We're going to need that gear [redesign] for the performance that we believe we're going to get out of the Max 10, but I'm confident in the solution set," Leverkuhn says.

As of mid-February, the 737 Max 10X engineering team was studying several options for altering the main landing gear. Those studies have now coalesced into a single solution that adds a 777-300ER-style semi-levered gear to the Max 10X, Leverkuhn says.

"We're really zeroing in on one now. It's about the upper portion of the gear as it integrates into the actuator, and can we do some clever folding using a link mechanism at the top and then an additional shock strut that we can fit inside the same forging," he says.

FREQUENT LANDINGS

Leverkuhn acknowledges the kinematics of the gear's moving pieces are "tricky", but the major engineering effort is focused on developing a reliable mechanism. The 777-300ER and the 787-10 also are designed with semi-levered main landing gears, but are not exposed to the relatively frequent landings of a medium-haul narrowbody aircraft.

"The functionality is going to be fine. I really want to make it maintainable," Leverkuhn says. "I want to make sure it meets the criteria – performance, maintainability, reliability – it has to be as maintainable and reliable as the gear we've got on the [737]NG."

Ahead of a 737 Max 10X launch decision, Boeing has

Twisted landing-gear made 737 zig-zag
Air Transport P11

Second member of re-engined narrowbody family performed 2h 24min maiden sortie

Boeing

scheduled several months of testing to verify how the semi-levered gear will perform in service. A drop test will first confirm that the new structure will fit inside the existing wheel, Leverkuhn says.

SIMULATED CONDITIONS

A new test rig will also evaluate the reliability and maintainability of the gear under simulated operational conditions, he adds. The trials should be complete in time for Boeing to pass through a scheduled firm configuration milestone by the end of year.

If Boeing launches the 737 Max 10X, the first aircraft would enter service in 2020, or three years after the operational debut of the 737 Max 8 with a Malaysia-based Lion Air subsidiary in May. By then, it would become the fifth of at least six potential models of the 737 Max to enter service, with the Boeing Business Jet version of the 737 Max 7 scheduled to arrive in 2022.

Meanwhile, Boeing plans to usher the first 737 Max 9 into operation early next year, followed by the 737 Max 200 and 737 Max 7 in 2019. Boeing has released design drawings for the 737 Max 7 to the supply chain and parts are already flowing into the production system, says Michael Teal, vice-president and chief project engineer for the 737. ■

TESTING

Certification campaign starts with tailwind

Boeing on 13 April began roughly eight months of flight testing on the 737 Max 9 to focus on validating the aerodynamic and environmental system changes compared with the smaller Max 8 variant.

The 2h 42min first flight took off with a tailwind from Renton Municipal airport and landed at nearby Boeing Field into a 20kt (37km/h) crosswind.

The crosswind landing on the first flight approximated flight-test conditions usually experienced weeks or months later in the programme, says Capt Christine Walsh, who became the first woman to pilot a new Boeing commercial passenger aircraft on its maiden sortie. "It was a workout," she said in a post-landing press conference at Boeing's Seattle Delivery Center.

The take-off was delayed by 90min at Renton airport due to a loss of telemetry between the aircraft on the ground and Boeing's control centre. A radio dedicated to flight-test communications also failed to work properly after take-off.

Despite these difficulties, Walsh and colleague Capt Ed Wilson managed to complete a full test card, validating the 737 Max 9's handling at each flap setting and at speeds up to 240kt and altitudes up to 24,000ft, Walsh says.

The crew also shut down and re-lit each of the 28,000lb-thrust (125kN) CFM International Leap-1B engines in sequence.

The 737 Max 9 landed with only one uncompleted task: a publicity photograph by the chase aircraft, which was called off because of a thick blanket of cloud around Mount Rainier, Walsh says.

A second and final test aircraft is nearing completion inside Boeing's Renton factory.

> "The 20kt crosswind landing [made at the conclusion of 737 Max 9's debut flight] was a workout"
>
> **Capt Christine Walsh**
> Deputy chief test pilot, Boeing

As the second member of the re-engined single-aisle family to enter flight test after the 737 Max 8, the certification process for the 2.6m (8.53ft)-stretched version is expected to proceed more rapidly with fewer resources.

About 30% of the test points completed by the 737 Max 8 must be revisited during the campaign for the 737 Max 9, says chief project engineer Michael Teal.

All of the testing is focused on how the larger size of the 737 Max 9 affects the aerodynamic characteristics and the environmental control system. ■

DESIGN
DAVID KAMINSKI-MORROW
LONDON

Analysts sound out potential of quieter engines

Russian analysts have conducted windtunnel tests on an aircraft design featuring overwing-mounted engines which is intended to reduce noise.

The Central Aerohydrodynamic Institute says the short-haul aircraft model also features a shallow-swept laminar-flow wing to cut drag.

It adds that the design includes the "distinguishing" characteristic of engines mounted above the wing, positioned over the trailing edge, while the model also has a low-set horizontal stabiliser.

"This option is governed by a desire to reduce noise from airborne aircraft in the areas next to airports," the institute says.

"It also allows for [the] installation of more economical engines, with increased diameter."

The institute adds that the overwing mounting also lowers the risk of debris ingestion.

Overwing jet engines have been previously featured on aircraft designs such as the VFW-Fokker 614 – which failed to gain success as a short-haul airliner – and more recently the Honda Aircraft HA-420 HondaJet business aircraft.

The institute says it has carried out transonic windtunnel tests with an improved model of an original design it had examined in 2015; modifications include adjustment of the wing geometry to better account for the laminar-flow requirements.

Tests on the design in early April have "confirmed the calculated predictions" of researchers, the institute says, adding that the "aerodynamic quality" of the aircraft design has been improved at airspeeds of Mach 0.78.

Analysts at the Moscow-based institute are set to explore the acoustic characteristics of the proposed aircraft, as well as its structural strength. ■

AIRLINE EDWARD RUSSELL WASHINGTON DC

Global overcapacity prompts Delta widebody fleet review

Carrier has no plans for order cancellations, but 2017 retirements will outpace deliveries

Delta Air Lines is reviewing its widebody fleet requirements in the face of what it views as overcapacity in international markets globally.

"We continue to see excess capacity in widebodies as we look to the future for the industry as a whole," said Ed Bastian, chief executive of the Atlanta-based carrier, during a first-quarter earnings on 12 April.

Bastian says management is reviewing the implications for Delta, noting that excess capacity could result in some widebody fleet reductions across the industry over the short to medium term.

Delta operates 149 widebodies, Flight Fleets Analyzer shows, and is scheduled to take delivery of one Airbus A330-300 and its first six A350-900s this year.

However, the new arrivals will be part of a net twin-aisle reduction, with its six remaining Boeing 747-400s, as well as three 767s, scheduled to depart from its fleet in 2017.

Airbus

US airline plans to replace older twin-aisles with more efficient A330s

Glen Hauenstein, the carrier's president, says the outgoing 767s – from a batch of nine delivered in 1990 and among Delta's oldest examples – will be replaced by larger and more efficient A330s.

However, there are no current plans to alter its widebody fleet or orderbook, Bastian says.

The carrier has firm orders for one A330-300, 25 A330-900neos and 25 A350-900s, Fleets Analyzer indicates.

Separately, Delta added 10 737-900ERs to its orderbook during the first quarter, bringing its total commitments for the type to 130 aircraft.

The carrier disclosed the order for incremental aircraft in a quarterly financial filing made on 12 April.

Delta has ordered 737-900ERs twice before: 100 in August 2011 and an additional 20 in December 2015. ■

MODERNISATION

ATR finally seals order from Iran Air

More than a year after it was first disclosed, Iran Air has concluded an agreement to buy up to 40 ATR 72-600 turboprops.

ATR says the deal has now been "officially signed" and covers 20 firm aircraft orders and 20 options.

AirTeamImages

Several of the turboprops are already painted and awaiting delivery

The agreement is part of a broad fleet modernisation by Iran Air, made possible by a thaw in relations with the West, which has also included deals for 180 Airbus and Boeing jets.

Iran Air and ATR have yet to disclose the delivery schedule for the turboprops.

But several ATR 72-600s have already been painted in Iran Air colours, and have been parked at Toulouse awaiting delivery to the airline.

Among these aircraft is one airframe which conducted a demonstration tour in Iran in September last year. ■

Qatar plans to shake up Indian aviation
Air Transport P12

INCIDENT **DAVID KAMINSKI-MORROW** LONDON

Twisted landing-gear made 737 zig-zag

Boeing freighter "became impossible" on landing at Bogota due to misalignment of undercarriage, investigation says

Colombian investigators have revealed that both main landing-gear of a Boeing 737-400 freighter were found to be badly out of alignment after a serious landing incident in Bogota.

The aircraft (HK-5139), operating a domestic service from Leticia, had landed on runway 13R in darkness on 9 November last year.

Colombian investigation authority GRIAA says the AerCaribe aircraft stopped on the runway adjacent to taxiway P, located some 3,200m (10,500ft) from the threshold. None of the seven occupants of the 26-year-old twinjet were injured, it adds.

The 737 had flown from Bogota to Leticia, without incident, a few hours before. Investigators say that the return landing at Bogota resulted in "normal" contact with the runway but, during deceleration, a "strong" vibration was felt which "progressively increased".

The aircraft's landing-gear had been affected, and control on the ground became "impossible", the inquiry adds. It states that the aircraft made a 170° left turn before it came to a halt, pointing northwest, 3,160m away from the threshold of 13R.

GRIAA says marks on the runway indicated both sets of main landing-gear had been "zig-zagging", and were found to be considerably misaligned – the left-hand gear was twisted 55° to the right, while the right-hand was 43° right. Both tyres on each set of main gear were worn or had burst.

AirTeamImages

Twinjet was operating a domestic service with seven people aboard

Inspection of the runway did not detect any foreign debris or components which might have contributed to the incident, nor was there a record of any system malfunction or damage relating to the landing-gear misalignment.

GRIAA has yet to reach any conclusions about the event. ■

FLEET **DAVID KAMINSKI-MORROW** LONDON

Syrian Arab Airlines rises above war to introduce services with A340-300

Syrian Arab Airlines has introduced an Airbus A340-300 to its operation, opening services by conducting a flight to Dubai.

The Syrian ministry of transport says that a ceremony in Damascus welcomed the aircraft, with attending delegates including transport minister Ali Hammoud.

Syrian Arab Airlines' aircraft (YK-AZA) is a 17-year-old airframe originally delivered on lease to Cathay Pacific. The aircraft's layout includes 24 business-class seats, says the ministry, which adds that it will shortly be used on Chinese routes.

"Air transport is of great importance to the country's economy," says the ministry, adding that it contributes additional revenues to the state treasury.

Introduction of the aircraft, it adds, shows that the Syrian transport sector is "recovering" despite the conflict which has engulfed parts of the country.

Juma Muhammad/ImagesLive via ZUMA Wire/REX/Shutterstock

Damascus says air transport sector is recovering despite the conflict

Syria remains subject to US government sanctions and the A340's transfer to Syrian Arab Airlines appears to have been a complex affair.

Flight Fleets Analyzer indicates that the jet was returned to AerCap in 2015 after a lease to SriLankan Airlines. But it was subsequently placed on the US registry, and was eventually passed to an undisclosed entity before being transferred to Kazakhstan, where it was stored on the local register as UP-A4001, before being transferred to the Chad registry and then to Syria.

Kazakhstan's transport prosecutor stated in February, however, that it had informed the country's national anti-corruption bureau about the possibility that Airbus aircraft on the Kazakh state registry had been sold to Syrian entities. ■

OPERATIONS

MAS launches enhanced flight tracking system

Malaysia Airlines, whose missing flight MH370 drew attention to airlines' surveillance capabilities, is to become the first customer carrier for an enhanced tripartite flight-tracking scheme.

The system is being marketed by communications specialist SITA OnAir in partnership with space-based ADS-B surveillance firm Aireon and the tracking data company FlightAware.

SITA OnAir says Malaysia Airlines, one of its customers, will be the first to benefit from the "revolutionary" tie-up.

It says the airline will be able to access global "minute-by-minute" data on its aircraft, through SITA OnAir's Aircom FlightTracker system.

The product will be augmented by space-based ADS-B data derived from Aireon – giving enhanced coverage over oceanic and remote regions – which will be fused with FlightAware's other surveillance sources. ■

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STRATEGY **AARON CHONG** SINGAPORE

Qatar plans to shake up Indian aviation

Carrier seeks to capitalise on rising traffic and expansion opportunities on subcontinent, but will face regulatory hurdles

As India's airlines continue to fight each other in their home market, Qatar Airways is seeking to upset the delicate balance with plans for a new Indian subsidiary.

But with the change in India's ownership rules – its foreign direct investment (FDI) policy – for domestic airlines last June, the planned venture will not involve a local partner, Qatar chief executive Akbar Al Baker has indicated. Instead, the new airline will be jointly owned by Qatar Airways Group and the Gulf state's investment arm.

If established, the Qatar subsidiary, which reportedly will operate a fleet of 100 narrowbodies, could be India's first 100%-foreign-owned airline.

The attraction for the Gulf carrier to create a subsidiary in India is obvious: Capstats, based on FlightGlobal schedules data, shows that traffic from India to Qatar has been steadily rising over the past five years. And India has consistently been the second busiest destination for outbound flights from Qatar between 2012 and 2016 – coming in only behind the United Arab Emirates.

Flight Ascend Consultancy's head of advisory Asia, Joanna Lu, is unsurprised to see Qatar take advantage of India's liberalised aviation market: "The strategic advantage in doing this is getting onward traffic from Doha."

RULE CHANGE

Under changes to the FDI regulations, foreign investors can now hold 100% of an Indian airline, subject to government approvals. Foreign airlines, however, continue to be barred from holding more than 49% of an Indian-registered carrier's paid-up capital.

Opinions on Qatar's plans are mixed. Amber Dubey, India head of aerospace and defence at KPMG, believes that India can only gain by opening up its aviation sector to allow "the world's best airlines" to invest in the country.

Airteamimages

Initiative has potential to generate onward connections from Doha

> "The problems in India persist of issues like airport and airspace infrastructure constraints"
>
> **Peter Morris**
> Chief economist, Ascend

Meanwhile, the Federation of Indian Airlines (FIA) – which counts GoAir, IndiGo, Jet Airways and SpiceJet among its members – is likely to cry foul over two issues.

First, Qatari regulations are not similarly liberal and do not allow foreign carriers to start a domestic airline. Second, the establishment of the Qatar subsidiary could shift international traffic out of Indian hands, diverting it through Doha instead.

One industry source, who is against Qatar's move, believes the investment will turn India's aviation market "upside down".

He says: "Two coffee shops open side by side and it costs $1 to make a cup of coffee. While both may sell at different prices – low-cost at $2 and full-service at $5 – both shops can still make profits. Now, if a third shop opens and is backed by a $100 million investment fund, and it sells the same cup of coffee at $0.50, how long can the other two shops survive?"

Lu expects similar pushback from lobbyists within India. Dubey, however, believes that Indian airlines will still have an advantage: "Gulf carriers may use Indian airports to launch eastbound flights and ASEAN carriers may do the same on westbound flights. But Indian carriers like Air India have the advantage that they offer nonstop services to the USA, Europe and the Far East, which many corporate travellers prefer."

Besides opposition from Indian carriers, Qatar could face regulatory restrictions as part of its permission to operate, argues Lu.

She thinks it will also be challenging for the new carrier to move from initial domestic services to international operations, judging by the difficulties that incumbent airlines have faced. It will also be tough for the Qatar subsidiary to access slots at key Indian hubs such as Mumbai and New Delhi, which are already overcrowded.

"The problems in India persist of issues like airport and airspace infrastructure constraints, the intervention effects of state or government regulation and taxation (especially on fuel), and support – either direct or indirect – for Air India. These factors all serve to make the market less efficient and therefore inhibit its growth," adds Ascend chief economist Peter Morris.

Qatar will also need to avoid violating India's substantial ownership and effective control norms, by showing that the subsidiary will be managed in India, not from Doha.

New Delhi mandates that the principal place of business of any airline started in India should remain in the country, and that two-thirds of all directors and management should be Indian nationals.

AMPLE ROOM

Despite the challenges, Morris believes there is enough space for India to accommodate another major competitor.

He points out that the subcontinent "has the potential for a much higher level of air service", given its high economic growth and a relatively low level of air travel compared with other large and populous countries at present.

"Most observers think China or Indonesia may be broad comparisons, [but India's] double-digit growth has persisted for decades now," says Morris. "There have been boom and bust phases in India's growth that have made investors wary of the sector. However, a well-funded investor looking at the long-term fundamentals of India's aviation market has the potential to do well, provided government at the state and country level can adopt a hands-off approach." ■

Sales pressure mounting on Typhoon
News Focus P15

INVESTIGATION **ELLIS TAYLOR** PERTH

Shaft fracture caused propeller to separate in Saab 340B incident

Fatigue cracking originated in dowel pin, but investigation has yet to determine reason for problem with CT7 engine

Australian investigators have determined that fatigue cracking in the propeller shaft flange led to the in-flight separation of one of the propellers on a Regional Express Saab 340B on 17 March, but have yet to identify the root cause of the fracture.

The incident occurred on a flight from Albury to Sydney after the crew detected abnormal indications and vibrations from the right engine, and chose to shut it down, after which the propeller sheared off. The crew made a "pan" call before landing safely at Sydney airport.

In its initial report, the Australian Transport Safety Bureau (ATSB) says that inspections of the aircraft (VH-NRX) identified that the propeller shaft of the GE Aviation CT7-9B had fractured.

Examinations of the propeller found that it was properly secured to the flange by bolts and dowel pins. However, fatigue cracking appeared to run between the main shaft and the flange region, leading to the in-flight fracture.

Cracking was found to have originated in the bore of the dowel pin, which showed signs of corrosion, although further analysis is taking place to determine if the corrosion or other factors initiated the fracture. "This is the first known critical failure of this type initiating within the propeller hub flange of a CT7-9B engine," the ATSB says.

The same propeller gearbox is also used on other CT7 engines that power Saab 340s and the Airbus Defence & Space CN235. At present however, there are no requirements to routinely inspect the dowel pin bores, leaving engine overhauls as the sole opportunity to detect any corrosion or cracking.

The ongoing investigation will focus on maintenance procedures for the propeller gearbox shaft, and factors that may have contributed to the fatigue fracture.

GE, which is assisting the investigation, is undertaking further metallurgical analysis of the propeller flange and inspecting gearboxes across the fleet. ■

AirTeamImages

Milestone was reached with engines to power twinjet for Air India

PROPULSION **DAVID KAMINSKI-MORROW** LONDON

CFM reaches 100 mark as Neo deliveries Leap

Total CFM International deliveries of Leap-1A engines to Airbus have reached triple figures, as the manufacturer stays on track to maintain its target of delivering 500 Leap powerplants this year.

The delivery of a Leap-1A for an Air India Airbus A320neo takes the total number of engines handed over for the variant to 100, says Safran, which is a partner in the CFM joint venture with GE Aviation.

Air India is the first Indian carrier to use the Leap-1A; the initial A320neo operators in India – IndiGo and GoAir – both have Pratt & Whitney PW1100G-powered jets.

Airbus delivered 26 A320neos over the first quarter of this year, of which 14 were Leap-equipped.

The level of 100 Leap deliveries has been achieved some 11 months after the first.

CFM intends to produce 500 Leap engines – the -1B version of which powers the Boeing 737 Max – over the course of 2017. Safran expects its nacelles division to deliver 250 A320neo nacelles to Airbus this year.

Annual production of Leap engines will reach about 2,000 in the run up to 2020. ■

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Mask fix allows Goshawk to fly again
Defence P16

MANUFACTURING **BETH STEVENSON** TURIN

Sales pressure mounting on Typhoon

Four-nation Eurofighter consortium slows its production rate, but hopes key updates will attract additional customers

Eurofighter now has only 99 Typhoons left to deliver in order to fulfil its current orders, and while the four-nation industrial consortium is actively seeking new customers for the type, measures have been put in place to slow its production rate.

Kuwait – the most recent customer for the multirole fighter – is due to receive the last of 28 contracted Typhoons in 2023, at which point the Eurofighter final assembly lines will cease to manufacture the aircraft in the absence of further deals.

Partner companies Airbus Defence & Space, BAE Systems and Leonardo Aircraft could produce the remaining aircraft at a faster rate, but have opted to reduce annual output to allow more time to attract additional orders.

From 2009 to 2013, an average of 50 Eurofighters were produced per year. After the first example was handed over to the UK in 2003, a 200th delivery was made to Spain in 2009, while the 400th went to the Germany in 2013. It took another four years until the 500th Typhoon was transferred to the Italian air force on 11 April.

This recent level of activity, delivering an average of 25 aircraft per year, contrasts with the peak production rate in 2010, when 60 Typhoons were delivered.

Eurofighter is committed to rolling out upgrades for existing operators of the type, and is due to begin implementing the P3E operating standard. This includes weapon options including the MBDA Brimstone 2, Meteor and Storm Shadow missiles, plus the Euroradar consortium's Captor-E active electronically scanned array (AESA) radar during its P3EB configuration, the development of which is being led by Leonardo.

Eurofighter

Italy received the programe's 500th aircraft in April, and could also assemble its final examples, for Kuwait

Kuwait will receive all these features with its aircraft, having notably become the first nation to commit to acquiring the AESA radar.

Eurofighter and Leonardo are now carrying out flight testing of the radar in Scotland using one development aircraft, and have plans to carry out trials on a German example next year. The radar is being powered up during this test phase, but is not yet emitting.

Partner nations Germany, Italy, Spain and the UK have funded the development of the radar, but have yet to buy it for their own fleets. Typhoons in service today use a Leonardo-developed mechanically scanned radar, which Eurofighter claims is sufficient for current operations, meaning there is no rush for an AESA upgrade.

ACTIVE STEPS

A combined requirement to field the active array design is likely to emerge to support operations around the early 2020s, according to one industry source. The Italian air force's programme chief, Col Andrea Truppo, backs this schedule, noting that the service's Tranche 3-standard aircraft are likely to receive the update. Rome has yet to decide whether to also apply it to its Tranche 2 examples, he adds.

Discussions are under way regarding a future P4E operating standard, although Eurofighter chief executive Volker Paltzo declines to identify which updates this could introduce.

"We still have some debating left to do on the definition phase for this," Paltzo said during a delivery event for the programme's 500th aircraft in Turin. This process is likely to be complete in the June/July timeframe, he believes, with a contract expected to be signed during 2018.

Tranche 1-standard examples of the Typhoon will remain serviceable until they have either amassed 6,000 flight hours or been operational for 25 years, Paltzo says, and an "ongoing debate" concerns life-extension options.

Paltzo acknowledges that the annual production rate is being assessed within Eurofighter, but he declines to detail what the output will be each year until the end of the programme.

"Of course, we hope for more orders," he says. "It is going to be a steady flow of production, but at a lower rate."

Further ahead, the consortium is considering what subsequent P5E and P6E standards could look like. Paltzo reveals only that such phases will focus on network-centric operations, and notes that the long-term view is representative of its commitment to keep the programme going into the 2040s.

Kuwait's contract – signed via the Italian government and with final assembly by Leonardo – includes three years of support from delivery of the first aircraft, plus in-country infrastructure and training. The Gulf state's first batch of pilots has already been trained, Eurofighter says. ■

Eurofighter

Near-term capability enhancements include P3E-standard weapons

TRAINERS **LEIGH GIANGRECO** WASHINGTON DC

Mask fix allows Goshawk to fly again

US Navy sets 10,000ft operating ceiling for T-45, as search continues for long-term solution to oxygen system problem

The US Navy's commander of Naval Air Forces, Vice Adm Mike Shoemaker, allowed the service's Boeing T-45 Goshawk trainers to begin a return to flight process on 17 April, after the fleet was temporarily grounded due to persistent issues with the type's onboard oxygen generation system (OBOGS) equipment.

In early April, more than 100 of the navy's instructor pilots boycotted T-45 flights until high-level officials addressed the jet's oxygen system issues.

"We have identified a way forward to resume flight operations safely by limiting the maximum cabin altitude to below 10,000ft, in order to be able to operate without using the OBOGS," Shoemaker says. The US Naval Air Systems Command (NAVAIR) adds that this also involves "using a modified mask".

Instructors will conduct warm-up flights and brief other squadron pilots and students on using the modified equipment before training duties resume, NAVAIR says.

The Goshawk's OBOGS equipment is not required below 10,000ft, but pilots wear masks which contain microphones for communication and to reduce injury risk in the event of an ejection or other emergency which could require pilots to use oxygen.

"We will be able to complete 75% of the syllabus flights with the modified masks while we continue the important engineering testing and analysis at Pax River [NAS Patuxent River in Maryland] to identify the root cause of the problem," says Shoemaker. "This will remain our top safety priority until we fully understand all causal factors and have identified a solution that will further reduce the risks to our aircrew."

Onboard oxygen generation systems represent a persistent problem for the USN's T-45s, with the fleet having been plagued by hypoxia-like incidents for several years. A similar issue is being investigated on the service's Boeing F/A-18 fleet, including its E/F-model Super Hornets and EA-18G electronic-attack aircraft.

US Navy

Type has been affected by hypoxia-like incidents for several years

The navy is continuing to work with flight surgeons, physiologists and toxicologists to identify the root of the problem, Shoemaker says. Recently, an independent team from NASA visited Patuxent River as part of an ongoing review of physiological episodes.

Flight Fleets Analyzer shows the USN as having an active fleet of 197 T-45s in the A-C versions, ranging between seven and 28 years old. Developed from BAE Systems' Hawk advanced jet trainer, the type is used for tasks including preparing students to land on board an aircraft carrier. ■

OPERATIONS **LEIGH GIANGRECO** WASHINGTON DC

F-16 can fight on to 2048 as USAF extends lifeline

Lockheed Martin F-16s could remain in operational use with the US Air Force for at least another 30 years, after the US Air Force authorised a 50% increase in the type's flying life.

After a test and analysis phase conducted with the manufacturer over seven years, the USAF has approved an increase in the F-16's design service life from 8,000h to 12,000h, Lockheed says.

US Air Force

Service could modernise up to 300 of its existing C/D-model aircraft

"Following F-16 service life-extension programme [SLEP] structural modifications, the US Air Force could safely operate Block 40-52 aircraft to 2048 and beyond," Lockheed says. "Validation of the extended flight-hour limit directly supports the SLEP goal of extending the service life of up to 300 F-16C/D Block 40-52 aircraft.

"Combined with avionics modernisation programmes like the F-16V, SLEP modifications demonstrate that the Fighting Falcon remains a highly capable and affordable fourth-generation option for the US Air Force and international F-16 customers," the airframer says.

Lockheed unveiled its F-16V modernisation plan at the Farnborough air show in July 2016. The upgrade leverages technology from the company's F-35, such as Northrop Grumman's active electronically scanned array APG-83 scalable agile beam radar, and later adaptations could introduce a joint helmet-mounted cueing system and automatic ground collision avoidance.

Three international customers are so far participating in the F-16V upgrade, including Taiwan.

Meanwhile, Lockheed says it will submit a request "in the coming months" for a military type certificate to go beyond the newly approved 12,000h limit.

"Part II seeks to validate further extending the F-16's operational life based on final service life analysis from extended durability testing," it says. ■

USAF yet to decide on future of F-15
Defence P18

INVESTIGATION **LEIGH GIANGRECO** WASHINGTON DC

Grounding order keeps Cyclone under pressure

Sikorsky and the Royal Canadian Air Force (RCAF) appear no closer to finding the root cause of a failure with a flight control computer which has left the service's fleet of CH-148 Cyclone maritime patrol helicopters grounded for six weeks.

The air force has so far received 11 of the S-92-based type, with three of these supporting test and evaluation activities. The commander of the Canadian Air Division ordered an "operational pause" after a failure in the flight control computers on one test aircraft caused a momentary, uncommanded pitch change during a 10 March training sortie.

The incident marks yet another hurdle for Ottawa's Sea King replacement programme, which has faced ballooning costs and technical glitches over its lifetime.

Operational test and evaluation work has been suspended during the investigation, and the Department of National Defence (DND) tells FlightGlobal that the air force does not know when the grounding order will be lifted.

"In the meantime, RCAF pilots are doing increased training and simulator work. The temporary flying operations pause will delay the overall pilot training programme," the DND confirms. "The extent of that delay, and any impacts, are not yet known."

Until the root cause of the fault is identified, it is too early to say whether Sikorsky will be liable for any penalty, it adds. Maintenance training on the CH-148 is unaffected by the grounding order.

Canada's first 11 Cyclones have been supplied in a Block 1 configuration. The air force expects Block 2-standard aircraft to be delivered between June and 2021, to complete an eventually 28-strong fleet. ■

Royal Canadian Air Force

Royal Canadian Air Force has not flown its CH-148s for six weeks

EXERCISE **LEIGH GIANGRECO** WASHINGTON DC

Lightning deployment strikes Europe

F-35As arrive in UK for overseas training including visits to "multiple NATO bases" under European Reassurance Initiative

A formation of six Lockheed Martin F-35As from Hill AFB in Utah arrived at RAF Lakenheath in the UK on 15 April, starting the Lightning II's first overseas training deployment by the US Air Force.

Made as part of a long-planned effort under the European Reassurance Initiative, the activity will run for several weeks, the US Department of Defense says.

"This flying training deployment provides the opportunity for combat-ready aircraft to train alongside allies and other types of [US] air force aircraft in a realistic training environment, enhancing integration between the US and its allies," says Gen Todd Wolters, commander of US Air Forces in Europe.

"As we and our F-35 partners bring this aircraft into our inventories, it's important to train together to integrate into a team capable of defending the sovereignty of allied nations," Wolters adds.

During their visit, the fifth-generation fighters will operate from "multiple NATO bases, to maximise training opportunities and demonstrate US support to NATO," the USAF says. It has not disclosed which additional locations the jets will visit.

Additionally, operations from the service's Lakenheath base in Suffolk will enable it to prepare for the F-35A's introduction by the 48th Fighter Wing in the early 2020s. This will follow the UK's introduction of the short take-off and vertical landing F-35B at RAF Marham in Norfolk next year.

Drawn from the 388th and 419th Fighter Wings at Hill AFB, each F-35 was refuelled nine times during their transatlantic deployment, including by Boeing KC-135s operating from RAF Mildenhall in the UK.

The first international deployment for the USAF's F-35As follows the January 2017 arrival of US Marine Corps F-35Bs in Iwakuni, Japan. ■

US Air Force

Aircraft were refuelled nine times on transatlantic flight from Utah

MODIFICATION **DOMINIC PERRY** LONDON

Joint Strike Fighter braking parachute tests commence in USA

Norway has begun testing of the braking parachute it will use on its fleet of Lockheed Martin F-35As.

Initial work at Edwards AFB in California will focus on how the Joint Strike Fighter handles with the parachute fitted, and during braking in both dry and wet conditions. A later phase, to run until early 2018 at Eielson AFB in Alaska, will evaluate performance in icy conditions.

All trials will be performed with test aircraft AF-2.

Norway is sharing the development and integration costs for the system with the Netherlands, which is also acquiring the F-35A. Modifications include strengthening the fuselage and adapting the aircraft to house the parachute.

The Royal Norwegian Air Force's first F-35 will arrive in the country in November 2017. ■

PLANNING **LEIGH GIANGRECO** WASHINGTON DC

USAF yet to decide on future of F-15

Facing a potential $40 million overhaul bill per aircraft, service must determine how it could replace ageing C/D fleet

The US Air Force's chief of staff is not counting out a possible retirement of the service's Boeing F-15C/D fleet, but says he cannot make any solid plans until funding decisions have been made.

"We're looking at all options all the time because, until we get a budget, it's really hard to plan," says Gen David Goldfein. "I haven't made any decision on the F-15," he confirms, adding: "I actually haven't made any decision on any of the aircraft."

The USAF is examining the costs associated with retiring its F-15C/D inventory and replacing them with new Lockheed Martin F-16s, but Goldfein notes that this process is not unlike the analysis it conducts across all its weapon systems. The service has not drawn any conclusions on the potential benefits of removing the type from use, he adds.

Goldfein says that under current plans, the USAF will retain its F-15Cs until at least 2020, and its ground-attack-roled Fairchild Republic A-10s until 2021.

MAINTENANCE COSTS

Maintaining the legacy F-15 beyond the 2020s would require a new series of service life extension programmes, including a centre fuselage overhaul that has been estimated at up to $40 million per aircraft.

"There's an end out there [for the F-15C/D]," Air Combat Command chief Gen Mike Holmes said in late March. "Somewhere in the late '20s you either have to put $30 million or $40 million an airplane into them, or stop flying them."

The F-15C's possible retirement, details of which emerged during a Congressional hearing during March, is already shaping up to rival the planned removal of the USAF's fleet of A-10s. That saga has for the past several years pitted parochial interests on Capitol Hill against the harsh fiscal realities of keeping the ageing strike asset in use as the replacement Lockheed F-35 comes online.

US Air Force

Legacy fighter would require major modifications to fly into 2030s

Deputy chief of staff for operations Lt Gen Mark Nowland reiterates that any plan to retire the F-15C/D remains "predecisional", but emphasises the limits of future service life extensions.

"The F-15 has been a spectacular airplane, but the same F-15s I flew in 1991 are still flying today," he notes. "When I last flew it, it had 7,100 hours on it – and that was in 2001. We extended and keep extending it. To keep flying it, we had to do extensive maintenance."

> "The F-15 has been a spectacular airplane, but the same F-15s I flew in 1991 are still flying today"
>
> **Lt Gen Mark Nowland**
> Deputy chief of staff for operations, US Air Force

Instead of pursuing another life-extension effort, Nowland says he would like to see the next generation of USAF pilots flying a new aircraft. "The F-22 is a much better airplane than an F-15 for an air supremacy mission," he notes.

RAPTOR REVIVAL

Lockheed delivered the last of 195 Raptors to the USAF in 2012. Neither party appears to have warmed to suggestions from last year about a potential production revival, due to the costs associated with such a step, and its impact on the F-35.

Instead, new-build examples of the F-16 could be fielded with active electronically scanned array radars, enabling them to fulfil the air-defence mission.

Flight Fleets Analyzer records the USAF as operating a current fleet of 214 F-15C fighters and 26 D-model trainers, ranging between 28 and 37 years in age. ■

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ROTORCRAFT ASIA 2017

The inaugural edition of Rotorcraft Asia was a more subdued affair than the biennial Singapore air show, which is held on the same site at the Changi Exhibition Centre. However, participants say that a dedicated helicopter show gave the sector a better opportunity to step into the limelight and discuss the issues that are relevant to rotary-wing operations in the region. The key themes were innovation, mission suitability and the regulatory environment. Greg Waldron reports

Greg Waldron/FlightGlobal

OUTLOOK

Bell focuses on parapublic sector sales

Airframer eyes growth governmental market in Asia-Pacific region, as well as strong prospects for newest two models

Bell Helicopter sees strong opportunities in the parapublic sector across the Asia-Pacific region, as vertical lift is increasingly seen by governments as a cost-effective means of tackling the effects of natural disasters and law enforcement challenges.

Sameer Rehman, managing director of Bell Helicopter Asia-Pacific, spoke to FlightGlobal at the company's stand at the Rotorcraft Asia show, where the US manufacturer had a large presence, including three aircraft on static display.

"More and more, governments recognise the need to divert funds toward helicopter operations," he says. "Global warming is an issue for many of these countries, with typhoons, rising [sea levels], and flooding. Helicopters are a perfect solution to help people in distress."

Bell Helicopter

Recently certificated 505 Jet Ranger X has "healthy mix" of buyers

Rehman sees good prospects in the region for the airframer's newest helicopters – the 505 and super-medium-class 525 Relentless.

He says the short-light-single 505 is proving to be particularly popular in Asia-Pacific, with a "healthy mix" of buyers involved in missions such as training, air taxi services, and tourism.

Despite a company-imposed grounding in the wake of a crash during flight testing in July 2016, Rehman is confident that the fly-by-wire 525 will receive certification in 18-24 months.

He says that the type's prospects in the region have not been greatly dented by weakness in the oil and gas sector, which has hurt demand for large helicopters globally.

"The oil and gas market will recover, and the 525 will be the ideal platform for that when it happens – but for the moment the parapublic market will be our focus," he says.

Rehman also feels that the 525 has strong potential for the VVIP segment: "This will be the flagship helicopter for captains of industry and heads of state." ■

ORDER

PhilJets boosts inventory with pair of H130s, H145

PhilJets

Current fleet includes H130

Philippine operator PhilJets Group has placed orders for two Airbus Helicopters H130 light singles and one medium-twin H145.

The three helicopters will be delivered in the last quarter of 2017. PhilJets says it plans to use them for missions including VIP transport, tourism and possibly emergency medical services. The acquisition will bring PhilJets' Airbus Helicopters fleet to nine.

"Establishing PhilJets in 2013, our goal was to develop the business aviation market in the Philippines to a state where it can receive the attention it deserves," says Thierry Tea, chief executive of the company. ■

European certification nears for SF50
Business Aviation P22

STRATEGY

Airbus anticipates a decade of demand for civilian types

Manufacturer says fleet replacement and market expansion will drive sales in all segments

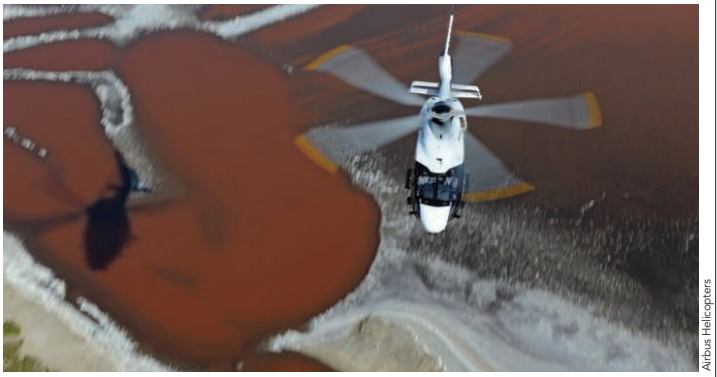
Airbus Helicopters is confident of delivering 1,000 new civilian helicopters into the Asia-Pacific region over the next 10 years.

The European manufacturer expects fleet growth across all mission segments, driven both by fleet replacement and market expansion, says Philippe Monteux, the company's regional head of Southeast Asia and the Pacific.

Airbus Helicopters is actively promoting its developmental H160 in the region, with a full-sized mock-up of the type on the company's stand at Rotorcraft Asia. Monteux says the H160 has yet to receive any orders in Asia-Pacific, although sales efforts for the type are focussed on offshore support and VIP missions.

The H160 will have a maximum take-off weight (MTOW) between 5.5-6t, a step down from the super-medium H175, which has a 7.5t MTOW. The H160 will also cost around 20-25% less than the H175.

Monteux's remarks came during a media briefing at the airframer's site in Singapore's Seletar Aerospace Park and was delivered in a conference room built specifically to serve as a customer delivery centre.



Airbus Helicopters

Developmental H160 has yet to win orders from region's operators

The creation of that facility is part of a reshaping of Airbus Helicopters' support infrastructure in the region, which sees its Singapore hangar focus solely on deliveries and completions, while all maintenance, repair and overhaul work is transferred to its operation at Kuala Lumpur's Subang airport.

"We need an ecosystem," says Monteux. "We need to work hand in hand with different partners to make a delivery. We have strong co-operation with local authorities that allows us to deliver any aircraft in a smooth manner. Singapore provides the right platform to continue in that direction."

Having greater support specialisation among Airbus Helicopters facilities across the region has several benefits, says Monteux, chiefly lower costs and improved efficiency. ■

CONNECTIVITY

Honeywell links in with GoDirect as helicopter fit

Honeywell sees growing levels of interest in satellite connectivity for helicopters in the Asia-Pacific region.

Derek Lockett, Honeywell regional sales director, says the service is a major part of its discussions with helicopter operators, particularly in the VIP segment.

Honeywell has developed a product called GoDirect that can be retrofitted to existing types. Currently it is certificated for the Leonardo Helicopters AW139, but Honeywell hopes to certificate nine additional rotorcraft in 2017, and eight in 2018.

Hardware involved in the system includes a receiver on the helicopter's tail.

"One challenge is that satcom is line of sight," says Lockett. "Helicopter blades chop up the signal, causing disruptions. We've been able to use a technology called interleaving where we can rebuild the signal. We now get much more robust and reliable signals at broadband speeds."

This provides connectivity of 1mbps, allowing for high bandwidth applications such as video streaming and conferencing. ■

DATA

Forecast says region will outstrip North America

Flight Ascend Consultancy says that Asia-Pacific's civilian helicopter fleet has grown by 65% over the last decade and forecasts that the region will outstrip North America for deliveries over the next 10 years.

Consultant Dennis Lau presented data showing that in 2016 the region accounted for just 17.5% of the global civilian helicopter fleet, but 29% of deliveries.

Lau says that the industry is still in recovery mode following the collapse of the resources sector a few years ago.

"Deliveries in the short term will still be impacted by the slowdown in 2015-2016, driven by the oil market slump and economic uncertainty," he says.

"New models such as the Bell [Helicopter] 505, 525, Airbus Helicopters H160, and others will help stimulate demand. The Asia-Pacific will eventually overtake North America, accounting for 30% of new deliveries in the next ten years."

Lau notes that the largest market in Asia-Pacific remains Australia, with nearly 2,000 civilian helicopters, followed by China, with just over 800.

"The largest markets in the region are not necessarily the fastest growing ones," he says.

All mission segments have seen strong growth, he says, highlighting offshore support, surveying, tourism, training, and emergency medical services. ■

Sikorsky

China's rotorcraft fleet has grown to second largest in Asia-Pacific

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DELIVERIES
KATE SARSFIELD LONDON

Embraer ships 35% fewer jets in first quarter

Embraer has recorded a 35% fall in business jet shipments for the first quarter of 2017 compared with the same period last year, reflecting a prolonged and persistent weakness across the global business aviation sector.

For the three months ended 31 March, the Brazilian airframer shipped 15 aircraft. These consisted of 11 light jets – eight Phenom 300s and three Phenom 100s – and four large jets: one each of the Legacy 450, 500, 650 and flagship Lineage 1000E.

This performance compares with 12 light jets and 11 large jets delivered during the first quarter of 2016. That total included 11 Phenom 300s and one Phenom 100, plus five Legacy 450s and six Legacy 650s. ■

PARTNERSHIP ELLIS TAYLOR PERTH

Dassault and Japan Airlines team up to make private French connections

Japan Airlines (JAL) has partnered with Dassault Falcon Service (DFS) to offer bespoke private jet connections for passengers from Paris to destinations in Africa and Europe from 1 May.

JAL says the service will offer seamless ground connections between Charles de Gaulle and DFS's fixed-base operation at Le Bourget airport. DFS – the business aviation services arm of airframer Dassault – will offer a range of nine Falcon twin- and tri-engined jets on a pay-as-you-go pricing structure.

"We see business jets as a way to multiply travel options for our customers without having to expand our route network," says JAL president Yoshiharu Ueki.

FlightGlobal schedules data shows that JAL flies twice-daily to Charles de Gaulle from Tokyo's Narita and Haneda airports. The Oneworld carrier says it could expand the service to the USA and other markets at a later date.

Dassault Falcon Service

Service will use Falcons to increase travel options for JAL passengers

Lufthansa blazed a trail 12 years ago with the introduction of its Lufthansa Private Jets (LPJ) service, which the German flag carrier offers in partnership with the world's largest business-aircraft operator, NetJets. LPJ offers Lufthansa passengers onward travel via the NetJets fleet throughout Europe and North America. It also offers ad-hoc point-to-point business jet travel. Flag carrier Air France has had a similar arrangement with French air taxi provider WiJet since 2014. ■

PROGRAMME KATE SARSFIELD LONDON

European certification nears for SF50

Cirrus Aircraft foresees "promising" market for single-engined type on continent following validation and service entry

Cirrus Aircraft is hoping to secure European certification for its SF50 Vision Jet before the end of the second quarter, so it can begin delivering the first single-engined personal jets to local owners and operators.

The US airframer says Europe currently accounts for around 15% of its 600-strong Vision Jet orderbook, and expects that figure to increase as acceptance of the clean-sheet, six-seat aircraft gathers pace across the region.

"The European market is very promising," says Pat Waddick, Cirrus's president, innovation and operations. While many of the position holders are current and former owners of the company's SR20/22-series of piston-singles, he is confident the Vision Jet's appeal will widen once the type has entered service. "This aircraft brings high performance into a price point that is far lower than comparable light-twins and single-engined turboprops," says Waddick. "There's nothing else like it on the market."

Cirrus – owned by China's CAIGA – is in the process of building a service centre network across Europe to support the local Vision Jet fleet. The continent is already home to 30 SR-authorised service centres, which will expand their capabilities to include the Vision Jet. Additional service sites will be added to the portfolio, says Waddick.

The $2 million Vision Jet secured US certification in October 2016, becoming the first single-engined jet to obtain Part 23 validation. The type entered service last December, and Cirrus has delivered six examples to date. "We are gradually ramping up production, and plan to deliver between 25 and 50 aircraft this year and between 75 and 125 in 2018," Waddick says.


Cirrus Aircraft

A first example was handed over to its private owner last December

Around 20 Vision Jets are in various stages of manufacture at Cirrus's composite parts and final assembly facilities in Grand Forks, North Dakota and Duluth, Minnesota, respectively, says Waddick. "Around 600 owners are waiting patiently for their jets, and we are working as hard as we can to clear the backlog," he adds.

The Williams International FJ33-5A-powered Vision Jet is equipped with a Garmin G3000-based Cirrus Perspective Touch flightdeck and an emergency parachute system. It has a maximum take-off weight of 2,730kg (6,000lb), a range of around 1,000nm (1,850km), a cruise speed of 300kt (555km/h) and a stall speed of 67kt. ■

New twist on tilt
Cover Story P24

PROPULSION **MICHAEL GUBISCH** DAHLEWITZ

Advance 2 at core of R-R's future plans

Despite struggles in business aviation segment, UK engine maker is preparing portfolio for next generation of aircraft

Rolls-Royce is developing a new engine core that should become available for future business jet programmes from 2020 onwards.

Dubbed Advance 2, the project is an extension of the UK manufacturer's Advance and UltraFan efforts to develop successors to its Trent family for large commercial airliners.

Frank Moesta, product strategy executive for R-R's business aviation activities, said during a media briefing at the company's site at Dahlewitz, near Berlin, last month, that the aim of Advance 2 is to develop a sufficiently mature core by 2020 – at technology readiness level 4-6 – to allow further development of a complete engine for a potential new aircraft programme.

The new core – comprising a 10-stage high-pressure (HP) compressor, combustor and two-stage HP turbine – will form the basis of a new business jet engine family that is to span a thrust range between 10,000lb-20,000lb (44.5-89kN).

Max Kingsley-Jones/FlightGlobal

Although it powers the G650, firm will not equip latest Gulfstreams

Chief project engineer Josef Hölzl says there will be two core variants – with an approximate 10% difference in size – and three different fan diameters, likely to be 44in (112cm), 48in and 52in. Today, R-R's largest in-production business jet engine, the BR725 for the Gulfstream G650/ER, has a 50in fan diameter.

The aim is to develop a sufficiently mature core by 2020 to allow development of a complete engine for a potential new aircraft

Similar to its future technology efforts in the large engine arena, the overall aim of Advance 2 is to develop a smaller, but more efficient, engine core that can be scaled in conjunction with different low-pressure systems to replace R-R's current business jet powerplants.

Specific fuel consumption is to be reduced by 10%, while NOx emission cuts are targeted at up to 50% versus the BR725. Meanwhile, the thrust-to-weight ratio is set to be improved by 20%.

In order to reduce weight as well as improve efficiency, R-R intends to use blisks rather than disks with individual blades for the HP compressor, and to install shroudless blades in the HP turbine. Also, the fan rotor will be a blisk rather than being assembled from individual blades.

New materials and component cooling technology will be employed in the hot section to withstand higher temperatures and pressures, and to improve combustion efficiency.

Hölzl says a first demonstrator engine – representing the largest variant with a 52in fan – will run "relatively soon".

R-R has suffered recently in the business jet market, with none of the large aircraft currently in development – including models from Bombardier, Dassault and Gulfstream – destined to use its powerplants. ■

TECHNOLOGY

Supersonic travel sounds tempting, but airframers must commit

Propulsion specialist Rolls-Royce foresees future demand for supersonic business jets and is studying engine options for such high-speed aircraft.

But R-R says any formal development would only be prompted by an airframer's launch of a supersonic business jet programme.

Dean Roberts, market analysis executive business aviation, says that a growing international population of billionaires represents a potential market for supersonic travel. "At least, these people will be the first buyers, the first movers in such a market," he says.

Senior vice-president customers and services business aviation Scott Shannon says R-R is in a good position to develop a new commercial supersonic engine as the manufacturer has relevant experience from providing powerplants for the Aérospatiale/BAC Concorde and military jets.

AirTeamImages

Manufacturer could leverage experience from Concorde programme

But significant commercial, regulatory and technological challenges remain. "Before anything happens, it has to make sense commercially. This won't be a science project," he says.

And R-R has no intention to develop an engine unless there is clear airframer demand, he says.

As a result of stringent international regulations largely driven by noise concerns, Roberts thinks a hybrid aircraft – which can cruise at high subsonic speed over land and fly beyond Mach 1 over water – will initially be a more likely proposition than a supersonic business jet.

Josef Hölzl, R-R's chief project engineer future programmes business aviation, agrees, adding that a hybrid design would be simpler to develop based on existing technology. ■

New twist on tilt

While making its mark as a troop transport, the V-22 has also been a story of tragedy and delay; can the new V-280 transcend the shortcomings of that first operational tiltrotor?

STEPHEN TRIMBLE AMARILLO & FORT WORTH

Bell Helicopter assembly leader Jeff Josselyn begins a tour for two journalists seated inside a nearly complete tiltrotor parked within a former OH-58D modification centre at the company's manufacturing complex in Amarillo, Texas. "The beauty is, this aircraft is based on all the lessons learned from the [Bell Boeing] V-22," he begins, as the seated pair grab a little too eagerly at the unfamiliar controls.

Josselyn's 10 April tour is the first time Bell has allowed journalists inside the V-280 Valor, a $500 million gamble that will compete with the Sikorsky-Boeing SB-1 Defiant and other concepts for a military rotorcraft replacement market worth billions of dollars over several decades. It is scheduled to begin a year-long flight demonstration phase along with the compound-pusher SB-1 later this year, with data to inform the requirements and, perhaps, the acquisition strategy for the USA's Future Vertical Lift (FVL) programme.

"There's a lot of concern. We're going to have to fly to prove some things out"

Vince Tobin
Vice-president of advanced tiltrotor systems, Bell Helicopter

With the SB-1 still in the final assembly stage, Bell is waging a full-on marketing blitz with its nearly completed aircraft. For Bell, the V-280 is as much about redemption as technological progress. Programme managers want to show that the company has learned lessons from the V-22, the first operational tiltrotor, which survived a tumultuous and tragic development phase. Josselyn notes that the V-280 was designed using lessons gleaned from more than 300,000h of test and operational flight hours on the V-22.

To demonstrate how the V-280 will be different, Bell starts with a cockpit tour.

With heated transparencies due to arrive from PPG by mid-April, the V-280's initial windscreens had been removed, allowing visitors to enter the cockpit through the front window rather than the side door. Once seated, it takes a few moments to absorb the differences between the V-280 and a conventional helicopter – or even the V-22.

"We don't have the traditional cyclic and collective as you'd see in a traditional rotor aircraft," Josselyn explains. "The reason is because of the range this aircraft is capable of. You're going to be sitting in this seat for quite some time."

Instead, Bell has installed sidesticks, a technology borrowed from the similarly fly-by-wire 525 Relentless, a super-medium helicopter still in development and aimed primarily at the commercial market. The bulkhead and keel of the V-280 are also modelled on the 525.

The first and only V-280, billed as 95% complete, is waiting for a few key components. One of them is the forearm support that mounts behind the sidestick, allowing the crew to manoeuvre the new tiltrotor with small wrist movements comfortably over long periods. Ergonomics is a surprising theme for a military helicopter, but Bell's layout for the V-280 is focused on providing 525-level com-

Valor demonstrator is "95% complete", ahead of flight testing from September

fort for the crew. The aisle stand features a cursor control device angled at about 45° rather than perpendicular to the glare shield, allowing the crew to toggle between four multifunction displays using a natural hand position. The multifunction displays themselves use traditional push-button controls, but Josselyn notes that Bell could move to touchscreen devices in an operational V-280.

Despite Bell's substantial investment, the path to an operational V-280 could be long and far less forgiving than the two-decade development project the US military lavished on the V-22. The V-280 may be a "fourth-generation tiltrotor", as Bell describes it, but it is not designed to replace the V-22, which the US Marine Corps and Air Force Special Operations Command are not looking to replace for the foreseeable future.

Like the SB-1, the V-280 is instead designed to fill the role once performed by Bell's original UH-1 Huey. Sikorsky's UH-60 Black Hawk won the 1970s competition to replace the Vietnam War-era UH-1; Bell's unsuccessful bids for that Utility Tactical Transport Aircraft System contract were based on two- and four-bladed versions of the Model 240.

Bell Helicopter

Bell believes its V-280 design is mature enough for the army to skip a risk-reduction activity

Bell Helicopter

The army has yet to settle on a firm plan for replacing the Black Hawk fleet. Instead, it is following a two-path strategy. First, it is funding the improved turbine engine programme, which will replace the 2,000shp (1,490kW)-class GE Aviation T700 engine with a 3,000shp powerplant. A competition between the GE3000 and the Honeywell/Pratt & Whitney joint venture ATEC HPW3000 should finish by the end of the decade, with the winner cleared to develop a product to re-engine hundreds of UH-60s and Boeing AH-64 Apaches.

At the same time, the army is funding GE to develop the future affordable turbine engine (FATE). This 6,000shp-class turboshaft will provide enough thrust to power a rotorcraft up to about 100kt (185km/h) faster than a conventional helicopter, and be able to take off and land vertically. Assuming the army can continue to afford to modernise UH-60s while simultaneously developing a high-speed replacement, the FATE engine will be relied on to power whatever comes next.

TECHNOLOGY DEMONSTRATOR

The joint multi-role technology demonstration (JMR-TD) is the army's flying laboratory for assessing the merits and challenges of combining relatively high speed and vertical lift. For Sikorsky-Boeing, JMR-TD is a chance to introduce the coaxial-compound-pusher configuration into operational service. Early experiments with Sikorsky ABC concepts in the 1970s shelved the concept for four decades, as flight control technology was not yet able to cope with the vibration levels associ- »

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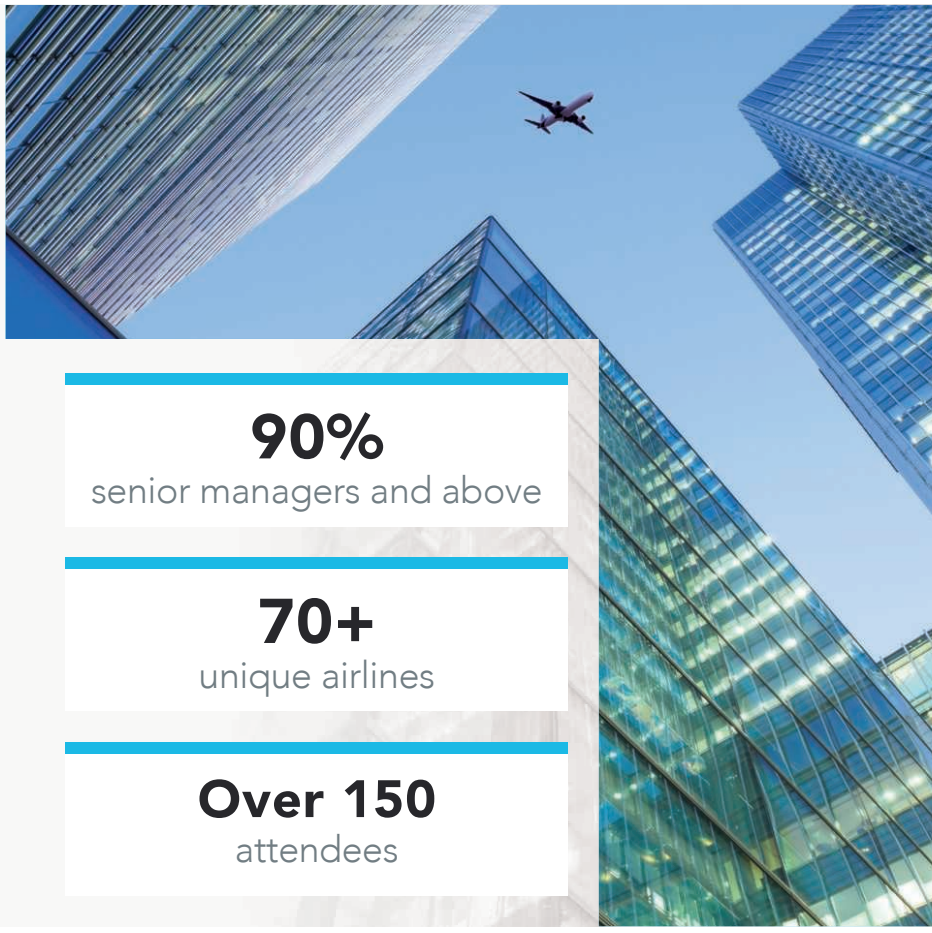

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» ated with high-speed flight. In the past decade, Sikorsky revived the concept with the X2 high-speed demonstrator, which won the prestigious Collier Trophy after demonstrating that fly-by-wire technology can offset the vibration effect. Sikorsky continues to develop the S-97 Raider to fill niche military roles, and is working with Boeing to develop the SB-1 for JMR-TD.

Technically, JMR-TD is not a competition. The army will not award a winner at the end of the demonstration. Both teams are preparing to compete for a follow-on development contract for FVL, along with alternative high-speed concepts proposed by Karem Aircraft and AVX Corp.

On 26 October 2016, the army released a request for information for a subset of the planned FVL family of aircraft called capability set 3 (CS3), which calls for replacing UH-60s and the USMC's UH-1s by 2032. The information the army gathers will inform an analysis of alternatives (AoA), the first step in the US military's new acquisition process.

If the Department of Defense follows the normal path, the AoA will clear the army to launch a three-year risk-reduction phase in 2020 focused on raising the maturity of key technologies with multiple contractors. The next step is to choose one contractor in 2023 to enter a seven- to nine-year engineering and manufacturing development (EMD) phase, leading to an initial operational capability in 2030 or 2032.

The V-280 is a new aircraft, but an operational tiltrotor is not a new technology. For this reason, Bell advocates accelerating the schedule by deleting the risk-reduction phase and proceeding straight to EMD in 2018.

"We think that based on what we've done that we could accelerate that [schedule]," says Vince Tobin, Bell's vice-president of advanced tiltrotor systems.

US Air Force

Anhedral, forward-swept wing and tilting engines meant added complexity on the Osprey

Accelerated development programmes are not a hallmark of the US military's acquisition system. In reality, many aircraft development programmes arrive years late – like the V-22. Army aviation, in particular, has a poor reputation for delivering new aircraft into service. With the exception of the non-combat Airbus Helicopters UH-72 Lakota, the army has not successfully fielded a new aircraft with vertical lift capability since the Black Hawk and Apache in the late 1970s.

PENTAGON SCEPTICISM

Tobin acknowledges that Bell's proposal to accelerate the schedule by skipping the technology maturation phase has met some reluctance within the Pentagon. "There is some receptiveness," he says. "But there's a lot of concern. Not unexpectedly we're going to have to fly to prove some things out."

Bell Helicopter

Other applications for V-280 could include supporting the Marines' amphibious missions

For its part, Bell remains on track to enter flight testing in September. The V-280 has recently completed ground vibration testing, which revealed the need for several undisclosed design tweaks, but nothing that will delay the programme's airborne debut.

The design and layout of the gearboxes are at the heart of Bell's claimed cost and reliability improvements for the V-280 compared with the V-22. The Osprey fleet features a complex, composite anhedral wing with forward sweep which requires special assembly processes.

The design of the V-22 wing creates another complication. A driveshaft runs through the wing to connect both engines, allowing one engine to power both propellers if the other fails. To achieve this, Bell installed a mid-wing gearbox to connect the driveshaft in the middle.

In the years since the V-22 entered service, Bell's engineers determined that the forward sweep and anhedral features were unnecessary, but it was too late to remove them in the Osprey configuration. The V-280, by contrast, features a straight, flat wing that requires no connecting gearbox above the fuselage.

Another major advance in simplicity for the V-280 is in the engines themselves. The V-22 tilts both the wing and the engines. For the army, this configuration prevents troops from exiting from the side of the aircraft, as they have grown used to in Black Hawks and Hueys. It also increases the complexity of both the engines and the tilting mechanism.

The V-280's engines – GE T64-419s – are mounted horizontally in the wing-mounted nacelles, and do not tilt. The direct drive that translates the engine power to the prop-rotor gearbox is also left stationary inside the engine nacelle, removing another source of complexity from the Valor configuration. The only mechanisms that tilt in the V-280 are the prop-rotor gearbox and the propellers. ■

From L to V

The US Army's long-term aviation planning is built around a next-generation family of rotorcraft, but in the meantime its venerable Black Hawk fleet is receiving a cockpit upgrade

Several iterations of Sikorsky's UH-60 have been a mainstay of worldwide operations since the 1980s

US Army

LEIGH GIANGRECO WASHINGTON DC

For US Army aviation, the future is spelled FVL, as in Future Vertical Lift, and it is being explored by bold prototype models: the Bell Helicopter V-280 Valor, Karem ATR36 and Sikorsky-Boeing SB-1 Defiant. To power that future, the service and industry are grappling with another Herculean project, the improved turbine engine programme (ITEP), to replace the GE Aviation T700 that powers the Boeing AH-64 Apache and Sikorsky UH-60 Black Hawk helicopters.

But while FVL and ITEP might transform the army's rotorcraft fleet, neither is coming soon or cheap. So the army is looking for a quicker and less costly bridge to that future. To wit, Redstone Defense Systems and Northrop Grumman have been charged with delivering a digital cockpit upgrade for its UH-60Ls, in the process creating a new variant, the UH-60V.

Northrop's upgrades are expected to add another 10 years to the life of the legacy "Lima"-model Black Hawks, and the army has heralded the UH-60V programme as a recapitalisation coup for a service faced with ever-tightening fiscal belts.

Lt Col Andrew Duus, product manager for the UH-60V programme, tells FlightGlobal: "The army had to go with the UH-60V from a cost savings perspective. It just makes a lot of sense to pursue the -60V cockpit upgrade, which allows us to spend more of our aviation funding on future vertical lift and ITEP."

DIGITAL MAKEOVER

The army's iconic Black Hawk has had several makeovers since it premiered in 1979 as the replacement for the single-engined Bell UH-1 Huey. Sikorsky had designed the helicopter to carry four crew members and 11 troops or an equivalent load of up to 4,080kg (9,000lb). The company churned out "Alpha" models until the introduction in 1988 of the UH-60L, powered by 1,940shp (1,445kW)-rated T700-701Cs, increasing power by 24% over the UH-60A.

Full-rate production of the next iteration, the UH-60M, began in 2007. Features included a digital update of the -60A's "boiler gauge" cockpit. The "Mike" version also got improved T700-701D engines and wide-chord main rotor blades.

As of February 2016, the army planned to convert 110 UH-60As to Ls and upgrade 142 UH-60Ls to Vs. The UH-60V upgrades would be carried out over a four-year period from fiscal year 2018 to 2021. The army has targeted 760 UH-60Ls for conversion to V-models by FY2034.

During this transition, the helicopter will receive a digital cockpit makeover, replacing a legacy analogue cockpit with state-of-the-art multifunction displays that allow pilots to fuse all of the aircraft's data into one location, increasing situational awareness and mission focus.

"By fusing all the data into one multifunction display, the aviator has to be less concerned with all the other instrumentation in the aircraft," Duus explains. In the analogue cockpit, clearly built and adapted over time rather than designed, gauges are split between the centre console and leg-level displays.

Under a 2014 contract, Northrop replaced the analogue gauges on "Lima" models with electronic instrument displays. The programme completed its critical design review in October 2015 and moved on to build three prototype aircraft. One flew earlier this year, and the next two are being built at the prototype integration facility at the army's Redstone Arsenal in Meridianville, Alabama. The prime contractor for the UH-60V programme, Redstone Defense Systems, is responsible for the installation of prototype kits and components. Northrop serves as Redstone's subcontractor, developing the software and main electrical components in the cockpit, such as the multifunction displays, Duus says.

ARMY UPGRADES

By the third quarter of FY2018, the army will cease converting UH-60As into UH-60Ls, and will convert only UH-60Ls into UH-60Vs, Duus says. The service will reconstruct the "Limas" using an existing production line at Corpus Christi Army Depot in Texas, where it is already recapitalising A-models today. By adopting the same recapitalisation model for the "Victor", the army estimates it will save about $1.5 million per aircraft, he says.

"One of the advantages of doing that is that we leverage a lot of activity going on at the depot level," he says. "We're already investing a lot of money in tearing down the aircraft and putting it back together with new components or rebuilt components. So from a cost savings perspective it just makes sense to do as many depot-level upgrades at that time as we can."

The UH-60V's displays include an integrated moving map capability similar to the M model's, centred in one location. Harris FliteScene Digital Map software supports the moving map by providing the base picture for the pilot's overlays and other situational awareness icons. Harris's software is operated on airborne platforms across the US services, including the army's Apaches and Boeing CH-47 Chinooks. FliteScene integrates with ViaSat's Blue Force Tracking 2 (BFT2), a shared army and Marine Corps network that supplies situational awareness of friendly and enemy forces. The enhanced BFT2 provides instant messaging and real-time location updates to air and ground platforms, according to ViaSat.

> **"It just makes sense to do as many depot-level upgrades at that time as we can"**
>
> **Lt Col Andrew Duus**
> UH-60V product manager, US Army

Northrop has advertised that its UH-60V package incorporates its redundant multicore processor FlightPro Gen III mission computers, which promise excess processing power for future growth. However, the army states that flight safety requirements restrict the UH-60V to single-core processing.

POWER TO SPARE

"There is processing growth capability should we ever qualify multicore processing in the UH-60V. However, there is no plan to use more than one core in the near future," the army tells FlightGlobal. "Because not all software functionality has been completed, we do not know the amount of excess processing power that we will have. However, we do not anticipate any processing power issues under the current design."

US Army

Updates to venerable utility type will enhance situational awareness for the army's pilots

While the UH-60V cockpit will be capable of processing video from a forward-looking infrared sensor or other attachment, the capability is not part of the -60V baseline and the army is not currently planning any additional functionality outside of the model's baseline requirement.

Northrop's upgrades will also help the UH-60V meet global air traffic management requirements.

"The UH-60V will be able to perform most GPS approaches which previously had not been a capability in the UH-60L aircraft," Duus says. "This is really critical for all of our aviation forces; particularly as a lot of older navigation aids are no longer being maintained."

FACE TIME

The integrated avionics suite on the UH-60V maintains an interface that is almost identical to the M model. Northrop has also designed the digital cockpit in accordance with the future airborne capability environment (FACE) standards: an open architecture initiative led by the US Navy which supports the integration of off-the-shelf hardware and common software across aviation platforms. The decision to comply with the navy's FACE standards could also leave the door open for future integration on to the FVL platform, which the army, navy and USMC will develop jointly.

Along with the digital cockpit improvements, the UH-60V will also receive line-replaceable units that are common with the UH-60M. A redesigned improved data modem will provide network access to exchange data on allied and adversary locations, and will be less expensive than its commercial predecessor, according to the US Army Aviation and Missile Research Development and Engineering Center. The upgrade also includes Raytheon's ARC-231 multimode aviation radio system, which is also fielded on the Apache, Airbus Helicopters UH-72A Lakota and special operations MH-47G Chinook.

On 19 January, Northrop and the army flew a set of flight exercises with the UH-60V engineering and development model, testing takeoff, hover and tracking capabilities.

"The experimental test pilots from the Redstone test centre were so confident in the capabilities that after they brought it up to a hover, they took off and flew a traffic pattern at Meridianville," Duus says.

He says the army is on track to accomplish the UH-60V's limited user test in the fourth quarter of FY2018 and initial operational test and evaluation by FY2019. During the limited user test, army aviators will take two aircraft through a set of basic missions and assess whether the cockpit needs further modifications before low-rate initial production. Production should kick off that same year, with a first unit equipped in FY2021. ■

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www.flightglobalevents.com/LoyaltyFreddies2017

Airborne might

With more than 4,500 helicopters on active duty, the US Army packs a formidable punch

Dianne Bond/Airbus Helicopters North America

UH-72A Lakota light utility platform is a militarised version of Airbus Helicopters' H145

US Army

The CH-47 Chinook is a heavy-lift essential

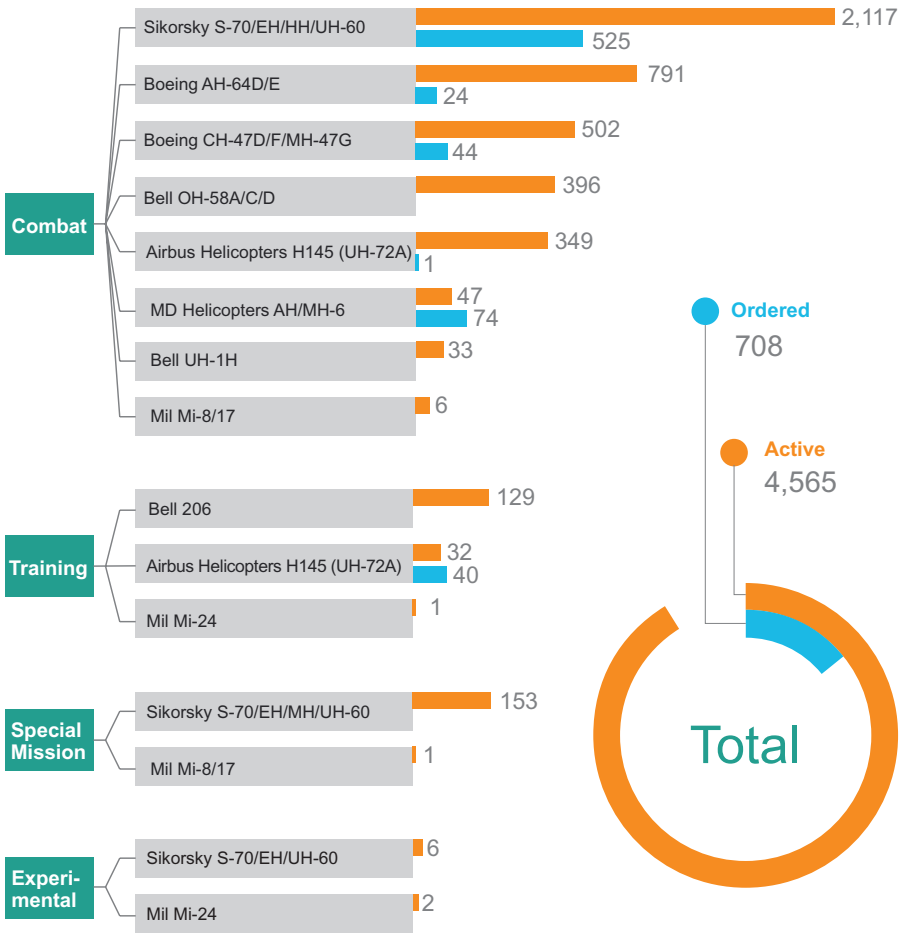
US Air Force

Service has 791 Apaches in operational use

US Army

Almost 400 OH-58 Kiowa Warriors remain

US Army rotorcraft fleet



Source: Flight Fleets Analyzer

Notes: Pending purchase approval or contract signature

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

Who killed Trident?

The Hawker Siddeley Trident (*right*) is another of the UK's what-might-have-beens – as famous for its acoustics as for its commercial success.

The sophisticated trijet promised to revolutionise the short-haul air transport market with its advanced design, low operating costs and sophisticated auto-flight systems. But despite some world-beating technical firsts, FlightGlobal's Max Kingsley-Jones will recount to Farnborough's FAST Association how the Trident was prevented from achieving its true potential amid short-sighted strategic thinking and political wrangling.

The talk takes place on 9 May at Farnborough's Village Hotel. It is free to FAST Association members, while non-members are welcome (£5 donation per head). More details: airsciences.org.uk/events

Cathay to Coke

Cathay Pacific's last A340-300 has been parted out and is on its way to the breakers' yard in France. Like the Hong Kong carrier's other 10 retired Airbus quadjets before it, it will be disassembled, with some of its parts recycled back through Cathay's maintenance department. As usual with broken-up aircraft, other bits could end up almost anywhere.

Given that Cathay's trading conglomerate parent, Swire, also owns the rights to Coca-Cola in the territory, we wonder if its inhabitants could end up swigging their black gold from a piece of Hong Kong aviation history.

Airbus

Star turn: the agile Atlas

Max Kingsley-Jones collection

"Take it from me Simkins, this airliner is going to be a big noise in aviation."

Big bank

Anyone who has witnessed the Airbus A400M strutting its stuff at an air show will vouch for its remarkable aerial agility, but Roger de Mercado, a former flight test engineer at Hatfield and secretary of the de Havilland Aeronautical Technical School Association, draws our attention to a piece in the esteemed Royal Air Forces Association Air Letter.

In the article on a visit by an RAF Atlas to New Zealand, it refers to the type's "staggering 170 degrees angle of bank".

"One wonders why it wasn't cleared to fly at the full 180 degrees, thus being straight and level, albeit inverted," ponders our correspondent. "The ability to fly upside down might be handy down under, although partatrooping might be awkward."

To be fair to the journal, we think its claim was a mere 50° out, with the A400M tipping to an eye-watering 120° during various public displays.

Ready or not?

The latest edition of FAST, Airbus's technical magazine, notes that the airframer has "worked with several airlines, defining the Operational Availability of an aircraft as the number of days per year the aircraft is not available for operation due to technical reasons…"

We wonder how they define operational non-availability?

Meanwhile, a press release from Toulouse about progress on its new giant transporter is headed: "BelugaXL hits the road". Er… we hope not.

Behind the mask

Qantas has teamed with some of "Australia's leading artists" to design new amenity kits for business class travellers.

The packs include an elaborately-decorated eye mask, the one item that – once in use – you are never going to fully appreciate aesthetically.

A British republic

100 YEARS AGO

The republican outburst of Mr. H. G. Wells in the *Times* does not appear to have received the welcome the famous novelist must have anticipated when he penned his letter. As a matter of fact, all it has received has been a liberal douching with the coldest of cold water.

Burma withdrawal

75 YEARS AGO

More Chinese troops have been pouring down into Burma, but the Anglo-Chinese withdrawals have continued. Help from American aircraft is expected, but the difficulty is to get them from India to Burma.

Starfighter suit

50 YEARS AGO

A former Luftwaffe pilot, Herr Manfred Kohnle, is suing the West German Defence Ministry for depriving him of his flying licence after he complained last year that the F-104G Starfighter was not safe to fly. Herr Kohnle, then a sergeant-major, was dismissed from the Luftwaffe after declining to fly F-104Gs.

Better Fishbeds

25 YEARS AGO

The Polish air force is considering upgrading at least some of its Mikoyan MiG-21 Fishbeds with Western avionics and radar to extend their life. The air force has held exploratory talks with various companies, including GEC Avionics.

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No hike in UK defence spend

May I once again point out the difference between the words of the so-called "increase in defence spending" and the apparent reality?

Extra personnel for the UK Royal Navy are, if I properly understand it, partially to come from the Royal Marines? And seemingly there is to be no shortening of the timescale for the Lockheed Martin F-35B purchase?

The aircraft carriers themselves are even now still under threat. There are only eight new frigates to be built, and no sign as to the order of the fill-in, new style Amazon class. These were supposed to make up the frigate numbers to the already-too-small 13 that were originally promised.

Couple this with the ongoing technical issues with ships and submarines, and the retirement, without immediate replacement of entire weapon systems, then what does an "increase in defence spending" actually look like?

Does "project disarmament" proceed apace and with scant regard to world events?

Steven Page
via email

INFRASTRUCTURE

Put a stop to airfield closures

REX/Shutterstock

Manston shut its doors in 2014

Small airfields in the south-east of England are under risk. Dunsfold, Fairoaks and Redhill in Surrey, and Manston in Kent, have either been sold or are under offer to housing developers, who see them as good pieces of land for building on.

These airfields are a vital part of our infrastructure. Without them, police and air ambulance helicopters would have no maintenance or operating bases.

Above all, pilots start their training at these airfields, and their closure would result in huge pressure elsewhere as demand for pilots grows. Soon, few general aviation airfields will be left in the southeast.

The UK government must act, and deny planning applications that threaten this vital resource.

Rod Simpson
Vice-chairman, Air Britain
Merstham, Surrey

Is Nexit next?

Regarding your article "Netherlands gets royal ascent with BBJ purchase" (*Flight International*, 18-24 April): does the decision of the Dutch transport minister to purchase US-built aircraft over a European-manufactured type lend any weight to a Holexit/Duexit/Nexit theory?

Guy Farnfield
Abu Dhabi, UAE

Sterling career

I read Max Kingsley-Jones's article "Airbus forefather" (*Flight International*, 13 December 2016-2 January) on the Caravelle with great pleasure. For 24 years (1969-1993) I was employed by Sterling Airways, with headquarters in Copenhagen, as cabin chief – and flew with this beautiful aircraft.

Over the years, Sterling operated a total of 32 Caravelles, including the series 6R, 10B and 12. Most articles about the Caravelle describe it as a short-haul jet – but one should not forget that Sterling operated the Caravelle on long-haul charter flights for years.

During the 1970s and 1980s we operated many charter flights from Scandinavia to destinations like Bangkok, Hong Kong, New Delhi and Kathmandu. When we flew over the Atlantic (with a fuel stop in Keflavik and Gander) it was to destinations like Toronto, Boston, Hartford, Chicago and occasionally Vancouver.

In the late 1970s, Sterling operated 14-day-long "Africa air cruises", where an aircraft and crew followed the same group of tourists for two weeks. The route was Copenhagen-Marrakesh-Dakar-Abidjan-Livingstone-Arusha-Luxor-Copenhagen, with fuel stops including Kinshasa.

The most interesting tour I ever had with a Caravelle was in 1980, a 14-day special flight to the Asia-Pacific region for a German/Danish "culture travel club", including a four-day visit to China. It was the very first private charter flight ever from Scandinavia to get permission to fly to Beijing. It was operated by a Caravelle 12, registration OY-SAE (*left*). Cabin layout was with 84 first-class seats. The route was Copenhagen-Hamburg-Damascus-Sharjah-Karachi-Lahore-New Delhi-Yangon-Hong Kong-Beijing-Hong Kong-Medan-Chennai-Sharjah-Aqaba-Rhodes-Hamburg-Copenhagen.

According to my cabin report, the aircraft flew 18,018nm (33,400km), spent 47h 48min airborne and used 163,875 litres (43,300USgal) of fuel. Two inflatable life rafts were carried in the cabin due to the 3h 45min over-water leg from Sumatra to India.

Christian Funch
Copenhagen, Denmark

Christian Funch

Caravelle made first-ever private charter from Scandinavia to Beijing

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Xponential Unmanned Systems and Robotics
Dallas, Texas, USA
xponential.org

17-18 May
Technology and Innovation in Airline Distribution
Bangkok, Thailand
flightglobalevents.com/TIAD2017

22-24 May
European Business Aviation Convention & Exhibition
Geneva, Switzerland
ebace.aero

4-6 June
IATA Annual General Meeting
Cancun, Mexico
iata.org

19-25 June
Paris air show
Le Bourget, Paris, France
siae.fr

14-16 July
Royal International Air Tattoo
RAF Fairford, Gloucestershire, UK
airtattoo.com

18-23 July
MAKS
Moscow, Russia
aviasalon.com/en

24-30 July
EAA AirVenture Oshkosh
Oshkosh, Wisconsin, USA
eaa.org/en/airventure

12-15 September
DSEI
London, UK
dsei.co.uk

23-26 September
World Routes
Barcelona, Spain
routesonline.com/events/

24-27 September
RAA Annual Convention
Palm Beach, Florida, USA
raa.org/page/2017ACMain

25-28 September
Airline Passenger Experience Association
Long Beach, California, USA
apex.aero

3-5 October
Helitech International Expo and Conference
London, UK
helitechinternational.com

10-12 October
NBAA
Las Vegas, Nevada, USA
nbaa.org/events/bace/2017

17-19 October
ERA General Assembly
Athens, Greece
eraa.org

17-22 October
Seoul ADEX 2017
Seoul, South Korea
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WORK EXPERIENCE NEELU KHATRI

Expanding in a high-growth region

A decade and a half in the Indian air force, rising to wing commander, gave Neelu Khatri a rare insight into the country's aerospace potential. At Honeywell she is putting that understanding into practice

What sparked your interest in aviation?

I grew up in Jabalpur, a small city in India, and after receiving a master's degree in English Literature from Rani Durgavati Vishwavidyalaya University, I joined the Indian air force. This is where I discovered my passion for the aerospace industry and found myself completely immersed when friends who were pilots would offer to take me on flights.

Tell us about your career to date

From a young age, I always looked beyond the career paths available to me in Jabalpur. I was offered the chance to be the first female officer as a part of the Indian air force. I spent 15 years there and worked in a variety of roles across project management, procurement and supplies. In 2008, I joined KPMG as the head of defence and security advisory services, where I provided aerospace and defence consultation – very new to India at the time. I joined Honeywell in 2014, in a business and strategy development role, where I worked with businesses to help develop and execute growth initiatives on Honeywell's offerings in the Indian market. I became president – aerospace of Honeywell India in February 2017.

What have been your highlights and lowlights?

Along with being one of the pioneer women commissioned within the Indian air force, becoming president – aerospace of Honeywell in India was definitely a highlight in my career. I am also a member of the India Executive Council, which is a personal highlight for me. Like anyone else, I've had to overcome challenges in order to excel in my career. Over the years, when starting a new job, I always faced the challenge of proving myself to my team and superiors. I learned the importance of always showing my motivation when beginning a new project or job.

Honeywell

A key part of the job for Khatri is to localise Honeywell's offering

What does your new role entail?

I am responsible for providing strategic direction for the India business. I focus on the best ways to develop and grow Honeywell's services and products for air transport, regional, business aviation and defence, plus space. With footfall in India increasing every day, Honeywell's investment in the market will only continue to grow and help develop the aerospace landscape in India. I focus on collaborations such as Make in India, and work with businesses to ensure Honeywell can expand within the market and localise products and services to best serve clients.

How important is the Indian market to Honeywell?

Honeywell identifies India as a high-growth region and a key market. Clients here have very unique requirements and we work to provide a tailored service for them. Honeywell Technology Solutions now has centres in Bangalore, Hyderabad and Madurai, helping us meet client requirements more efficiently. We are keen to continue focusing on growth in the region and will work to see how we can continue to lead industry innovation.

What are the major challenges?

India is a unique market and, as an international company, understanding and meeting the needs of our clients here can sometimes be a challenge. However, Honeywell has had a presence in India for over 40 years and we've made an investment in the market to meet the requirements of customers, suppliers and research institutes. The team here is strongly positioned to overcome challenges and pre-empt limitations in order to deliver results, plus maintain and build relationships with key customers.

Where do you see yourself 10 years from now?

I'm always looking for the next challenge, seeing how I can grow and meet my personal goals. As I've recently made the jump to this role, I'm very excited to help Honeywell drive change within India and the aerospace industry. I'll continue to look for ways to diversify teams and work more internationally, to ensure that we provide the most advanced services and products for clients around the world. ■

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