

# Flight International

28 November-4 December 2017

flightglobal.com

## Big let-down

What next for deflated HAV, after Airlander's latest mishap forces halt to flight testing? **8**

## Regional push

Superjet seeks new customers in Latin America as Moscow puts weight behind SSJ100 talks **13**

## Maple lift

We visit home of Canada's Hercules fleet, where training system rises to challenge **24**

## PROGRAMME

# Green light for Airbus

Biggest A350 nears delivery as certification brightens appeal

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## Flight International



### COVER IMAGE

We chose this shot of the A350-1000 taken during cold-weather testing in Iqaluit, Canada earlier this year as the big-twin's manufacturer celebrates its certification **P9**



### BEHIND THE HEADLINES

Beth Stevenson ventured to CFB Trenton in Ontario, for an update on Canada's training system for the Lockheed Martin C-130 transport (P24). And our news team was at the ALTA event in Buenos Aires (P13)



### NEXT WEEK AIR FORCES

It's time for our essential World Air Forces directory: a once-a-year snapshot of the global military inventory

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## Image of the week

Matthieu Douhaire captured this spectacular shot of a Norwegian 787-9 at Paris Charles de Gaulle airport in early November. Powered by Rolls-Royce Trent 1000 engines and configured with 344 seats, the twinjet, registered LN-LNI, was built by Boeing in 2016, Flight Fleets Analyzer shows

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AirTeamImages

## The week in numbers

✦ **2-3%**

Flight Dashboard

Chile's LATAM airlines plans "very modest" capacity growth in Brazil in 2018, after three years of discipline in the country

**\$137<sub>m</sub>**

Arconic

Metals specialist Arconic will invest in a horizontal heat treat furnace to support its new thick plate stretcher in Iowa

✦ **192**

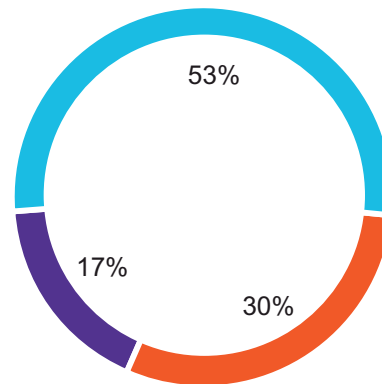
ICAO

ICAO welcomed new member Tuvalu, taking its roster to 192 countries. Most reputable counts put the world total at 194

## Question of the week

Last week, we asked: **F-35 sale to the UAE?**  
You said:

**Total votes: 1,311**



Israeli opposition will halt deal  
697 votes

Not if it buys Sukhois  
397 votes

Would cement closer ties  
217 votes

This week, we ask: **A350-1000 certification?**

☐ Launchpad for new sales ☐ Limited potential

☐ Beaten by Boeings

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# Wing and a prayer

For so long hailed as a vital part of the UK's future economy, the aerospace sector could be forgiven its reaction to the lack of a clear strategy from the government on post-Brexit trade

**F**or all its corporate reshaping, Airbus is still a highly political animal, and remains attuned to the winds blowing from Berlin and Paris.

With that in mind, there can be little question that Katherine Bennett, the head of its UK operation, knew exactly what she was saying when she warned parliamentarians that Brexit risked jeopardising the future of its wing production in the country.

Airbus has two sites in the UK: Filton, near Bristol, and Broughton in North Wales, the latter making the wings for the airframer's entire civil range.

Wing expertise is, as Bennett puts it, the "jewel in the crown" of aerospace design and manufacturing.

Of course, it would not be easy for Airbus to simply up sticks from either site, particularly during a period when its focus is on getting its products out of the door, and doing so at a faster rate than ever.

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**Unless there is a coherent and cohesive strategy, the industry will be unable to fulfil its promise**

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The airframer will not place at risk output ramp-ups now, but the litmus test will be the next programme, or the one after that.

Will Airbus continue to invest in its UK sites if they cannot remain competitive against other locations? Bennett thinks not, pointing out that other countries are already "knocking at the door".

Although parts for transport-category aircraft are tariff-free under World Trade Organization rules, added customs bureaucracy and varying certification standards are the sort of headaches Airbus can well do without.



Carved up

One also imagines, although Bennett did not say it, that if the UK is unable to give Airbus the assurances of a "soft Brexit", then it would much rather invest in any of its three home markets, or even a potential partner like Poland, than give more money to *les rosbifs*.

Short of ending the whole Brexit madness, the next best thing will be for the government to present the country's aerospace industry with tangible solutions to the issues it will be facing in less than 18 months' time.

Brexiters blame Brussels for the deadlock, citing an unwillingness to engage in trade talks, but the fact remains that these problems were predicted from day one.

The UK government believes the country's aerospace and high-tech manufacturing sectors are vital components of its future growth, post-Brexit.

It is right to think so, but unless there is a cohesive and coherent strategy underpinning those words, the industry will be unable to fulfil its promise.

It is not too late to bring order from this shambles, but the clock is ticking. ■

**See News Focus P15**

## Grand designs

**O**ne thousand. It's a number that has literary and poetic power – the symbolism of the beginning of a new cycle – and whose digits resemble, fortuitously, the wheels of a triple-axle main landing-gear.

Some of this might have been deliberately considered when Airbus picked the name of its largest twinjet.

For an aircraft that underwent such a jittery conception, the A350-1000 seems to have had a surprisingly trouble-free upbringing.

It did not even feature when Airbus initially unveiled its original A350 concept; a two-aircraft family in the 245-285-seat sector, to compete with the Boeing 787.

Airbus introduced the -1000 when it scrubbed the A350 for the A350 XWB, ambitiously opting to take on

not just the 787, but also higher-capacity Boeings including the 777-300ER, the US big twin that had entered service two years before.

This was never going to be simple, and the -1000 struggled to convince crucial customers, forcing Airbus to overhaul the design – not to everyone's satisfaction.

But if the indecision over what precisely to build seemed unpromising, the smoothness of the -1000's development is far more encouraging.

With certification secured, and service entry on track, Airbus has an auspicious start to the tough task of chasing down the 777-300ER's enviable sales record.

The hard work is over. Bring on the hard work. ■

**See This Week P9**



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# BRIEFING

## AVOLON FIRMS 75-UNIT MAX DEAL

**LEASING** Irish lessor Avolon has finalised an order for 75 Boeing 737 Max aircraft first disclosed at June's Paris air show. Comprising 55 Max 8s and 20 Max 10s, as well as options for another 20 Max 8s, the deal is valued at \$11 billion at list prices. Flight Fleets Analyzer shows that the HNA Group-owned firm already had 57 Max aircraft in its orderbook.

## GKN DISCLOSES CUMMINGS IS GOING

**MANAGEMENT** Kevin Cummings, GKN's chief executive-in-waiting, has left the UK-headquartered engineering specialist before starting the role. He was selected during September to replace Nigel Stein from January 2018. The company says Cummings has left the business with immediate effect, after a board decision "that the next stage of GKN's development is best delivered under alternative leadership". Non-executive director Anne Stevens will serve as interim chief.

## LOSSES CONTINUE AT TROUBLED ALITALIA

**FINANCE** Alitalia made an operating loss of €9.3 million (\$11 million) over its first five months in administration. Revenue for the period 1 June-31 October was €1.43 billion, the carrier's government-appointed commissioners have disclosed. Expenses included fuel (€305 million), labour (€284 million) and ground handling (€157 million), as well as €10 million in interest on a €600 million government bridging loan awarded in May.

## FACEBOOK LIKES AIRBUS STATUS UPDATE

**FACT** Airbus and Facebook are to jointly lobby regulators over the future allocation of capacity on the radio spectrum for high-altitude pseudo-satellites. The two companies are already separately developing solar-powered unmanned air systems – named Zephyr and Aquila, respectively – designed to fly above 70,000ft for weeks at a time. The pact calls for the pair to work together on future developments.

## RESCUE PROVIDER PICKS H225 PAIR

**ORDER** South Korea's National 119 Rescue Headquarters is to acquire two additional Airbus Helicopters H225s for delivery by end-2019. The agency will use the Super Pumas primarily for search and rescue missions, but will be able to reconfigure them to accommodate fire-fighting or medical equipment. The operator currently flies a pair of AS365 N2s and two H225s.

## ASSEMBLY UNDER WAY ON 737-7

**PRODUCTION** Boeing has started final assembly of the 737 Max 7: the third, and smallest variant in the re-engined narrow-body family. The initial flight-test aircraft has been loaded into a final-assembly position in Renton, Washington. The 737-7 enters final assembly three years after Boeing achieved a similar milestone with the Max 8, which entered service in May 2017.

## INDIA SPIKES GUIDED-WEAPONS DEAL

**MUNITIONS** India's defence ministry has cancelled a \$500 million missile deal with Israeli company Rafael, instead asking its Defence Research and Development Organisation to provide an indigenous alternative. Rafael had been teamed with local company Kalyani Strategic Systems to supply Spike-series missiles to the army, including helicopter-launched examples.



Lockheed Martin

Proposal includes additional \$1 billion for more Joint Strike Fighters

**SPENDING** LEIGH GIANGRECO WASHINGTON DC

# Senate funding to boost F-35 uptime

Appropriations committee signs off its version of defence spending bill, adding extra money for spares and repairs

Lawmakers have moved closer to a final version of their US defence spending bill for the 2018 financial year – which includes additional money for Lockheed Martin F-35s – with the Senate's version of the proposal signed off by the chair of its appropriations committee.

In June, the same committee in the House of Representatives approved its version of the FY2018 defence appropriations bill, including funds to buy 14 more F-35s than originally requested by the Trump administration earlier this year.

The Senate's version trims that additional spending slightly, calling for \$1 billion to fund only eight additional examples: four short take-off and vertical landing F-35Bs and the same number of carrier-variant F-35Cs.

Despite lowering the proposed total F-35 procurement, the Senate bill still provides an additional \$120 million to fund a planned increase in FY2019, as well as \$750 million to cover spare parts and repairs in order to address maintenance and readiness issues that are being experienced across the F-35 fleet.

The maintenance funding boost comes on the heels of a recent US Government Accountability Office (GAO) report, which states that F-35s could not be flown for 22% of the time between January and August this year due to spare parts shortages.

While they differed on the F-35 programme, both chambers agreed on other line items, including for the Boeing F/A-18E/F Super Hornet. The Senate proposed adding \$739 million for 10 more examples, in addition to another \$108 million to fund an extra eight Sikorsky UH-60 Black Hawk utility helicopters for the US Army National Guard: the same level as the House version.

Both appropriations bills also include provisions to support a next-generation replacement for the US Air Force's Northrop Grumman E-8C joint surveillance target attack radar system aircraft. The proposed recapitalisation has remained a focus for lawmakers, even as the USAF has positioned the programme on its chopping block due to concerns over a future system's inability to operate within contested airspace. ■

See Defence P17





HAV deflated after  
Airlander breaks free  
of mooring mast  
This Week P8

LEGAL JON HEMMERDINGER BOSTON

# Animus abounds in CSeries import row

All parties in dumping case call for Department of Commerce to disregard Airbus partnership, as final judgement nears

Boeing and Bombardier are both urging the US Department of Commerce to discount the planned partnership between the Canadian airframer and Airbus from its pending decision on CSeries import tariffs, albeit for differing reasons.

Delta Air Lines, meanwhile, insists that its purchase order for CS100s is not yet technically a sale, and that as a US production site is being established in Mobile, Alabama, none of its CSeries jets will be imported from Canada.

"There has been no sale for import to date and, now, likely will never be," says Delta in a legal filing with the US Department of Commerce. "The absence of such a sale or likelihood of the same requires that the department issue a negative final determination."

Purchase agreements can change substantially before hand-over occurs, argues Delta, which has expressed willingness to delay CSeries deliveries until a US assembly site opens.

The legal filings do not make clear if Delta has actually



Delta's acquisition of 75 CS100s is at the heart of trade dispute

changed its agreement with Bombardier: contract modifications were redacted from the legal papers and Delta was not available to comment.

Both Bombardier and Airbus argue in recent filings that their deal – which would see the European manufacturer take a 50.01% share of the CSeries programme – remains far from final and would come into force outside of the department's investigation timeframe. It still requires regulatory approval, but is scheduled to

close in the second half of 2018.

The Department of Commerce's preliminary rulings propose import tariffs of 300% on the CSeries, arguing that the programme received unfair subsidies, allowing Bombardier to dump the narrowbody on the US market.

The department is set to issue final rulings on 18 December, but the imposition of any tariffs depends on an investigation by the US International Trade Commission determining that Boeing suffered harm; that decision is

expected on 1 February 2018.

Boeing, which instigated the trade complaint, also urges the Department of Commerce to leave the pending partnership out of its investigation. "Quite simply, there is no deal to evaluate at this time – only materials outlining a transaction," it says.

It continues to argue that aircraft assembled in the USA should still be subject to import duties, claiming that Airbus and Bombardier would drop their "commercially irrational" plans if the tariffs were dropped.

Delta's court filings, however, offer a scathing assessment of the US manufacturer's position, noting that it does not produce an aircraft of the size requested.

"In Boeing's view, any action would be a form of 'evasion,'" says Delta. "Modify a purchase agreement – evasion. Look at options to acquire a 109-seat aircraft that the US industry does not currently produce – evasion. Support expansion of the US aerospace industry and competition in the service of customers – evasion." ■

REGULATION DAVID KAMINSKI-MORROW LONDON

# 777X's folding wing-tips face FAA safety scrutiny

US regulators have detailed safety measures proposed for the Boeing 777X's folding wing-tips, including preventing the aircraft from departing if they are not deployed and secured.

The US Federal Aviation Administration is seeking com-

ments by 18 December on the measures which, it says, are intended to avert a "catastrophic event" should the wing-tips not be secured for take-off and flight.

The FAA points out that the scenario falls into a broader consideration of preventing im-

proper aircraft configuration before take-off.

Recent Boeing briefings on the 777X cockpit indicated both automatic and manual wing-tip fold switches will be located in the central overhead panel. A wing-fold position indicator will be displayed on the engine-indicating and crew-alerting system display screen on the forward panel between the two pilots.

Boeing is incorporating the wing-tip fold to reduce the span of the 777-8 and -9 from 71.6m (235ft) to 64.6m, to comply with airport regulations.

The FAA special conditions require more than one means to

alert the crew to an improperly positioned or unsecured wing-tip prior to take-off. "Each of these means must be unique in their wing-tip monitoring function," it adds. There must also be an indication to the crew that the wing-tip is folded during taxiing.

But the alert system must go further, and prevent the aircraft from taking off if the wing-tips are not deployed and secured.

Once the aircraft is airborne all power sources which could trigger the unlocking of the wing-tips must be "automatically isolated", the conditions state, while the latching and locks need to resist all flight loads. ■



System reduces the type's wingspan to comply with airport criteria



**ROTORCRAFT**  
DOMINIC PERRY LONDON

## Era of decline as H225 valuation suffers steep fall

US offshore helicopter operator Era Group has booked a \$117 million write-down in its latest financial quarterly report – a figure that is primarily based on a reappraisal of its fleet of Airbus Helicopters H225s, which values the 11t-class rotorcraft at just \$4 million each.

Era has nine offshore-configured Super Pumas in its fleet. These have been idle since the April 2016 loss of an H225 off the coast of Norway, operated by CHC Helikopter Services, which claimed the lives of all 13 passengers and crew.

Speaking on a 10 November third-quarter earnings call, chief executive Chris Bradshaw said following the new valuation, Era calculates that its H225s are worth “an average of approximately \$4 million per helicopter”.

Prior to the accident and subsequent grounding, offshore-configured H225s would have been valued at around five times that figure.

Although Bradshaw says the company is currently “actively marketing” the Super Puma fleet for sale or lease, it believes that the aircraft will now only find a use as heavy-lift utility helicopters, or possibly for certain search and rescue applications.

However, Bradshaw rules out their return in the offshore sector, noting that although flight bans are no longer in place, Norwegian accident investigators are yet to determine a root cause for the gearbox failure that doomed CHC's H225.

This situation makes it impossible to develop a “robust” safety case, he argues. Some customer tenders have also “excluded” the H225, he says.

Era is still pursuing Airbus Helicopters through the courts, arguing that it was sold helicopters with a known safety defect, a position the manufacturer vehemently disputes. ■

**ACCIDENT** MICHAEL GUBISCH LONDON

## HAV deflated after Airlander breaks free of mooring mast

Experimental airship's safety system automatically opened hull following incident at airfield

Hybrid Air Vehicles (HAV) is staying silent on the impact of an 18 November mishap in which its Airlander experimental airship collapsed after it broke free of moorings at the UK firm's base at Cardington airfield.

HAV says it will assess the repairs required to the airship over the “next few weeks”. An in-built safety feature caused the Airlander to automatically deflate when the lighter-than-air vehicle “broke free from its mooring mast”.

The 92m (300ft)-long, helium-filled airship is equipped with a system “designed to rip open the hull” in such an event, in order to “minimise any potential damage”.

“We are testing a brand-new type of aircraft and incidents of this nature can occur during this phase of development,” the company says. However, HAV declines to provide further detail about the extent of damage to the vehicle and any potential impact on the programme. Why the airship broke free from its mast is also yet to be determined.



Programme has now suffered two setbacks since August 2016

Peter MacDiarmid/REX/Shutterstock

Meteorological data for Luton airport – approximately 28km (17 miles) south of Cardington – indicated wind speeds up to 11kt (20km/h) on 18 November.

The incident is the second major setback for the programme. In August 2016, the airship crash-landed during its second flight. Following repair, the Airlander resumed test flights in May, completing four sorties this year.

The 18 November accident took place a day after the first flight of a “second phase” of test activity, which promised “more intense” flight trials, HAV says.

Under an expanded permission, called “Airworthiness Release 2a”, the aircraft's operating envelope was expanded to an altitude of 7,000ft, an airspeed of 50kt, and flights up to 75nm away from Cardington. ■

**PROGRAMME** DAVID KAMINSKI-MORROW LONDON

## No stress for MC-21 in wingbox test

Further stress testing of the Irkut MC-21 wingbox has indicated that the structure will be able to withstand maximum flight loads.

Irkut said earlier this year that it would need to reinforce the MC-21's wingbox because, de-

spite coming close to passing a destructive test, it had not achieved the strength threshold.

The airframer proceeded to commence flight testing of the initial aircraft in May, but the composite wing has undergone

additional stress testing at the Moscow-based Central Aerohydrodynamic Institute.

The institute says it completed the latest phase of tests on the wingbox in mid-November, in order to ensure the safety of the MC-21 flight-test fleet, and reports that the wingbox “withstood a load exceeding that specified by the test programme, without damage”.

Irkut has been preparing a second flight-test MC-21 to join the campaign, and the airframer has further test aircraft at various stages of construction. ■



United Aircraft

Initial prototype was recently transferred to Zhukovsky near Moscow





Slattery insists Embraer focus is on E2  
Air Transport P10

DEVELOPMENT DAVID KAMINSKI-MORROW LONDON

# A350 gains emergency descent system

Upgrade is among several features to be introduced on widebody twinjet following EASA certification of largest variant

Airbus has incorporated an automatic emergency descent function into the newly certificated A350-1000, which it intends to also introduce into the smaller -900.

The function is designed to simplify a rapid descent to a safe altitude.

A350 chief engineer Alain de Zotti says the -1000 will be able to “slightly deviate” from the flight-plan if the system is activated, and leave its cruise altitude.

## Airbus A350-1000 backlog

Operator	Orders
Air Caraïbes	3
Air Lease	5
Asiana Airlines	10
British Airways	18
Cathay Pacific	20
Etihad Airways	22
Iran Air	16
Japan Airlines	13
LATAM Airlines Group	12
Qatar Airways	37
Virgin Atlantic Airways*	12
Undisclosed	1
<b>Total</b>	<b>169</b>

Source: Flight Fleets Analyzer  
Note: \*Four aircraft sourced from Air Lease

As well as executing the high-speed manoeuvre, the aircraft will automatically notify air traffic control of the action.

FlightGlobal exclusively revealed in 2009 that an emergency descent feature was being considered for the A350, which would automatically initiate an unaided descent if the crew failed to respond to a cautionary alert – possibly indicating incapacitation from depressurisation.

This had been conceived as a method of allowing the aircraft to descend to around 10,000ft, the typical safety altitude in the event of loss of cabin pressure.

Full details of the system’s development on the A350-1000 have yet to become clear, but de Zotti says it amounts to an avionics software adaptation to “support” an emergency descent.

He indicates that its activation involves a push-and-pull input in order to “make sure you don’t make a mistake”.

Airbus is already intending similarly to offer the system on the A350-900 and de Zotti says it can be retrofitted to the in-service fleet.

De Zotti says the European Avi-



Three airframes were used for 12-month type approval campaign

ation Safety Agency’s certification of the -1000 will provide other opportunities to enhance the A350 with “additional capability”.

He says that, over the course of testing, the airframer has “identified some margins”, in systems such as the landing-gear. While the analysis is not finalised, de Zotti states Airbus should be able “soon” to provide enhancements to the -1000.

De Zotti declines to elaborate, but Airbus has previously point-

ed to an increased-weight A350-1000 with a maximum take-off weight of 311t, some 3t higher than the current aircraft.

The Rolls-Royce Trent XWB-97 engines have performed well during the certification campaign, he says.

“Our challenge was to work in parallel with the testing on the ground,” adds de Zotti, ensuring that any ground work findings could be smoothly addressed by the flight-testing schedule in order to keep the certification on track.

The XWB-97 is a higher-thrust engine than that originally conceived for the A350-1000, because the aircraft underwent a redesign in 2011 to appeal to customers seeking improved performance.

EASA’s type certificate for the -1000 lists the engines as offering net take-off thrust of 97,000lb (431kN) and maximum continuous thrust of 83,100lb.

The extended twin-engine operations (ETOPS) capability of the -1000 has still to be confirmed.

De Zotti says the certification campaign has undertaken ETOPS-related activity, such as long-range flights and engine shutdown tests, and that the aircraft will enter service with “some” ETOPS capability, while work progresses on expanding the limits. ■

## FLEET

### Brégier hails ‘incredible achievement’ of -1000’s rapid arrival

European certification for the A350-1000 was secured just three days shy of the first anniversary of the twinjet’s maiden flight.

The European Aviation Safety Agency has issued a type certificate for the Rolls-Royce Trent XWB-97-powered aircraft, and the airframer says that US Federal Aviation Administration approval has also been received.

Qatar Airways will be the first to take delivery of the -1000 – airframe MSN88 – by the end of the year, says Airbus commercial aircraft president Fabrice Brégier.

A350 chief engineer Alain de Zotti says the aircraft is essentially intended to perform the same

missions as the smaller -900, with the same typical 8,000nm (14,800km) range, but with some 40 additional seats in a standard three-class layout.

EASA has approved the -1000 for 385 passengers in its basic passenger emergency exit configuration, with up to 440 if this exclusively includes type-A doors.

As well as a stretched fuselage, the -1000 has a larger wing than the -900 owing to a modified trailing edge, and it also has six-wheel main landing-gear bogies.

Airbus has conducted more than 1,600h of flight tests with three certification airframes – the instrumented MSN59, MSN71

and the cabin-fitted MSN65 – including 150h with a single aircraft under typical airline operating conditions.

De Zotti says the -1000 “behaved extremely well” during the handling-quality and performance testing, which examined the aerodynamics and the refinement of the flight controls for the jet.

Airbus first flew the -1000 on 24 November last year and Brégier describes completion of certification in less than 12 months as “an incredible achievement”.

Airbus has orders for 169 A350-1000s, accounting for around 20% of all firm A350 agreements. ■



STRATEGY DOMINIC PERRY DUBAI

# Slattery insists Embraer focus is on E2

Despite initial consultations over future turboprop, Brazilian airframer's commercial chief says no launch is imminent

Embraer's commercial aircraft chief has emphasised that the immediate priority for the Brazilian airframer remains its re-engined E-Jet E2 family, while still leaving the door open to any future aircraft launch.

In recent months, Embraer Commercial Aviation chief executive John Slattery has repeatedly hinted that the manufacturer is exploring the potential for a future turboprop airliner. That effort has included consultation with several major airlines.

But speaking at the recent Dubai air show, Slattery was keen to play down any suggestion that a launch was imminent.

Embraer recently stated an ambition to be the market leader in the entire segment under 150 seats. That means it is "incum-

bent" on the manufacturer to "look at alternative platforms" for the future, says Slattery.

"But exploring the space is not a commitment to developing alternative platforms," he says.

An initial customer advisory panel comprising "over 22 airlines from around the world" was held in early September at the airframer's European office in Amsterdam to gauge opinions on the turboprop segment.

Slattery declines to be drawn on the feedback from the event, citing non-disclosure agreements in place. "My commitment to the [Embraer] board and investors is on the E2," he says. "My focus is exclusively on delivering the E2 on spec, on time and under budget, and secondly to support the development of sales."



First example of re-engined regional jet will enter use next April

The E190-E2 is due to enter service in April 2018, with the E195-E2 arriving the following year and the E175-E2 in 2021.

Slattery insists that although in his view Embraer could deliver a

"meaningful shift" in turboprop performance, a "robust business case" would need to be developed first.

"We are not remotely close to pulling the trigger," he says. ■



Revenue flights with the new narrowbody will begin in early January

DELIVERY JON HEMMERDINGER BOSTON

## First Neo looks vine for Hawaiian

Hawaiian Airlines' first Airbus A321neo (N202HA) has arrived at the company's Honolulu hub, the milestone coming about seven weeks before its planned launch of revenue flights with the re-engined narrowbody.

On 16 November the company held a "blessing ceremony" for the Pratt & Whitney PW1100G-powered aircraft, delivered in Hamburg on 27 October. The airline has named the twinjet "Maile" after the Hawaiian vine used to make traditional leis, or garlands.

The airline's schedule calls for Hawaiian to begin passenger flights with A321neos on 8 January 2018, linking Maui and Oakland, California.

"As we welcome our A321neo fleet, some of our widebody aircraft serving the US West Coast will be deployed for further long-haul expansion," says chief executive Mark Dunkerley.

Hawaiian has orders for a further 17 189-seat A321neos, the majority to be delivered by the middle of 2020, according to Flight Fleets Analyzer. ■

FLEET JAMIE BULLEN LONDON

## EgyptAir has CSeries intent with finance bid

EgyptAir has issued a request for proposals to finance its recent tentative order for 12 Bombardier CSeries jets, Flight-Global understands.

The carrier is open to all forms of financing and leasing, says a source. EgyptAir did not immediately respond to a request for comment, however.

At the Dubai air show on 14 November, Bombardier disclosed that EgyptAir had signed a letter of intent covering a firm order for 12 CS300s, plus purchase rights for another 12 of the 130-seat aircraft.

The Cairo-based Star Alliance member intends to finalise its CSeries order by year-end, Bombardier indicates.

The total list-price value of the deal rises to \$2.2 billion if all options are exercised.

EgyptAir intends to become

the type's launch customer in the Middle East and North Africa region.

Other CSeries customers in the region include Al-Qahtani Aviation, Falcon Aviation Services and Gulf Air.

With the EgyptAir announcement, up to 85 new CSeries jets are covered by commitments disclosed since Bombardier agreed to transfer a majority stake in the small narrowbody programme to Airbus in a deal set to be finalised in the second half of 2018.

EgyptAir chief executive Safwat Musallam, speaking in Dubai, said the Airbus deal should make the Bombardier programme "strong", but did not sway the carrier's decision. "We were ordering the CSeries anyway," he said. ■

**Additional reporting by Stephen Trimble in Dubai**





Aerolineas Argentinas to upgauge regional fleet  
**Air Transport P13**

**ACCIDENT** DAVID KAMINSKI-MORROW LONDON

# Let L-410's engine was in 'beta range' during fatal plunge

Data from turboprop's flight recorders shows right-hand powerplant was providing reverse thrust prior to impact

**P**reliminary analysis of flight-recorder information from a crashed Let Aircraft Industries L-410 indicates that the turboprop entered a near-vertical descent after its right-hand engine effectively began developing reverse thrust.

The Khabarovsk Airlines aircraft (RA-67047) had been conducting a daylight approach, in good visibility, to runway 04 at Nelkan in eastern Russia on 15 November.

Investigators have detailed preliminary findings from the aircraft's flight recorders which show that, at a height of 150m (492ft) above ground, the right-hand engine entered the "beta range" – the power setting below flight-idle which is normally used to slow the aircraft after landing.

"This mode was maintained until the aircraft collided with the ground," the inquiry says, adding that the left engine continued to operate normally.

The L-410 was fitted with two GE Aviation H80-200 engines.

Its crew, the inquiry adds, recognised that the engine had entered the beta range and their subsequent actions resulted in

the aircraft decelerating and rolling to the right.

The aircraft descended with a high vertical speed but with little horizontal speed, with less than 3m separating the first point of terrain contact from the final resting place, 1,480m from the runway threshold.

Just one survivor, among the seven occupants, was rescued from the wreckage.

Investigators have disclosed that the aircraft – a UVP-E20 variant with serial number 3010, owned by state lessor GTLK – was relatively new, having been manufactured in 2015.

The captain had accumulated more than 12,000h, with 1,243h on type, while the first officer had 837h on type from a total of 1,220h.

An initial recommendation from the inquiry advises a one-time check on the H80-200's beta mode and propeller control system, and that L-410 crews should ensure they are familiar with engine control procedures and actions after engine failure.

Along with the flight recorders, investigators retrieved a Garmin GPS system from the wreckage for analysis. ■



Budget carrier will lease in aircraft from now-defunct German airline

**ACQUISITION** OLIVER CLARK LONDON

# EasyJet looking to make capital from Berlin move

**A**ndrew Findlay, EasyJet's chief financial officer, expects the assets it is acquiring from Air Berlin to be making a positive contribution to turnover and profit by 2019.

The UK budget carrier has agreed to lease up to 25 ex-Air Berlin Airbus A320s for operation from the German capital's Tegel airport, and will recruit 1,000 flight crew formerly with the now-defunct Oneworld member and acquire other assets, including airport slots, for a cost of €40 million (\$47 million).

Speaking on an investor call on 21 November, Findlay said that while EasyJet's Tegel operation would create £60 million of "headline" costs in 2018, it would become "earnings accre-

tive" in 2019 and represent "attractive financial returns" in the long run, given the airport's strategic market position.

Findlay says EasyJet will initially operate wet-leased A320s at Tegel and conduct its first flights under its own branding from the airport in January 2018.

Over the course of the year, the wet-leased aircraft will be phased out in favour of dry-leased aircraft crewed by airline staff, with the process completed by the winter of 2018.

This "parallel approach", which will include training new crew and sourcing dry-leased aircraft and other expenses, will represent an additional "non-headline" cost of £100 million in 2018, Findlay predicts. ■



**DELIVERY**

# ATR starts IndiGo's regional fleet push

Indian carrier IndiGo has received its initial turboprop airliner, an ATR 72-600 – the first of an eventual 50 of the type. The carrier intends to begin revenue services with the 70-seater by year-end. ATR says IndiGo's introduction of a turboprop fleet is "in line with the Indian government's regional connectivity scheme, which aims to boost economic development, employment and tourism by connecting small and remote cities". As part of the scheme, "100 new airports are expected to be created in the next three years", says ATR.

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Causes of fatal  
IrAn-140 crash  
disputed  
**Air Transport P14**

**SALES** MAX KINGSLEY-JONES BUENOS AIRES

# Upgraded SSJ100 can capture Latin American growth

Italy-based marketing operation SuperJet International is confident that enhancements to aircraft will boost appeal

SuperJet International (SJI) expects Latin America to require around 700 airliners in the Sukhoi Superjet 100's category, and is confident that upgrades and sales initiatives in the pipeline will ensure it can capture a proportion of that market.

"We see a market from this region for 700 90-120-seaters over the next 20 years," said SJI chief executive Stefano Marazzani at

the ALTA Airline Leaders Forum in Buenos Aires.

The Italy-based marketing arm aims to build on the existing fleet of 22 Superjet 100s, plus eight orders, with Mexico's Interjet.

Marazzani says that testing of a winglet upgrade for the 95-seater will begin soon.

"The Sukhoi engineers have dubbed these 'sabrelets' because of their shape. The first set is being



Mexican airline has a further eight examples of narrowbody on order

installed, and testing will begin at Zhukovsky [airfield, Moscow] before year-end," he says.

The prime purpose of the winglets is to enable a reduction in approach operating speeds to enable the aircraft to serve the restricted

runway at London City airport, says Marazzani. SSJ100 customer CityJet, in particular, is pushing for that capability.

In parallel, work is under way to provide more attractive acquisition methods for the SSJ100, says Marazzani: "In the next months we will be able to offer more clear and efficient financial packages, also thanks to our Russian shareholders, who are working a lot on that."

"This involves [state transport leasing company] GTLK, the Russian lessor that has a big participation of the Russian federation."

Marazzani adds that as the Latin American economic recovery gathers pace he sees prospects for more Superjet customers in the region. "We have a lot of talks in progress with airlines," he says.

**PROPULSION** EDWARD RUSSELL BOGOTA

## Engine niggles do not detract from Interjet's 'money maker'

Mexican carrier Interjet believes the Sukhoi Superjet 100 is a "money-making machine" despite ongoing maintenance issues with the type's PowerJet SaM146 engines.

However, said Interjet chief executive Jose Luis Garza at an event in Bogota, Colombia, the additional work required – driven by a number of service bulletins

for the powerplants – is more a "nuisance" than a serious operational concern.

The engine manufacturer – a joint venture between Safran and Russia's NPO Saturn – is providing on-going support, including spare engines, to Interjet, he adds.

"As we expected, there have been certain problems, like any new type," says Garza. "We are

satisfied. It is a money-making machine."

He adds that Interjet negotiated a "sweet deal" with the airframer for the SSJ100, with the capital cost of 10 aircraft roughly equal to the pre-delivery payment for a single Airbus A320.

Interjet operates 16 SSJ100s, with firm orders for another eight, Flight Fleets Analyzer shows. ■

**REQUIREMENT** GHIM-LAY YEO BUENOS AIRES

# Aerolineas Argentinas to upgauge regional fleet



Subsidiary Austral's E190s will be swapped for higher-capacity type

Aerolineas Argentinas plans to dispose of the fleet of Embraer 190s operated by regional subsidiary Austral as it evaluates larger aircraft for the operation.

The SkyTeam Alliance carrier is considering proposals for aircraft in the 150-seat category, including the Airbus A320 and Boeing 737, as well as Bombardier's CSeries and the Embraer E-Jet E2.

Aerolineas wants to upgauge its fleet to tap into strong domestic traffic growth, says chief executive Mario Dell'Acqua: passen-

ger numbers are forecast to grow by around 25% this year.

Austral operates 24 E190s, with an average age of six years. "We are analysing all the options," says Dell'Acqua, including leasing.

While Aerolineas already operates the 737 for its mainline operations, Dell'Acqua says that has no bearing on the new requirement. And while welcoming the CSeries as a "new competitor" in the segment, the carrier is unmoved by Bombardier's planned partnership with Airbus. ■



**SAFETY** DAVID KAMINSKI-MORROW LONDON

# Causes of fatal IrAn-140 crash disputed

Sepahan Airlines turboprop came down shortly after take-off, but investigation authorities diverge in analysis of incident

Iranian investigators have provided deeper insight into a fatal HESA IrAn-140 crash during departure from Tehran three years ago, revealing substantial disagreement with Ukrainian and Russian counterparts over the accident and the capabilities of the aircraft.

The Sepahan Airlines aircraft (EP-GPA) suffered an electronic engine control system failure just 2s before lifting off from Tehran Mehrabad airport, according to the Iranian Civil Aviation Organisation, shutting off the fuel supply to the starboard engine's combustion chamber.

Investigators state that the crew had used a departure flap setting of just 10°, which was not approved for the airline, and the aircraft's take-off weight of 19,800kg (43,700lb) exceeded the calculated maximum of 17,200kg.

## UNCLEAR INSTRUCTIONS

The inquiry says the aircraft flight manual procedure for calculating take-off weight was "not clear and confused the crew".

It adds that the crew failed to perform the manual propeller feathering procedure. The propeller was not fully feathered, automatically, until 17s after the initial problem. Investigators claim that



Only eight of the 48 occupants survived as overweight aircraft stalled

the unfeathered blades generated "negative thrust", which affected the flight performance, and that this was "not considered" during aircraft certification tests.

The aircraft deviated to the right, climbed to around 40m, stalled and crashed; just eight of the 48 occupants survived.

But the findings were challenged by the Interstate Aviation Committee (MAK) and the NBAAI, the respective investigative authorities for Russia and Ukraine. The IrAn-140 is a licence-produced version of the Antonov An-140, built by HESA in Iran.

MAK states that HESA has not

requested certification of the IrAn-140 from the Russian authority, and points out that the An-140 type certificate "does not cover" the Iranian turboprop.

It believes the engine failure was caused by uncontained damage of the air duct arising from separation of the air-bleed flange, supported by flight-data recorder evidence, and the failure was "nothing to do" with components of the electronic engine control.

The NBAAI insists that the flight manual charts allow pilots to carry out an "unambiguous and error-free" calculation of maximum take-off weight, and that this should not have exceeded 19,500kg. The Iranian inquiry says the crew "accepted" the aircraft as being 190kg overweight but the NBAAI indicates the figure was actually 300kg.

"Over the years of long-term [An-140] service with airlines of Ukraine, Russia and Iran there have been no complaints as to ambiguities or confusion in the performance charts," it adds.

Simulator analysis, carried out with participation from the Civil Aviation Organisation, showed that the take-off could have been conducted safely with the engine failure, provided the crew followed the flight manual requirements.

The NBAAI says "erroneous" crew actions, including failure to retract the landing-gear, allowed the engine failure to result in "considerable drag" on the aircraft and the situation to evolve from being "major" to "catastrophic".

The crew had a "right" to use the 10° take-off flap setting, it adds, because the procedure is described in the flight manual and – as far as the NBAAI is aware – Sepahan Airlines had a copy of the manual approved by the Iranian authority.

## "IMPROPER" ACTIONS

The NBAAI also rejects claims by the inquiry of An-140 non-compliance with certain certification performance requirements, centred on the failure of the ill-fated aircraft to attain the crucial V2 climb-out speed. The Ukrainian authority says "improper" actions by the crew – which had rotated the aircraft early – prevented the twin-turboprop from accelerating to this speed.

**"There have been no complaints as to ambiguities or confusion in the performance charts"**

National Bureau of Air Accidents Investigation, Ukraine

"If the [flight manual] requirement of accelerating the aircraft after lift-off, up to the take-off safety speed V2, had been strictly complied with," it says, "it would have been possible for the crew to continue take-off safely with the actual weight of 19,800kg and in the situation of early lift-off."

Iranian investigators have disagreed with these findings in their report into the 10 August 2014 crash, which is dated almost exactly three years after the accident. ■



Iran's Civil Aviation Organisation says flap setting was not approved





New Tu-160  
provides  
strategic boost  
Defence P16

REGULATION MICHAEL GUBISCH LONDON

# Rivals waiting in wings, Airbus warns

European airframer says Brexit could risk UK's role as centre of excellence for structures, citing fears over competitiveness

Airbus's UK chief has warned that Brexit could jeopardise the country's role as the airframer's primary location for wing design and manufacturing.

Speaking on 21 November before the UK parliament's Business, Energy and Industrial Strategy Select Committee, which is looking into the impact of Brexit on the country's aerospace sector, Airbus UK senior vice-president Katherine Bennett, said that "other countries would dearly love to design and manufacture wings" for its aircraft programmes.

She says that Airbus's UK sites have established specialist expertise in aerodynamics and wing design over decades: "UK engineers are just really good at it."

Airbus has major UK facilities in Filton, Bristol and Broughton, North Wales, the latter producing wings for all the airframer's civil types.

She describes wing design as the "crown jewels of aerospace" and says: "It is important to keep that capacity and build on that [for future programmes]."

Bennett confirms that Airbus is "extremely committed" to its UK facilities and that "it is not terribly easy to move a huge manufacturing site". But she says it is "most important" that the facilities stay "productive and competitive".

She acknowledges that parts for air transport-category aircraft are exempt from tariffs under World Trade Organization rules if customs charges were to apply between the UK and EU post-Brexit.

However, she says Airbus is concerned about non-tariff barriers – for example, additional customs procedures and bureaucracy – which could complicate supply chain processes and increase costs.

Meanwhile, Bennett says, manufacturers from other countries have taken the Brexit refer-



Company has invested billions in Broughton manufacturing facility, but site will face fight for extra funding

endum as an opportunity to potentially win additional work packages from Airbus: "They are knocking on the door as a result."

She says "we are fortunate" that no large investment decisions regarding potential new aircraft developments are on the "near-term" agenda. But she cautions that "soon" there may be a need to make plans for future programmes, adding that "uncertainty breeds uncertainty".

Bennett notes that the company has invested "billions" in its UK facilities over the past 10 years. "The most important thing is that our sites remain productive and competitive. Every single site in Airbus, whether inside or outside the EU, has to compete for every single bit of investment."

## STATUS BLOW

Paul Everitt, chief executive of industry body ADS, says that member companies want the status quo to be maintained throughout any transitional period following the UK's scheduled departure from the EU in March 2019.

"For us, status quo means retaining our EU membership during that period," says Everitt,

**"Leaving the EU without a deal would be the worst possible outcome from an industry perspective"**

Paul Everitt  
Chief executive, ADS

who notes that much of the sector's regulatory framework is shaped by Brussels.

He says: "The reason why we think it is the best deal to stay an EU member state during the transition is because we have a whole series of bilateral agreements that would have to be negotiated and in place at the moment that we cease to be an EU member state."

Everitt says UK government proposals to implement a transitional period on "current terms" were "reassuring". But he urges policymakers to have "some kind of formal recognition" that there will be a transitional period. Such a commitment should "ideally" be made by year-end.

Leaving the EU without a deal would be the "worst possible outcome from an industry perspec-

tive" and lead to a "chaotic" situation, Everitt says.

Despite the demand for a transitional phase, he called on the government to create clarity, rather than having an indefinite period of gradual or prolonged change: "We are very keen there is only one step from current conditions to the future ones and having a clear period for us to implement that [change]."

At the moment he sees a two-step process: a post-2019 interim stage and then the longer-term relationship. Asked whether two years would be enough, he says a 24-month transition would be a "good start – certainly better than none". But he adds: "Whether that is sufficient will depend on what a final deal looks like".

Bennett says that "some firm decisions" are needed "as soon as possible".

In the space sector, meanwhile, conditions already appear to have deteriorated for UK suppliers since the Brexit vote, says Simon Henley, the UK Royal Aeronautical Society's president-elect. Several companies have reported exclusion from EU-funded programmes. ■



MANUFACTURING DOMINIC PERRY LONDON

# New Tu-160 provides strategic boost

Improved strike aircraft rolls-out from Kazan plant, while new-generation airborne early warning asset makes flight debut

Russian industry has advanced a pair of development programmes for the nation's air force, on the path to introducing updated airborne early warning and strategic bomber capabilities.

Tupolev rolled out a first re-manufactured example of the Tu-160 bomber from the Kazan Aviation plant on 16 November, with the supersonic aircraft scheduled to make its flight debut in February 2018.

The Tu-160 was last produced in 2008, and the latest example is a key test of Tupolev's ability to restore final assembly, as well as modernising the type, including by the introduction of new en-



Russia is planning to introduce 50 M2-standard bombers after 2023

gines and avionics.

Moscow intends to procure 50 of the new-build M2-standard Tu-160s, with serial production to begin in 2023.

Tupolev intends to fly the first new-build M2 variant in 2019, which will feature next-generation systems and new Kuznetsov NK-32-02 powerplants.

Separately, on 18 November fellow United Aircraft company Beriev performed the first flight of its A100 airborne early warning and control system aircraft from its Taganrog facility in the east of the country.

Based on an Ilyushin Il-76MD-90A – the latest version of the strategic transport – the new development is designed to replace the 1980s-era A50.

Flight Fleets Analyzer records the Russian air force as operating 13 of the current-generation type, which has also been exported to China and India. ■

**See World Air Forces directory next week**

STRATEGY LEIGH GIANGRECO WASHINGTON DC

# Funding issues threaten air supremacy ambition

The US Air Force will need to replicate funding levels not seen since President Ronald Reagan's military spending build-up in the early 1980s in order to make its next-generation air dominance (NGAD) concept a reality, Air Combat Command chief Gen Mike Holmes suggests.

Holmes says the service has a solid grasp of what it would take to guarantee control of the air, after completing a 2030 air superiority study which assessed its limitations against future threats, but that it is still struggling to find the dollars to fund its next ambitious acquisition programme.

**"We believe you have to go fight the enemy in their airspace if you want to make air superiority work"**

Gen Mike Holmes  
Commander, Air Combat Command,  
US Air Force

"I don't see a shortcut to doing it," he says. "Whatever path you choose, to go after maintaining that air superiority option, it's going to cost about the same as it did 30 years ago."

While the study proposed a family of systems offering a mix of range, persistence and lethality, rather than one central fighter such as the Lockheed Martin F-35, the core of the NGAD concept appears to rely on a penetrating counter-air platform.

"We believe you have to go fight the enemy in their airspace if you want to make air superiority work," Holmes says.

"Certainly we think we're going to pursue counter-air, we're going to pursue suppression and destruction of enemy air defences; we're going to have to pursue an electronic warfare component of that."

The USAF also must work out how to afford all these capabilities while it ramps up production of the F-35A, he adds. ■



Structural modifications could be applied to 489 US Air Force jets

MODERNISATION LEIGH GIANGRECO WASHINGTON DC

# F-16 upgrade gains structure

A request for proposals has been issued for a contract to strengthen the structures on a subset of the US Air Force's Lockheed Martin F-16 fleet, keeping the fighter in service for at least 30 more years.

In April 2017, the USAF authorised a plan to extend the F-16C/D model's service life from its original 8,000 flight hour limit to 12,000h, and then in June increased its target to more than 13,800h.

Under its proposed service life-extension programme (SLEP), the USAF would keep up to 300 of its

Block 40-52-standard F-16s flying beyond 2048, with an option to increase this fleet size to as many as 489 aircraft.

The USAF intends to start procuring structural modification kits in 2018, with the programme having a contract ceiling of \$403 million, according to an overview released on 20 November. The upgrade will also be made available to Foreign Military Sales programme customers, the service says.

Flight Fleets Analyzer records the USAF as having a current active inventory of 942 F-16C/Ds. ■





Tokyo's first E-2D  
advancing nicely  
**Defence P18**



Leonardo Helicopters

An eventual 16 examples will be operated by the nation's air force

**ROTORCRAFT** DOMINIC PERRY LONDON

## AW101 delivery begins SAR renewal for Norway

Leonardo Helicopters has delivered the first of 16 AW101s being acquired via the £1 billion (\$1.32 billion) Norwegian all-weather search and rescue helicopter programme.

Oslo's lead example departed the company's Yeovil manufacturing facility in the UK on 17 November for Sola air base, and will undergo operational testing and evaluation ahead of service

entry with the Royal Norwegian Air Force in 2018.

The 15t-class rotorcraft, to be deployed across six bases, will replace 11 SAR-rolled Westland Sea Kings operated by the air force, which Flight Fleets Analyzer shows are aged between 21 and 45 years. The deal also includes the provision of personnel training and support, with options on another six aircraft. ■

**RECAPITALISATION** LEIGH GIANGRECO WASHINGTON DC

## USAF yet to determine JSTARS target

Service faces dilemma as it seeks replacement for ageing E-8C fleet capable of surviving in contested environments

Recapitalising the Northrop Grumman E-8C joint surveillance target attack radar system (JSTARS) fleet will not provide the US Air Force with the capability it needs to operate in contested environments, according to the head of its Air Combat Command.

Remarks made by Gen Mike Holmes during an Air Force Association event near Washington DC on 20 November shed more light on the reasons why the USAF's \$6.9 billion JSTARS replacement programme has ground to a halt since September, leaving bidding teams led by Boeing, Lockheed Martin and Northrop waiting on a final decision.

### UNDER THREAT

Options include a large business jet or adapted airliner as either a temporary or long-term replacement for the current Boeing 707-based E-8C, or jumping to a next-generation system able to survive in a contested environment.

A key issue during current discussions is how a next-generation JSTARS asset would fit into a US inventory already boasting several similar capabilities. In addition to the E-8C's synthetic aperture radar/ground moving target indi-



Northrop Grumman

Current 707-based asset is largely tasked with ground surveillance, rather than battle management role

cation (GMTI) capability, the air force operates 11 Northrop RQ-4 Global Hawk Block 40 unmanned air vehicles with a smaller version of the same radar. The US Army flies manned surveillance aircraft equipped with Northrop's vehicle and dismount exploitation radar, while the US Navy is developing the Raytheon advanced airborne system for use with its Boeing P-8A Poseidon maritime surveillance aircraft.

Holmes notes that all these systems operate in permissive environments, and warns that even a new JSTARS fleet would not be fit to fly in contested airspace.

"How will we fight and how will we close the 'kill chain' in a

highly contested environment in a world we live in now, where, if war kicked off in northern Europe, NATO and coalition soldiers would already be underneath that umbrella provided by an integrated air defence [system]?" Holmes says. "Our conclusion is that none of those systems that are fielded now – including our current JSTARS or a replacement JSTARS – would give us the capability to do that."

### CAPABILITY GAP

A decision will come down to whether the USAF should fund a recapitalisation programme, or find another way to bridge the capability gap, Holmes says.

While the service would like to field a "non-traditional" GMTI capability that is more effective in contested airspace, the JSTARS fleet still provides a crucial capability in counter-insurgency operations, and has powerful support in Congress.

"We're not doing much around the world right now with that broad-area, air battle management [capability] because we're not fighting that kind of war," Holmes says. "What we are using the airplane for is as a communications relay, and to do some specific GMTI work against some novel threats that it wasn't built for: looking for things like small vehicles and people." ■



## SURVEILLANCE

## Tokyo's first E-2D advancing nicely

Japan's first Northrop Grumman E-2D Advanced Hawkeye airborne early warning aircraft has entered testing, having made its flight debut on 9 October. Confirmation of the programme milestone – which was conducted from the company's facility in St Augustine, Florida – came from Northrop in mid-November. Tokyo's defence ministry selected the E-2D in 2014 for a Japan Air Self-Defence Force requirement, making it the first export customer for the Advanced Hawkeye variant. It initially ordered a solitary example of the surveillance type, before doubling its commitment in August 2016. Both aircraft are scheduled to be handed over next year. Flight Fleets Analyzer details Japan as already operating 13 E-2Cs, aged between 24 and 35 years, and as having expressed interest in another two D-model examples.

See World Air Forces directory next week



Northrop Grumman



Bell Helicopter

Tiltrotor technology demonstrator could serve as flying laboratory

## DEVELOPMENT DOMINIC PERRY DUBAI

## Valor targeting autonomous flight

Bell Helicopter is already considering future applications for its V-280 Valor tiltrotor, even before conducting a first flight in support of the US Army's future vertical lift programme.

"With the help of the government, we hope to look at flying the V-280 autonomously, hopefully in the next year or so," says Vince Tobin, Bell's vice-president of military business.

Tobin argues that the application of fly-by-wire controls on the Valor and the development of its flight-control laws will make a transition to autonomous flight relatively straightforward.

"While it's not trivial, it is less significant than having to do everything from scratch," he said at the Dubai air show.

Although the V-280 is being produced under a tightly defined

US Department of Defense contract for the army's joint multi-role technology demonstration effort, along with the Boeing-Sikorsky SB-1 Defiant, Tobin says the aircraft could serve as a flying testbed.

"We intend to make the government programme office aware that once tests are completed they have a relatively low-cost flying laboratory available." As well as autonomous flight technologies, this could be used to trial the integration of weapons onto the platform, he suggests.

Tobin expects some government funding would be available to support such an activity.

Powered by two GE Aviation T64 engines, the V-280 demonstrator is scheduled to get airborne for the first time before "the end of the autumn", Tobin says. ■

## DEPLOYMENT LEIGH GIANGRECO WASHINGTON DC

## US test campaign keeps KC-390 on certification track

Second prototype transport/tanker deployed to Embraer's Jacksonville site for avionics, crosswind and noise checks

Embraer has deployed its second prototype of the KC-390 transport/tanker to Jacksonville, Florida, where it will undergo a series of flight tests in support of the Brazilian airframer's certification campaign.

Flight-testing of the KC-390 is primarily performed at Embraer's remote Gavião Peixoto complex, deep in Brazil's interior, but the US deployment will be used to support evaluation of the airlifter's avionics systems, crosswind operations and external noise characteristics.

The activity involves aircraft PT-ZNJ, which flight tracking websites show landed in Jacksonville on 20 November, after making stops in Brasilia, Manaus, Punta Cana in the Dominican Republic and Fort Lauderdale, Florida.

Embraer Defense and Security chief executive Jackson Schneider says he is optimistic that the KC-390 will secure certification on time by the end of this year,

and deliver its first example to launch customer the Brazilian air force in 2018.

The service has ordered 28 KC-390s, and will eventually also receive the programme's two prototypes, to replace a fleet of Lockheed Martin C-130H tactical transports.

Since first flight in February 2015, the KC-390 test fleet has accumulated 1,450h in the air. Embraer currently has only one of its aircraft available, following a 12 October stall testing incident involving lead example PT-ZNF, which will be returned to use following minor repairs required after it "experienced an event beyond the planned limit".

The Portuguese government is also considering the purchase of five KC-390s, with an option to add a sixth.

Four more countries – Argentina, Chile, Colombia and the Czech Republic – have expressed interest in buying a combined 26 more examples. ■





GAMA reveals  
modest rise in  
deliveries  
**Business Aviation P21**

UNMANNED SYSTEMS STEPHEN TRIMBLE DUBAI

# Range limitations hinder Chinese UAS

AVIC touts Cloud Shadow's stealthy characteristics, but reveals operating endurance well short of Western counterparts

A Chinese family of jet-powered Cloud Shadow unmanned air systems displayed at the Dubai air show offered a potent mix of high-altitude intelligence-gathering and weapons capabilities – but unusually short endurance, according to specifications released by AVIC.

AVIC's design philosophy breaks from the multi-mission approach used for many Western UAS. Each of the three models in its Cloud Shadow range is optimised for a single role, in the form of the imagery-collecting CS-1, electronic-eavesdropping CS-2 and the hunter-killer CS-3.

Overall, the Cloud Shadow's maximum altitude and range place the family at the top of AVIC's portfolio of exportable

UAS, which also include the medium-altitude Wing Loong family and the low-altitude A-Hawk I and II quadcopters. The Cloud Shadow is designed to fly at 340kt (630km/h) and cruise at altitudes of 41,000-42,600ft.

But the aircraft's endurance falls far short of the 10-30h of most competitors in the high-altitude, long-endurance or medium-altitude, long-endurance market. The CS-1 and CS-2 variants are listed with only a 6h endurance, while AVIC says its CS-3 can be flown for up to 5h.

A clue to the Cloud Shadow's relatively short endurance is its engine. AVIC says the UAS family is powered by the WP-11C turbojet. This is derived from a 1950s-era French engine which powered



Hunter-killer CS-3 is capable of being flown for a maximum of 5h

the Fouga Magister, and US drones in the Vietnam War as the Teledyne CAE-built J69.

Despite such apparent shortcomings, AVIC claims that the

Cloud Shadow family has some ability to operate undetected within contested airspace, with the company referring to an "electromagnetic silent" mode. ■

PROCUREMENT LEIGH GIANGRECO DUBAI

# Ottawa targets 2021 for future fighter selection

The Royal Canadian Air Force is expecting a new request for proposals to be issued in its fifth-generation fighter contest by

2019, with a contract award to follow by 2021, says the service's commander, Lt Gen Michael Hood.



Canada intends to replace its ageing CF-18s with 88 new aircraft

In June, the government in Ottawa proposed acquiring 88 new fighters to replace its ageing Boeing CF-18s: an increase from the previous administration's plan to purchase 65 Lockheed Martin F-35s.

Prime minister Justin Trudeau pledged to hold an open competition, but has since downgraded Canada's interest in the F/A-18E/F Super Hornet as an interim solution, due to Boeing's dispute with Bombardier over its CSeries programme.

Speaking to FlightGlobal at the Dubai International Air Chiefs conference on 11 November, Hood declined to comment on

whether the air force is still considering the Super Hornet. "My relationship is limited to the support of our ongoing Boeing products and those normal day-to-day discussions," he says.

Ahead of its next-generation fighter selection, Canada is considering options for an interim deal. It recently submitted a formal expression of interest linked to the potential acquisition of some of Australia's F/A-18A/Bs, which are similar to its CF-18s. Hood notes that Ottawa has previously bought intellectual property rights on the Boeing type, and uses L3 Technologies for its sustainment. ■

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PROGRAMME KATE SARSFIELD LONDON

## Initial PC-24 nearing delivery

The first Pilatus PC-24 destined for launch customer PlaneSense has been registered in Switzerland by the Stans-based airframer, as certification and service entry of the superlight business jet draw near.

The all-metal aircraft – serial number 101 – carries the registration HB-VSB. It will be delivered to the Portsmouth, New Hampshire-based fractional ownership company after European Aviation Safety Agency and US Federal Aviation Administration validation of the PC-24, earmarked for December.

Following pre-delivery testing, the aircraft will be placed on the FAA registry of N-prefixed aircraft.

PlaneSense is already a long-standing Pilatus customer and the largest commercial operator of its PC-12NG single-engined turboprop, with a fleet of 35.

Based in New Hampshire, the operator acquired six PC-24s during the first order round, which sold out within 36h of opening in 2013. Pilatus has a backlog for 84 PC-24s, and plans to reopen the orderbook in 2018.

The seven-seat PC-24 is Pilatus's first jet after almost eight decades of producing models such as the PC-12 – the best-selling single-engined turboprop business aircraft, with more than 1,500 deliveries to date – and the rugged PC-6 Porter, which has sold around 600 units over its 60-year lifetime. Production of the latter ends in 2019.

Pilatus also builds the PC-21 turboprop military trainer, whose customers include the French air force.

However, the PC-24 is expected to top them all, with Pilatus forecasting production of 4,000 units over the next 40 years. ■



Empire Aviation Group

Firm manages three aircraft so far, including an Embraer Legacy 650

CHARTER KATE SARSFIELD LONDON

## Empire gaining territory with new Indian venture

Dubai's Empire Aviation Group (EAG) has launched a charter and management venture in India, in a move that aims to plug a gap for high-quality business aircraft services within the country's private aviation sector.

Steve Hartley, EAG's executive director, says the Bengaluru-headquartered venture, which will help grow the region's fleet of midsize and high-end jets, has been "three years in the making", thanks to "an incredibly frustrating [bureaucratic] experience".

To comply with India's foreign ownership rules, EAG has formed a venture with Indian maintenance, repair and overhaul provider and strategic investor Air Works. "We have total control of the day-to-day running," Hartley says.

EAG is one of the largest business jet operators in the Gulf,

with a fleet of more than 20 aircraft. It hopes to export its high service levels to India, where the standard of rivals is "indifferent", says Hartley. It is not uncommon for passengers to "climb into a filthy aircraft", he says, adding "we plan to change all that".

In November, EAG was awarded a non-scheduled operator's permit by India's Directorate General of Civil Aviation, and has added three managed business jets to the line-up, including its first on the Indian register – a large-cabin Embraer Legacy 650.

EAG plans to double its fleet year on year over the next four years. "The opportunity is tremendous, but our growth will be controlled," says Hartley.

Flight Fleets Analyzer records an in-service fleet of around 230 business aircraft in India. ■



PlaneSense

US launch operator PlaneSense has ordered six of the superlight jets

INTERIORS KATE SARSFIELD LONDON

## Legacy upgrade puts pressure on rivals

Brazilian airframer Embraer lowers cabin altitude by 200ft for midsize pair, which it claims offers class-leading performance

Embraer has reduced the cabin altitude for its Legacy 450 and 500 business jets by 200ft.

Aircraft shipped to owners in early 2018 will have a cabin altitude of 5,800ft when flying at 45,000ft, thanks to an increase in the cabin pressurisation differential, from 9.3psi (0.64bar) to 9.73psi.

The aircraft's environmental control system also preserves a

sea-level cabin altitude while flying below 27,050ft.

Embraer Executive Jets chief executive Michael Amalfitano says the lower cabin altitude shows the Legacy pair are "setting new standards for the midsize cabin segment".

The Legacy figure compares with cabin altitudes of 5,950ft and 7,000ft for the rival Cessna Citation Latitude and Gulfstream

G280, respectively.

Available on all new aircraft from the first quarter of 2018, the enhancement will then also be available as a retrofit on the in-service fleet.

"These aircraft are beautifully designed and brilliantly engineered, and they will continue to elevate the experience that we provide our customers," he says.

The cabin altitude upgrade

comes about a month after Embraer announced a series of improvements to the Legacy 450 and 500, including changes to the passengers seats, avionics and connectivity provision.

The Legacy 500 and 450 entered service in 2014 and 2015, respectively. By the end of September, the airframer says, it had delivered 50 and 21 examples of the types. ■



Train hard,  
fight easy  
Military Simulators P22

ANALYSIS KATE SARSFIELD LONDON

# GAMA reveals modest rise in deliveries

But increase in total shipments masks larger percentage fall in overall value as expensive big jets continue to struggle

Worldwide shipments of fixed-wing business and general aviation aircraft rose slightly during the first nine months of 2017, led by a strong performance from the piston-engined sector. However, total billings for the period slid year-on-year, reflecting the mix of shipments in favour of smaller, cheaper models.

The General Aviation Manufacturers Association (GAMA) says deliveries of piston-engined, jet-powered and turboprop business aircraft rose by 1.7%, to 1,532 units, between January and the end of September. However, the total value of shipments fell by 2.8%, to \$13.2 billion.

## JET POWER

The association recorded 434 business jet deliveries in the period ended 30 September – six more than in the same period a year earlier. The best performer was Honda Aircraft, which saw output of its HA-420 HondaJet double, to 30 units, in the period.

Cirrus, which began deliveries of its Vision SF50 personal jet in December 2016, handed over nine units between January and September.

Gulfstream recorded a two-unit hike in deliveries, to 90, including the final G150. The airframer called time on the midsize jet and its large-cabin stablemate, the G450, in 2016, following poor sales. The 14-year-old G450 will bow out in January, when its larger, faster and longer-range replacement, the G500, is scheduled to enter service.

## Fixed-wing aircraft shipments (Jan-Sep)

	2016	2017
Business jets	428	434
Pistons	696	724
Turboprops	382	374
<b>Total shipments</b>	<b>1,506</b>	<b>1,532</b>
<b>Total billings (\$bn)</b>	<b>13.5</b>	<b>13.2</b>

Source: GAMA Note: Excludes Dassault deliveries



October 2016 service entry for 8X helped boost Dassault's figures

Cessna recorded an increase of two Citations over the nine-month period, to 122 aircraft, but this was largely a result of the continued strong demand for its Latitude business jet. Shipments of the midsize type, which entered service in 2015, climbed by 50%, to 36. The CJ4 appears to have fallen out of favour with light business jet buyers, with deliveries of the seven-seat type sliding between January and September by nearly 40%, to 14 aircraft.

GAMA's report does not include shipments of Dassault Falcon business jets for the full nine months, as the French airframer releases its deliveries and earnings at six-month intervals. However, Flight Fleets Analyzer records 34 Falcon deliveries for the period – seven more than last year – thanks to a rise in shipments of its flagship 8X, which entered service in October 2016.

Elsewhere in the business jet sector, Bombardier shipped a combined 96 Learjets, Challengers and Globals – a fall of 14 units year-on-year. Embraer saw its deliveries slide by 15 units, to 59.

Soft demand from the traditionally strong markets of China, Russia and the Middle East continues to affect sales of VIP airliners, but Airbus has been particularly badly hit, delivering no green ACJ models between January and September for the

second year in a row. The airframer has an order backlog for 11 aircraft – an ACJ350-900 and 10 ACJ319/320neos. The first example from the re-engined single-aisle family, an ACJ320neo, is scheduled for delivery to Swiss completion house AMAC Aerospace in the fourth quarter of 2018.

Boeing fared better during the nine-month period, shipping six green widebodies – three BBJ 777-300ERs; a pair of BBJ 787s and a BBJ 747-8. No 737-derived BBJ deliveries were recorded, however. As with rival Airbus, demand in the single-aisle segment has shifted to the re-engined option. Boeing will deliver its first example, a BBJ Max 8, to US completion centre Comlux America late next year.

## PISTONS PERFORM

The piston aircraft sector fared well during the nine-month period, recording a 4% year-on-year rise, to 724 units. This was triggered by an uptick in sales from private flyers and international training schools. Cessna lead the charge, shipping 140 of its high-end piston-singles during the three quarters, compared with 127 during the same period last year.

Diamond also made impressive gains, shipping 98 of its DA family of piston-singles and

twins – nine more than last year. Cirrus, meanwhile, recorded a 10-unit hike in deliveries of its SR-series of high-performance singles, ending September with a total output of 236 aircraft.

Tecnam bucked the upward trend, shipping 132 aircraft between January and September, compared with 146 during the same period a year ago. The fall was mainly attributable to a poor performance from its P92 piston-single, for which no deliveries were recorded.

The turboprop sector was the worst performer in the fixed-wing aircraft market, recording a 2.1% drop in deliveries, to 374 units. The slide is due almost entirely to the poorly performing twin-engined segment.

Weak demand for the Beechcraft King Air family of executive and utility turboprops from the traditionally strong international marketplace, coupled with parent company Textron Aviation's strategy to hold a firm line on pricing, resulted in a 23-unit fall in shipments between January and September, to 55 aircraft.

The market is proving even more brutal for Piaggio, which failed to deliver a single P.180 Avanti Evo during the first nine months of the year.

In contrast, output across the single-engined turboprop segment was solid between January and September. Piper led the field, recording a nearly three-fold increase in deliveries of its flagship M600 – which entered service last year – to 23 units. Daher recorded 36 deliveries of its TBM 930 and 910 – up from 32 the year before.

GAMA president and chief executive Pete Bunce says the association's focus on streamlining certification and validation processes around the world will help manufacturers continue to bring "new and safer products to the market and hopefully spur growth in future quarters". ■





CAE supplies simulators for the PC-21 trainer, with France a future recipient of the Swiss-built type

# Train hard, fight easy

The latest FlightGlobal data puts the total number of military simulators at over 2,700, with the majority in the USA and CAE and L3 Link Simulation & Training as dominant players

ANTOINE FAFARD LONDON

**T**he military aircraft simulators market is dominated by five manufacturers, which between them account for more than two-thirds of the devices in service worldwide. The clear leaders are CAE and L3 Link Simulation & Training, each with a 19% share. Boeing and FlightSafety International (FSI) are in third and fourth positions, with 11% and 10% respectively, followed by Thales at 8%.

Data recently updated by FlightGlobal shows devices designed for military aircraft simulation now total more than 2,700 units.

The USA has 1,500 simulators currently in service – 55% of the world total – with nearly half of these devices operated by the US Air Force.

Lockheed Martin and Boeing aircraft are respectively simulated by 22% and 17% of devices. Nearly 300 devices are designed for Lockheed's F-16, making it by a large margin the world's most-simulated military aircraft.

## RECENT ADDITIONS

Information provided by FlightGlobal shows more than 60 military simulation devices were delivered this year between January and October. Recent arrivals include two Sikorsky

MH-60R Seahawk helicopter simulators delivered by CAE to the Royal Australian Navy, which currently operates more than 35 of the type and has five simulation devices.

CAE provided a single weapons system trainer for the Lockheed KC-130J to the US Marine Corps; the USMC also awarded the Canadian company contracts for four fuselage trainers for the tanker.

A full-flight simulator for the Airbus Defence & Space C295 tactical transport was delivered by CAE to the 8th air base Krakow-Balice for the Polish air force, which operates a fleet of 16 C295s. The C295 device joins a CAE-built PZL Swidnik SW-4 helicopter simulator, and an additional full flight simulator order was recently placed with CAE; this is due to be delivered in 2019.

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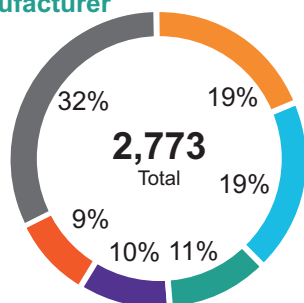
**Nearly 300 devices are designed for Lockheed's F-16, making it the world's most-simulated military aircraft**

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CAE also recently took an order for five Pilatus PC-21 devices from the French air force.

In February, the Royal Canadian Air Force awarded CAE a contract for 14 devices tailored to various applications for the C295, which was selected by the nation's government as its new fixed-wing search and res-

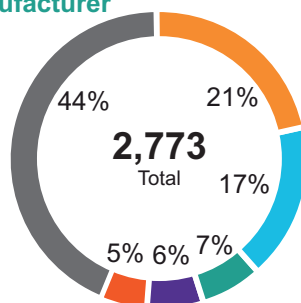
## Market share by military simulator manufacturer



Source: Flight Fleets Analyzer

CAE 537	L3 Link Simulation & Training 524	Boeing 303
FSI 271	Thales 245	Other 893

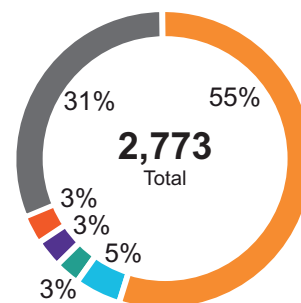
## Military simulator share by aircraft manufacturer



Source: Flight Fleets Analyzer

Lockheed Martin 600	Boeing 466	Beechcraft 186
Sikorsky 173	Airbus Helicopters 129	Other 1,219

## Military simulator share by country



Source: Flight Fleets Analyzer

USA 1,537	France 145	Russia 85
UK 80	Canada 76	Other 850

cue platform in December 2016. As part of this programme, the air force will receive a total of 16 of the twin-turboprop aircraft.

L3 Link provided 24 new training devices for the F-16 and six weapons system trainers for the General Atomics Aeronautical Systems MQ-1 Predator unmanned air system to the US Air Force in 2017. A total of 38 Predator simulation devices are currently being operated by the USAF – a figure set to almost double by the end of 2018.

L3 Link has also provided two tactical operational flight trainers for the Boeing F/A-18E/F Super Hornet to the US Navy this year and two

F-16 weapons tactics trainers to the Iraqi air force; Oman's air force took an L3 Link device that simulates the BAE Systems Hawk advanced jet trainer.

A couple of devices designed for the Boeing KC-46A Pegasus tanker have been delivered by FSI to the USAF this year, including a weapons system trainer and a boom operator trainer. The KC-46A is a military version of the 767 currently in the late stages of flight testing, with first deliveries expected early in 2018. The multirole tanker is intended to replace the oldest aircraft in the USAF's Boeing KC-135 fleet.

FSI also provided four operation flight trainers for the Airbus Helicopters UH-72 Lakota and a single Sikorsky UH-60 Black Hawk device to the US Army. The USMC received three Bell UH-1 flight training devices from FSI in 2017.

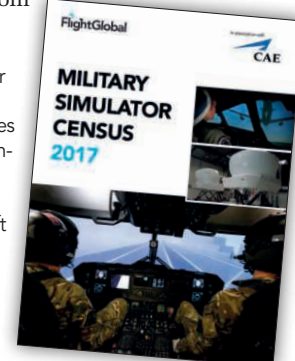
Other providers recently active include Russian aircraft simulation specialist CSTS Dinamika, which delivered two Kamov Ka-52 devices to the Egyptian air force. Dinamika also provided four simulators to the Russian air force – one for the Sukhoi Su-34 fighter, and three for Aero Vodochody L-39 jet trainers.

Elsewhere, Lockheed's dominant position is reflected by a fair presence in the simulation business; this year it delivered three F-35 Lightning II devices to Japan.

The Spanish navy has taken delivery of two NH Industries NH90 helicopter full-mission simulators from Indra Sistemas. ■



The Military Simulator Census 2017, sponsored by CAE, features a listing of military simulators, including operator and device information by aircraft type and by country. The census can be downloaded for free at [flightglobal.com/milisim](http://flightglobal.com/milisim)



CAE offers training centres, training services, and simulation products for helicopters.

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# Virtually ready

Canadian Forces Base Trenton in Ontario hosts one of the world's most advanced Lockheed Martin C-130 training facilities; vital given the nation's diverse operational needs



CAE currently helps to prepare 20-22 pilots per year for Canada's CC-130J airlifter fleet

BETH STEVENSON CFB TRENTON

The Royal Canadian Air Force's 8 Wing air mobility unit is home to its fleet of Lockheed Martin CC-130 fleets, comprising 17 J-model tactical transports and 13 H-model examples configured for search-and-rescue (SAR) duties.

Located at Canadian Forces Base (CFB) Trenton in Ontario, the service's 426 Transport Training Sqn is responsible for instructing all personnel that serve on the CC-130 fleet, and arguably has one of the world's most comprehensive Hercules training facilities.

CAE is contracted by the air force as the operational training systems provider for its CC-130 aircrews, and is in the fifth year of operations out of a 20-year term. The company has 60 employees and 28 sub-contractors based at Trenton to provide the year-round service, although military instructors are additionally required to carry out the live flying aspect of training.

In addition to the provision of full-motion and static simulators, the Air Mobility Training Centre service also includes a CC-130J fuselage trainer (FuT) for maintenance personnel, which was developed in conjunction with Cascade Aerospace under a sub-contract to CAE. Cascade was responsible for the hardware element of the FuT, while CAE provided the simulation software.

Sections from a legacy Canadian C-130E were used to form the stretched CC-130J's fuselage, and structural modifications were made to mimic the interior of the J-model Hercules, including floor adaptations and the installation of a cargo winch and retriever winch for paratroopers.

## "Pilots get their instrument rating without ever having to step in an aircraft"

Lt Col Brent Hoddinott

Commanding officer, 426 Sqn, Royal Canadian Air Force

CAE also provided the fully simulated aircraft systems that run on the host computer, as well as the virtual cockpit. This drives the simulation and interface with FuT hardware components such as the ramp/door and communications systems.

The device can also be networked to a tactical flight training device (TFTD), which CAE says benefits students as it provides a more rounded and realistic mission scenario. Typically, fuselage trainers simply mimic the inside of the back of an aircraft, without providing the added feeling of being in a transport while it is flying, it notes.

First officers and loadmasters train separately for the first part of their courses,



Royal Canadian Air Force

New personnel for older, H-variant aircraft are required to undergo live training on transport

then are brought together for TFTD/FuT combined training.

The annual output for CC-130J training is 12-14 first officers, eight aircraft commanders and 12-14 loadmasters.

In order to qualify as a CC-130J pilot, 204h of ground school training has to be undertaken, plus 121h in simulated devices, with no live aircraft training required. This is because the facility's full-flight simulator is a level D device, which Transport Canada has approved for instrument rating.

"Because of the simulator and the training we have on the J side, you are producing pilots with their instrument rating without them having to step in an aircraft," says Lt Col Brent Hoddinott, commanding officer of 426 Sqn.

Relying entirely on simulated devices and ground schooling to achieve this rating alleviates unnecessary strain on the live aircraft, he says, although noting that it is not fair to compare the H-model training system with the newer variant, because of their different capabilities and ages. Canada's first CC-130H was delivered in the early 1980s, while its lead CC-130J was delivered in 2010.

Hoddinott adds that there is a need for experienced pilots to carry out the full course, even if they are moving between the different CC-130 models, because of differences in the handling and design of the two models.

"They look the same and have the same name, but they are absolutely not the same aircraft, so personnel train on the H or the J, and if one has to convert, they have to do the entire course [for that model]," he says.

This is followed by mission training, which entails of 164h of ground instruction, 88h in simulators, 40h of local live flying, and 20h of deployed flying. In total, the course takes 96 calendar days, and recurrent training for pilots requires 8h in the simulator per quarter.

A loadmaster, meanwhile, must receive 136h of ground school training, 34h in the same simulators as the pilot candidates, plus 85h in the FuT, with no live flying required.

Mission training involves 100h of ground school, 24h in flight simulators, 77h in the FuT, and 12h in a loadmaster part-task trainer. The same live flying time that the pilots undertake is required, and the whole course takes 89 calendar days to complete.

## QUALIFICATION PHASE

The H-model course has an annual throughput of 12 first officers, plus six to nine loadmasters. There is more reliance on using live aircraft during CC-130H training, as both the pilots and loadmasters have to carry out 46h in the qualification phase and 62h in the SAR training phase, because the simulator is not at a level D standard.

For the CC-130J training, the air force is reducing the course length from six months to four months and three weeks, Hoddinott says. The first shortened course commenced during the summer, and so far "it does not look like there will be any degradation in training", he says. "To save five weeks was a significant achievement," he adds.

"My budget has not been confirmed to grow on the contractor side as of yet, but we are ramping up production to 24 first officers annually, and 18 or so loadmasters," says Hoddinott, adding that this work has already started, with the goal of starting a new first officer course every three weeks.

"January will be the time that I either have the money in my budget to go five courses in house at a time, or we continue at three," he says. Getting to the stage at which 24 first officers per year will be trained will help counter demographic changes and attrition in the air force, but will require additional funding for more instructors.

"We are looking to hire three to four more contractors, and that will be the best way to do it," he says, adding that the amount the squadron is seeking approval for is less than C\$500,000 (\$393,000).

"The air division of the Canadian armed forces has accepted a certain forces employment and number of lines of tasking, and if we can increase first officer production, that will just grow the number of lines of tasking that can be used. The system has adapted to what we can produce and what we have, and if we can provide more, the system will make use of that extra capacity."

There is a notable shortage of personnel as the "baby boomers" of the 1960s begin to retire, and a lull in trained operators that began in 2016 is expected to last for a couple more years, Hoddinott says.

Joe Armstrong, vice-president of CAE Canada, says this is a market-wide problem for training, and there is a need for more pilots in both the military and commercial domains, which the company is anticipating and trying to counter.

"It is certainly a demand that we are feeling significantly, to be able to produce more training systems and pilots in general," Armstrong notes.

"With the Royal Canadian Air Force, the issue is not so much a recruitment problem, because the recruitment system is generating sufficient interest, but it is related more so to the availability of training systems, which includes the systems themselves and instructors.

"If you look at the ramp-up of new aircraft – fixed-wing SAR [FWSAR], and the C-130J that is still relatively new in the context of the forces – you need to collectively ramp up the ability to train."

Air Canada recently began a new round of pilot training, which could be a problem for >>



Full-motion simulators are heavily used





## Aerospace Big Data

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» the military, as the airline is “looking for exactly the kind of pilots we produce”, Hoddinott notes.

There is a three-year minimum service requirement for air force personnel once qualified, and at a strategic level, the Canadian armed forces are looking at how staff can be retained. This includes offering bonuses, salary reassessments, and the possibility that retiring personnel could stay on as reservists to fly one day per week, for example.

Hoddinott says there is also an option to convert some of the CC-130J training devices to be used during tuition on the Airbus A310-derived CC-150 tanker/transport, although this proposal is in its initial stages. The work is currently done by Canadian instructors using Lufthansa simulators in Germany.

## ROLE TRANSITION

The H-model Hercules that carry out SAR duties for Canada will begin to be replaced by Airbus Defence & Space C295s from the early 2020s. The first FWSAR asset is expected to be handed over to its air force in Seville, Spain in December 2019, with a planned delivery to Canada the following year, at which point training will begin.

A total of 16 examples will be delivered, two of which will be in maintenance at any one time and two dedicated to the operational training unit, meaning that a 12-strong operational fleet will be in use.

The training facility for the FWSAR fleet



Airbus Defence & Space

Fixed-wing SAR duties will be transferred from aged CC-130H fleet to 16 adapted C295s

will be based at CFB Comox, in British Columbia, which is where its Leonardo Helicopters AgustaWestland CH-149 Cormorant (AW101) rotorcraft fleet is also based. Instrument type training for the CC-130H is carried out at Trenton, followed by SAR mission training at Comox. C295 training will be similar to the CC-130 model, in terms of in-service support for simulation, the classroom environment and training equipment.

“The plan is to take our H-model guys and transition them into fixed-wing SAR,” Hoddinott says. “We are in discussions now to figure out when the last of the H-model courses will happen, but I expect it will be in the next two years, so we can transition the instructors and the positions to Comox to build up the training centre there, as well as train the instructors on the actual aircraft.”

The CC-130H fleet will transition to retirement as of 2022-2023, as the C295s are phased in.

CAE has been subcontracted by Airbus to provide aircrew and maintenance training for the FWSAR fleet. The planning phase for this will run until 2019, followed by 20 years of in-service training.

“We are going to capitalise on the fixed-wing SAR programme, taking the entire CAE database and loading it into this,” Hoddinott says. “Because the FWSAR programme has access to everything that already exists, we’ve been able to hand-pick various regions of Canada that are fantastic for training the pilots, so we are going to get CAE to build those so that we can concentrate on that.

“Having all of the environments already created allows us to go forward in new areas.”

Hoddinott notes that much of the success of the training programme at Trenton is down to the operator-contractor relationship between the air force and CAE, and praises the services provided by the company.

“What works well from my perspective is that the relationship with CAE is fantastic, very responsible, and if there is extra capacity they will provide it,” he says. “What also works well is the instruction that CAE provides, as it is consistent.”

In the military domain, personnel are rotated on two-year cycles, for example, which can cause delays in output, while there is a consistency within contractor-supplied instruction. “The message is consistent all of the time, and that is fantastic,” says Hoddinott.

“The training devices and the Level D simulator provide a flexibility that allows us to run all of the emergencies that anybody could possibly conceive in the simulator. On the [operational] J you can’t run emergencies, and you cannot fail systems in the aircraft because it won’t let you, so that emergency management and handling need to be trained to in the simulator, which is worth its weight in gold.

“There is absolutely more to be gained from the evolution of simulation,” Hoddinott believes. “Because we are so small, we do have to rely on simulation.”

The success of the CC-130 training model is evident in the plans Canada has made to replicate it with its future C295 fleet. As Hoddinott notes, those future needs will be met by continuation and development of the training it already does. ■



CAE

CAE provides sophisticated terrain database



# Hacking the duopoly

Airbus and Boeing are well-equipped to counter competitive challenges from traditional aerospace rivals, but are anxious about threats posed by unforeseen market forces



Elon Musk's Tesla cars are propelled by electricity and, more worryingly for rivals, fundamental shifts in society

STEPHEN TRIMBLE DUBAI

Despite sitting atop a duopoly enjoying the longest uninterrupted run of market growth in aviation history, Airbus and Boeing executives seem gripped by a heightened sense of healthy paranoia these days.

But it's not the likes of Comac, Irkut or Mitsubishi that arouse the most concern in the corporate suites of Toulouse and Seattle. After decades of accumulated business wisdom, Airbus and Boeing know how to compete with that sort of external threat.

Rather, the paranoia is focused on a very different adversary: namely, the twenty-something software coder in a start-up somewhere in Austin, Palo Alto or Hyderabad, with a vision and an algorithm that in a decade could possibly change the way people move themselves or their belongings by air.

In response, Airbus and Boeing are pouring financial resources into engaging and, perhaps, mitigating not a short-term competitive threat, but a long-term disruptive menace.

In mid-2015, Airbus established a venture capital fund in California's Silicon Valley called A<sup>3</sup> ("A cubed"), and lured a former Google and US Defense Advanced Research Projects Agency executive, Paul Eremenko, to lead it.

A year later, Eremenko – who strictly adheres to Silicon Valley's business uniform of T-shirt, jeans and designer sneakers – became chief technology officer of Airbus Group, while A<sup>3</sup> continues to develop potential breakthroughs, such as a four-seat, vertical take-off and landing air taxi and a new concept for modular interiors for airliners.

Nearly two years later, it was Boeing's turn to make a move. The company announced the creation of the HorizonX business unit and venture capital fund in a 5 April news release, which also revealed the fund's first investment, in a Seattle-based hybrid-electric aircraft start-up called Zunum Aero.

Now, for the first time, HorizonX vice-president Steve Nordlund has met a group of reporters. At the Dubai air show in mid-November he explained how HorizonX fits into the company's strategy and organisation, and how it co-exists with units such as Phantom Works and Boeing Research and Technology.

## AUTO DRIVER

Boeing's strategy continues to concentrate on aerospace, but its recent foray into start-up investments was driven by the automotive sector.

Specifically, Tesla's rise from obscure start-up in 2003 to the world's fourth most valuable automobile manufacturer today caught the business world's attention. Protected by a high degree of technical complexity and barriers to scaling up production, aerospace manu-



CityAirbus taxi is the first of a series of concepts that could see company offer travel services

facturers are often considered relatively safe from such a disruption.

But Tesla's ability to challenge several of the world's largest manufacturing companies convinced the aerospace world that new technology and business models can put any industry at risk of severe disruption.

"One of the reasons we stood up HorizonX is you see what's going on in the automobile industry. Frankly, a lot of the large automobile companies were caught by surprise," says Nordlund.

## "It's really hard in our business to scale after you get past the initial stage of proving the technology"

Steve Nordlund  
Vice-president, HorizonX

Tesla's rise was made possible by the confluence of three forces, he says. The first was the ascendance of Tesla's visionary new product. In 2003, it was still normal to laugh at the idea of making a commercially viable electric car. Second, new business models emerged, such as ride-sharing services, that disrupted the automotive industry's normal customer base. Finally, manufacturers witnessed a change in consumer behaviour, as the millennial generation became teenagers and celebrated independence with smartphones instead of cars.

It took 14 years for Tesla to grow from start-up to a behemoth with a market value of nearly \$53 billion. Could Boeing face a similar challenge in 14 years? The answer, according to Nordlund, is unlikely – but only if you consider Boeing's traditional business model and products, like the single-aisle 737 family.

"I think the way I look at it is to broaden it,"

he says. "Will the single-aisle aircraft be disrupted? I think that's a harder obstacle to overcome. I think the next question is: will transportation be disrupted? Where will that happen? And how will that happen? And where will the value be created as that happens?"

## KEY CHALLENGE

To find answers to such questions and start preparing the corporation to respond, Boeing turned to Nordlund, an eight-year veteran of business development and strategy positions across the company's portfolio of defence, space and commercial units. Although he wears Boeing's suit-and-tie uniform rather than Silicon Valley's T-shirts and jeans, Nordlund is familiar with start-up culture. After working for Embry-Riddle Aeronautical University and IBM in the 1990s, Nordlund joined unmanned air systems start-up Insitu in 2002. The small company in Bingen, Washington pioneered the development of small tactical UAS for the military, and was bought by Boeing in 2008.

"I know this from my Insitu days: it's really hard in our business to scale after you get past the initial [stage of] proving the technology," Nordlund says. "That's where us [Boeing] partnering with some of these companies that have some unique innovation can help."

Nordlund's Chicago-based HorizonX has three avenues to engage with start-ups, non-traditional partners and ideas from internal and external sources. The most visible unit is HorizonX Ventures, a capital fund. Boeing has not disclosed the size of the fund, but Nordlund describes its investment strategy as typically Series A and Series B rounds from single-digit millions to about \$15 million. The company plans to announce new investments on a roughly monthly basis.

"I haven't been concerned about our >>



PROFILE STEPHEN TRIMBLE DUBAI

## Boeing venture cash injection helps start-up alloy manufacturer prove its metal

Gamma Alloys operated largely under the radar until 1 November this year. That was the day Boeing announced that the developer of a new, high-strength aluminium alloy had become the seventh target of its HorizonX Ventures strategic investment unit.

Boeing's venture capital fund is charged with funding potentially disruptive technology with aerospace applications in the five- to 15-year timeframe. The fund's interests are widespread, covering artificial intelligence, hybrid-electric propulsion, autonomous navigation and virtual reality.

But California start-up Gamma stands out in the HorizonX portfolio as a seemingly non-disruptive investment. The start-up's technology, if successful, promises to make a new alloy, about 10% lighter than titanium-reinforced 7056-T6 – which is one of the strongest aluminium materials currently on the market.

"Our investment is about what they've shown so far getting relatively early traction in the marketplace," says Boeing vice-president Steve Nordlund, who manages HorizonX. "It is also what they potentially can do down the road."



Lockheed Martin

### New materials promise a boost for SB-1

Gamma has developed a powder-based material, which is ideal for producing customised parts. In that sense, it can be manufactured more like parts made with carbonfibre reinforced plastics. But the reinforced aluminium offers better stiffness, strength and resistance to wear than other materials while exposed to a broader range of temperatures, according to the manufacturer.

Although only nine years old, Gamma has made in-roads on at least two military rotorcraft demonstrators: the Sikorsky S-97 and Boeing-

Sikorsky SB-1. The high-strength aluminium alloy – using ceramic-reinforced, metal matrix composite technology – replaces heavier metals used in the transmissions of both high-speed helicopters. It is an ideal entry-level application for such a material: a complex part under extreme loads for a vertical lift aircraft that is highly sensitive to weight.

### STRONGER, LIGHTER

The S-97 is a one-off demonstrator, but the SB-1 is the Boeing-Sikorsky team's proposal for the US Army's future vertical lift programme, which aims to replace the service's rotorcraft fleet after the mid-2020s.

"They're adding ceramic to their mixture to make things lighter and stronger – and lighter and stronger are good in our business," Nordlund says.

"We're also curious where their technologies and their advanced materials go over time, as we get to being able to do additive manufacturing and really print aerospace-grade materials."

For Gamma, Boeing's investment means being able to beef up its research and develop-

» [financial] ability to make investments," Nordlund says. Since April, HorizonX Ventures has met 1,800 start-up companies, averaging about eight a day. So far, Boeing has decided to make seven investments; one of those remains under wraps, for now.

Nordlund's organisation also includes a unit called New Business Horizons, which is focused on identifying and developing new business models. The unit will "bring new capabilities to current markets, and current capabilities to new markets" by developing "non-traditional partnerships", according to Boeing's web site.

### FERTILE GROUND

A third unit, Disruptive Horizons, stages accelerator and incubator programmes to support new ideas from external and internal sources. For example, Boeing partnered with Hyderabad-based incubator T-Hub to host a pitch day for Indian aerospace. Boeing plans to select three start-ups to join T-Hub's incubator. Meanwhile, HorizonX will also solicit proposals from Boeing India employees, with the top three also set up to join T-Hub, Nordlund says.

If the single-aisle aircraft is not quite ripe for disruption, what is? Nordlund suggests one clue comes from his recent trip from London to Moscow. The 1,390nm (2,570km) flight lasted 3h, but the 56km (35 mile) transfer to a final destination downtown took 2h through congested traffic from the airport.

"So the question is in the future how do people want to travel and how does connected transport happen and how does that happen through a multi-modal effort? And what disruption does that create? So our organisation is created to be looking out there so that we can find the early indicators of disruption so we're not caught off guard like some of the automotive industry was," Nordlund says.

In a way, Boeing appears to want to catch the automotive industry off guard again.

Any disruption caused by shortening Nordlund's taxi ride from the airport to city centre to downtown is no threat to Boeing's large

commercial aircraft. If someone invents a viable way to safely and affordably transport people by air over the same distance within a city, that technology will pose yet another disruption to the makers of cars. By launching HorizonX, Boeing announces that it wants to be involved in that disruptive force.

"I do think that within the next 15 years there will be a disruption in transportation," Nordlund says. "It's just unacceptable. We have to overcome the traffic problems that we have. The skies are less dynamic than the ground."

Enabling such a shift in transportation will not be easy. The transition from cars to flying



Zunum Aero, with its 12-seat hybrid-electric concept, was HorizonX's first acquisition

Zunum Aero

ment spending as it prepares to scale up production beyond demonstrator programmes, chief executive Mark Sommer tells FlightGlobal.

"We are now talking about being implemented to existing platforms," Sommer says.

The company also is working with the automotive and energy industries to find applications for its new high-strength alloy. By comparison, the aerospace market has lower production volume, which eases the transition, Sommer says.

"We're probably at least another funding round away" from starting full-scale production, Sommer says.

Gamma uses 10-12% ceramic content to reinforce aluminium and make it stronger, he explains. At the molecular level, ceramic rods essentially pin the aluminium to a matrix, increasing the material's overall strength without adding significant weight.

Boeing's new venture capital fund plans to continue making investments in start-up companies at a pace of roughly one per month, Nordlund says. The company's focus is on software-enabled applications with autonomy, artificial intelligence and virtual reality. Such



Gamma's ceramic-reinforced aluminium helps keep weight down on S-97 demonstrator

technologies have the potential to disrupt traditional modes of transportation over the next five to 15 years.

Meanwhile, finding new materials that can improve Boeing's existing and future aerospace products is another priority. In addition to HorizonX Ventures, Boeing's other experimental units – Phantom Works and Boeing Research and Technology – have announced major projects to develop new advanced materials for aircraft.

materials for aircraft.

Gamma Alloys is "another bet, if you will, for us", Nordlund says. "We've got a number of activities that we're doing internally in our normal R&D across a broad area. Advanced materials is one of those.

"We've made that investment and we'll continue looking at different investments that we think may have potential with advanced materials in aerospace." ■

vehicles implies breakthroughs in autonomous control and navigation, vertical take-off and landing propulsion and electric power generation and storage.

In June, Eremenko unveiled Airbus's roadmap for developing a series of new electric and hybrid-electric demonstrators. A first step should come in 2018, with first flight of the battery-powered CityAirbus autonomous taxi concept; a 100-passenger concept vehicle could follow in two decades. Airbus has detailed plans to make the aircraft and even run a transportation service.

Aside from placing the investment in Zunum, Boeing is not quite ready to reveal any specific plans for developing a series of similar demonstrators. In the 14 November meeting with reporters in Dubai, Nordlund remained guarded as to how Boeing planned to counter the Airbus roadmap, but he acknowledged Boeing would evaluate becoming a transportation service provider.

"I think when we look at long-term opportunity and growth and how the world evolves and what could happen, you've always got to sit back and look at where do you want to play in that value chain. So we'll always keep that on the table," he says.

Although Boeing has not released a product roadmap like Airbus, several of the investments by HorizonX Ventures and other units in the company offer a general direction. In October, HorizonX participated in a corporate

round investment in Near Earth Autonomy, a spin-off of Carnegie Mellon University that has developed a way for UAS to precisely navigate without using GPS.

### AIRBORNE SOLUTIONS

Separately, Boeing's corporate-level technology organisation acquired Aurora Flight Sciences, which specialises in autonomous flight controls and rapid prototyping of new air vehicles.

"You marry [Aurora's technology] up with the work that Near Earth Autonomy has done you're starting to put the package together," he says.

It is not just passenger transportation that could be ripe for change in the future. The same inefficiencies caused by traffic congestion on the ground also interfere with logistics operations. Moreover, ground-based infra-



Concepts like Aurora's eVTOL taxi would marry technologies from across Boeing

structure for providing internet service is expensive and difficult to expand to remote areas. In both cases, converting ground-based technology to an airborne service is becoming a popular pursuit.

"What we see transforming business is that other companies and industries are trying to figure how to leverage things that fly," Nordlund says. "Where would you go to in Boeing for that? Now you come to HorizonX. We're now the front door for this emerging marketplace."

HorizonX is not just to keep Boeing involved in disruptive technology in the commercial business. The US military is also courting Silicon Valley, seeking to exploit the same software-enabled technologies for weapons and intelligence-gathering. Concepts such as the US Air Force's Project Maven are exploring a new theory called algorithmic warfare, in which the integration of data analytics, machine learning and other software-enabled tools could transform the way the military operates on the battlefield.

Such interests are partly why Boeing last June decided to invest in Austin-based Spark-Cognition, an artificial intelligence start-up. "Now we're getting down to final completion of a new agreement with Spark to expand our relationship beyond an investment," Nordlund says. "Because we see the importance of artificial intelligence emerging really in all aspects of our business to include the defence and security piece of it." ■





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## The return of a Bristol rover

Aerospace Bristol, the impressive air museum in Filton, is appealing for funds to bring home a Bristol. The Type 170 Freighter is one of just 11 surviving examples of 214 built by the Bristol Aeroplane Company between 1945 and 1958 – and none of them are in Europe.

In fact, the one the museum is returning could hardly be further away. The aircraft has been sitting at New Zealand's Ardmore airport since a spares company purchased eight of them for scrap from the country's air force in 1978.

Earlier this year, the museum bought the aircraft and began making plans to strip it back to its fuselage and return it to its birthplace by sea.

The Type 170 was used in the Berlin airlift, as well as to transport cars across the English Channel. While the boxy and somewhat ungainly design was perhaps never the easiest on the eye, it is still, insists the museum, a "remarkable aircraft" and a vital piece of the city's aviation heritage.

The New Zealand aircraft reached Singapore on 7 November, and the museum is now looking for donations to ensure it completes its journey to Bristol docks, and can be restored for public viewing. Details are on the Aerospace Bristol website, where its journey home can also be tracked.



We like your hat



"It might be small numbers today, lad, but imagine what transporting cars by air will be like 50 years from now."  
(Staff load a Bristol Type 170 at Liverpool, circa 1960)

## Indi-doh!

It is an easy error to make, but there will be red faces at the *London Evening Standard* after the newspaper illustrated a story about Indigo Partners' commitment for 430 Airbus A320neo-family aircraft at November's Dubai air show with a picture of India's IndiGo.

The big-spending US investment firm may own four airlines – Frontier, JetSmart, Volaris and Wizz Air – but unfortunately none of them are the fast-growing, Gurugram-based low-cost carrier, which – rather confusingly for picture desks everywhere – also operates Airbus narrowbodies.

## Off their radar

Having long since switched beats from the pointier stuff to the civil sphere, senior Budgie scribbler Stephen Trimble worries about the commitment and expertise of today's defence reporters.

Despite being at the Dubai air show in their droves, "no-one catches the unveiling of the new AWACS version of the Lockheed Martin F-22", he complains, posting this precisely-angled image on Twitter. "Shameful."



Not one of ours

## Plate class

What to give the man who has everything (except perhaps a few more A380 orders to his name)? Airbus colleagues must be scratching their heads about a suitable retirement gift for soon-to-depart super salesman John Leahy, who after 33 years of commission-laden service, cannot want for much in the material department.

However, a quick check of a UK vehicle database reveals that there is a 1983 silver Ford Sierra somewhere with the registration plate A320 NEO.

Back in the 1980s, the Dagenham-built saloon was a favoured company chariot of road warrior executives.

While we can't quite see the big-earning New Yorker as a Sierra Man, the special registration might make the perfect parting-out present for the ultimate travelling salesman.

## Lord of the air

It was officially announced on November 27th that the

**100 YEARS AGO**

King has been pleased to approve of the appointment of

Lord Rothermere to be President of the Air Council. Lord Rothermere has built up several large businesses, including some prominent newspapers.

## In and out

The ordinary taxpayers, and particularly the staff and

**75 YEARS AGO**

readers of *Flight*, may be pardoned if they feel thoroughly

bewildered at the frequent changes of Minister of Aircraft Production. The substitution of Sir Stafford Cripps for Col Llewellyn is the most surprising of all.

## The pound barrier

In the past, when speculation about some

**50 YEARS AGO**

new Concorde cost escalation has appeared in the press, official

denials have soon had to be retracted. What, then, is the validity of the latest speculation that the £500 million is now £620 million?

## Still fighting

The latest indications are that Europe might, after all,

**25 YEARS AGO**

get a European Fighter Aircraft (EFA). By announcing

his country's intended withdrawal and thus forcing a cost-cutting programme, Germany's minister of defence may have saved the EFA.

**100-YEAR ARCHIVE**  
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### Altitude error

In your article: "C919 reaching altitude after its measured start" (*Flight International*, 14-20 November), you say the aircraft reached a maximum altitude of 9,840ft during a 3h 45min flight.

Should that be metres?

Ken Haynes

Bollington, Cheshire, UK

*Editor's reply: No, in this instance the C919 reached an altitude of 3,000m or 9,840ft.*

### Boeing must learn its lessons

Is something fundamentally flawed in the US aerospace industry? It seems Boeing should have engaged its brain before its lawyers. The company failed to do so when bidding for the replacement of the US airborne refuelling KC-135 fleet, and it has done so again in relation to the Bombardier CSeries.

Putting it bluntly, Boeing's tender for the tanker fleet was sloppy, and failed to impress the US Air Force, which selected the Airbus A330 MRTT. But Boeing's

### DESIGN Possible hazard with door move

In reference to your article: "Door move opens A321neo capacity" (*Flight International*, 31 October-6 November) – if the revision of the position of the emergency doors on the A321 shows creative thinking, I cannot help wondering if it also lacks precautionary foresight?

The idea, as I understand it, is that all four doors open onto the wing. Under the wing are two engines, and in the wing are fuel tanks.

In the event of a crash, you cannot discount the possibility that fire could render use of at least one pair of doors unusable. That would, to put it mildly, complicate the emergency evacuation of the aircraft.

Richard Chandless

Crêches-sur-Saône, France



A321neo's new cabin layout puts double exits above its wing

quick-draw lawyers scuppered the deal for Airbus, a sad and expensive outcome for the European airframer.

Incredibly, though, the result may be far more damaging for Boeing.

Had the USAF been allowed to proceed with the A330, there is a likelihood that it would have some operational aircraft by now. As it is, Boeing's KC-46A programme is behind schedule and over budget, and the USAF is still waiting.

Now Boeing has leapt in again with the CSeries – but the outcome is not what it had expected. Bombardier's project has fallen into the hands of a much tougher and more powerful competitor.

Perhaps it would have paid to leave well alone?

Name and address supplied

### Violent warning

Referring to your article: "Smolensk probe claims evidence of violent event" (*Flight International*, 31 October-6 November): maybe someone could inform the Polish government that such a "violent event" is often the result when a crew disregards published minima and ignores all terrain warnings. In aviation language this is called a "crash".

Harm Meuleman  
Munich, Germany

### Time to address R&D funding gap

Regarding your article: "The new Leonardo" (*Flight International*, 14-20 November): the company's new chief executive and former banker, Alessandro Profumo, says he believes pan-European co-operation will be crucial in a budget-constrained operation, and the key here will be in research and development programmes.

He also states that "developing a new aircraft as well as unmanned technologies is extremely expensive", and says that such efforts must be undertaken with the support of the European market.

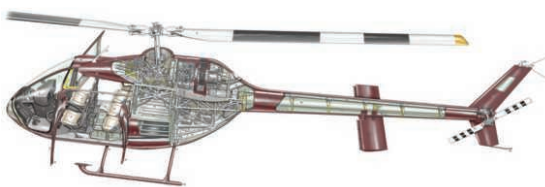
With research institutes and innovation centres dotted all over Europe, some benchmarking is urgently needed.

I know of at least one institute where the highly-qualified staff have literally no work to do.

Some other research institutes – many of them rashly set up in the past few years – receive millions in funding, courtesy of the taxpayer, but it seems nothing tangible has ever been produced from them, or is ever likely to be, in my opinion. If Europe is serious about getting its act together, research institutes and innovation centres must co-operate globally, work efficiently and only receive work based on merit – not political expediency.

After Brexit, EU budgets will decline, meaning that co-operation with our US and Canadian friends should really be doubled, especially when developing new aircraft programmes, along with space and unmanned technologies.

Peter Bishop  
Hamburg, Germany



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## EVENTS

### 8-12 January 2018

AIAA SciTech Forum  
Kissimmee, Florida, USA  
[scitech.aiaa.org](http://scitech.aiaa.org)

### 5-7 February Loyalty 2018

Bangkok, Thailand  
[flightglobalevents.com/loyalty2018](http://flightglobalevents.com/loyalty2018)

### 6-11 February

Singapore Airshow  
Changi, Singapore  
[singaporeairshow.com](http://singaporeairshow.com)

### 13-15 February

Routes Americas  
Quito, Ecuador  
[routesonline.com](http://routesonline.com)

### 26 February-1 March

HAI Heli-Expo  
Las Vegas, Nevada, USA  
[heliexpo.rotor.org](http://heliexpo.rotor.org)

### 3-10 March

IEEE Aerospace Conference  
Big Sky, Montana, USA  
[aeroconf.org](http://aeroconf.org)

### 13-15 March

IATA World Cargo Symposium  
Dallas, Texas, USA  
[iata.org](http://iata.org)

### 18-20 March

Routes Asia  
Brisbane, Australia  
[routesonline.com](http://routesonline.com)

### 10-12 April

Aircraft Interiors Expo  
Hamburg, Germany  
[aircraftinteriorsexpo.com](http://aircraftinteriorsexpo.com)

### 18-21 April

Aero Friedrichshafen  
Friedrichshafen, Germany  
[aero-expo.com](http://aero-expo.com)

### 25-29 April

ILA Berlin Air Show  
Berlin, Germany  
[ila-berlin.com](http://ila-berlin.com)

### 8-10 May

AIAA Defence Forum  
Laurel, Maryland, USA  
[defense.aiaa.org](http://defense.aiaa.org)

### 29-31 May

EBACE  
Geneva, Switzerland  
[ebace.aero](http://ebace.aero)

### 13-15 July

Royal International Air Tattoo  
RAF Fairford, Gloucestershire, UK  
[airtattoo.com](http://airtattoo.com)

### 16-22 July

Farnborough International  
Airshow  
Farnborough UK  
[farnboroughinternational.co.uk](http://farnboroughinternational.co.uk)

### 25-27 September

Aircraft Interiors Expo  
Boston, USA  
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### • Airworthiness

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The Government of the Hong Kong Special Administrative Region (HKSAR) is inviting applications for the post of Chief Inspector of Accidents (CI).

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- (a) Overseeing the investigation of all civil aviation accidents, serious incidents and/or incidents which occur in Hong Kong or those which occur outside Hong Kong but involve aircraft under its registry in accordance with the requirements of the International Civil Aviation Organisation (ICAO) stipulated in Annex 13 to the Convention on International Civil Aviation, and the Hong Kong Civil Aviation (Investigation of Accidents) Regulations (Cap 448B);
- (b) Overseeing the preparation of investigation reports to the Chief Executive, stating the circumstances and causes of accidents/serious incidents/incidents and making safety recommendations to prevent recurrence of accidents;
- (c) Leading and managing the AAIA, including staff deployment, staff training, procurement and maintenance of investigation equipment, facility maintenance and record management, etc., as well as formulating strategies and measures to enhance accident investigation and safety management procedures;
- (d) Collecting, protecting and analyzing relevant aviation safety information and data with a view to identifying potential safety hazards;
- (e) Disseminating aviation safety information to the aviation industry and co-ordinating the relevant education work through, amongst others, organisation of seminars;
- (f) Providing support and professional advice to overseas air accident investigation authorities when necessary (e.g. when aircraft registered in Hong Kong are involved in accidents or serious incidents occurred overseas);
- (g) On behalf of the HKSAR Government, participating in international organisations or activities in relation to air accident investigation and aviation safety and maintaining close liaison with international organisations on relevant issues; and
- (h) Any other tasks as assigned by the STH.

**Remuneration:** The successful candidate will be appointed on non - civil service agreement terms up to 31 March 2020. The CI will receive a salary of **HK\$164,500 per month (for 12 months a year.)** In addition, he/she will be entitled to housing benefits, vacation leave with leave passage allowance, and other benefits commensurate with a position of such seniority subject to the meeting of the eligibility criteria as stipulated in the regulations relating to the provision of such benefits.

**To Apply:** All applications must be made in English. A letter of application setting out why the applicant considers himself/herself suitable for the post, together with a full curriculum vitae containing an account of not more than 2000 words of air accident investigations he/she has led or participated, should be addressed to Korn Ferry International (HK) Ltd, 15/F, St. George's Building, 2 Ice House Street, Central, Hong Kong marked **Chief Inspector of Accidents** (or by email to AAIA@KornFerry.com) on or before the closing date for application (according to postmark).

**The closing date for application is 22 December 2017 (Hong Kong Time)**

The HKSAR Government reserves the right not to appoint any person for the post under this advertisement.

Please refer to the **full version** of this advertisement containing details of the entry requirements and relevant information on our website (<http://www.flightglobal.com>) and THB's website (<http://www.thb.gov.hk/eng/job/index.htm>).

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- Possession of a Certificate in Aeronautical Meteorological Observing issued by the UK Met Office is desirable

Consideration may be given to those applicants who do not hold a UK Civil Aviation Authority Licence.

Application details can be obtained from the Human Resources Department by contacting [liz.hughes@cityofderryairport.com](mailto:liz.hughes@cityofderryairport.com) or visiting [www.cityofderryairport.com](http://www.cityofderryairport.com)

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## WORK EXPERIENCE DAVID HARRINGTON

# Staying on the flight side of the law

After a distinguished 10-year career as a US Navy fighter pilot, David Harrington became an aviation lawyer primarily defending airlines as well as aircraft or component manufacturers following air disasters

## What sparked your interest in aviation?

My father was a naval aviator and an airline pilot. Ever since I was very young, he would take me flying with him on the weekends, and I just fell in love with it. Our family would vacation every year in Pensacola, Florida – the cradle of naval aviation – and we would always visit the Blue Angels. I was fortunate enough to meet a few of the Blue Angels pilots over the years and, after speaking with them and watching them fly, I knew that I wanted to fly fighter jets in the US Navy and have a career in aviation.

## Tell us about your career to date?

After graduating as a Naval Reserve Officer Training Candidate student from Marquette University with a mechanical engineering degree, I was commissioned as an ensign in the US Navy and began flight school. After primary and advanced jet training, I was selected to fly the Grumman F-14B Tomcat, and was assigned to fighter squadron VF-103 off of the USS *Saratoga* (CV-60), where I logged combat time in support of NATO's intervention in Bosnia and Herzegovina. In total, I logged more than 300 arrested landings, with over 100 of those being night carrier landings. After my tour, I was assigned to the Office of Naval Intelligence outside Washington DC, performing operational intelligence work and developing and delivering threat capability briefs to navy and US Marine Corps units, as well as to senior naval leadership. While



Harrington says he is constantly learning new things about aviation

stationed in Washington DC, I attended law school at night at the Catholic University of America. After graduating, I became an aviation attorney. I am now a partner at Condon & Forsyth, the oldest and largest specialist aviation law firm in the USA.

## What have been the highlights?

From my time in the navy, it would definitely be night carrier landings. Night traps are both exhilarating and terrifying at the same time. Also, I was very involved with development and testing of the use of laser-guided munitions with the F-14. From my legal career, being appointed lead trial counsel for Colgan Air after the 12 February 2009 crash of Continental Connection flight 3407, near Buffalo, New York, that resulted in 50 deaths.

## The lowlights?

The night carrier landings!

## Why did you decide to become a lawyer?

After my military career, I knew I wanted to stay in the aviation industry, but not necessarily as a pilot. I thought becoming a lawyer would provide me with the skills necessary to work in the business world, the legal profession and possibly even enter politics at some point. Being someone that doesn't shy away from a fight, whether a dogfight or a courtroom battle, I decided to pursue aviation litigation.

## What does your job involve?

I primarily defend domestic and international airlines and aircraft/component manufacturers in mass disasters, all the way from handling post-accident investigations to conducting civil jury trials on liability and damages issues. I also represent aviation or aerospace-related companies in

commercial litigation and administrative or regulatory matters, and pilots in Federal Aviation Administration enforcement actions.

## What do you enjoy most about your role?

I enjoy using my mechanical engineering degree, flying background and law degree to provide the best possible legal advice and counsel to my clients. I also enjoy being able to interact with engineers, pilots, flight department managers, operations specialists and aviation executives. But what I enjoy most is that every case is different, and I am constantly learning new things about aviation.

## What are the challenges?

Dealing with opposing counsel, and sometimes clients, who have unrealistic expectations about the value or strength of their case, or believe "scorched earth" litigation is the only way to litigate. And of course working with the families of victims who have suffered such a devastating loss can be very challenging.

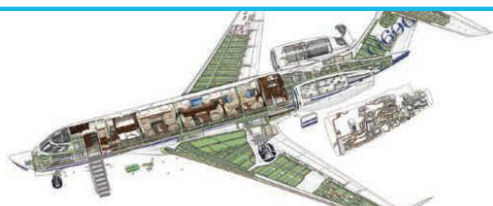
## What's your next career move?

I have always wanted to write a book on my experiences in the aviation industry, both as a pilot and as a trial attorney. ■



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