

# Flight

# International

7-13 February 2017

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## PROGRAMME

# Upping its game

How Superjet's new boss plans to take on the world



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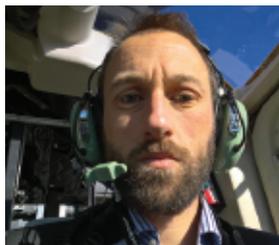


## Flight International



### COVER IMAGE

Artyom Anikeev took this shot of a Yamal Airlines Sukhoi Superjet 100 regional jet at Moscow Ramenskoye airport last November. The carrier has three of the type **P17**



### BEHIND THE HEADLINES

Dominic Perry (above) was aloft with Bell Helicopter, visiting its Amarillo and Fort Worth sites in Texas (P9). And Oliver Clark got a strategic update from Etihad chief James Hogan in Abu Dhabi (P8)



### NEXT WEEK SPACE

We assess the strength of Europe's commitment to spaceflight. Plus, how to overcome a fear of flying

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Restrictions lifted as HondaJet gets US approval **P22**. Etihad, Lufthansa sign co-operation agreement **P8**

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## Image of the week

Global SuperTanker's heavily modified Boeing 747-400 aerial firefighter is captured while tackling a wildfire near Dichato, Chile, on 1 February. Capable of carrying almost 74,200 litres (19,600USgal) of water or retardant, the unique aircraft is usually based in Colorado Springs

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## The week in numbers



American Airlines

Operating profit fell to \$5.28 billion at American Airlines in 2016, due to impact of lower revenues and higher expenses



Flight Dashboard

Record volume of passengers (in millions) using Singapore's Changi airport in 2016: a year-on-year increase of 5.9%



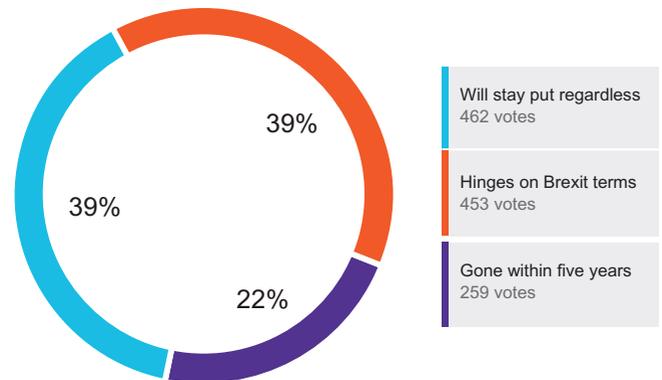
Flight Dashboard

Number of Boeing 787-9s to be leased by Polish flag-carrier LOT, under a new commitment with Aviation Capital Group

## Question of the week

Last week, we asked: **Airbus in the UK?** You said:

**Total votes: 1,174**



This week, we ask: **737 Max launch user wrangling?**

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# Dropping like flies

Worth \$16 billion, the US Air Force's T-38 trainer replacement contest was supposed to draw a major formation of rivals. Instead, its stringent requirements have resulted in a straight duel

**B**ack in October 1986, the US Air Force was faced with a difficult decision. It had received seven responses to a request for proposals to build two prototypes for the advanced tactical fighter competition that ultimately yielded the Lockheed Martin F-22. In the wake of later industry consolidation, the USAF, it seemed, would never again enjoy such a wealth of bids.

Supposedly, the competition for the \$16 billion T-X advanced pilot training system would be different. Lucrative enough to catch any defence contractor's eye, yet basic enough to attract a diverse field of off-the-shelf and clean-sheet proposals, this seemed destined for a rare, multi-bid showdown. That is what happened from programme launch in 2012 until the last week of January, when the field suddenly dwindled to two.

Lockheed Martin and Korea Aerospace Industries still intend to offer a slightly modified T-50A. Boeing and Saab will bid their clean-sheet T-X design. But gone suddenly is a Northrop Grumman/BAE Systems team with the clean-sheet Model 400 and Raytheon

## The USAF's strategy to "bend the cost curve" can only work if industry actually plays along

and Leonardo with the T-100 – a modified Aermacchi M-346. Other potential players, including a suggested Sierra Nevada team with Turkish Aerospace Industries and Textron AirLand's Scorpion, remain publicly mute with the bidding deadline only weeks away.

It is clear that the USAF drove a hard bargain with contractors on this deal: enough to provoke half of the expected field to walk away from the biggest military



Just park it up with the others...

trainer contract in more than 50 years. Indeed, the T-50 and M-346 were designed 20 years ago with an eye on replacing the USAF's vast fleet of Northrop T-38 jets to train fighter and bomber pilots.

When the USAF launched the bidding phase of the T-X competition in March 2015, service officials tied the contract to the "Bending the Cost Curve" initiative. The goal was to craft a set of requirements that met its performance needs, while accepting as little risk as possible for the taxpayer. A similar strategy played out in the KC-X tanker competition, and has cost Boeing's winning bid more than \$2.1 billion in pre-tax charges since contract award.

That strategy only works if industry plays along. Despite investing millions in prototypes and industrial preparation, Northrop and Raytheon determined T-X was not worth the effort. It is now up to Boeing and Lockheed to answer the USAF's call. In a fight between an off-the-shelf T-50A and a clean-sheet alternative, the former should have the advantage on risk and cost. ■

See Defence P21

## Me first!

**I**n a world where profit is king, it feels odd to see two airlines squabbling over a title that appears to carry no commercial advantage.

The carriers are Norwegian and Southwest Airlines of the USA – both of which are vying to be recognised as launch customer for the Boeing 737 Max.

Southwest placed the first order for the re-engined twinjet, but Norwegian may receive the initial aircraft. In addition, the European carrier – which is riding the crest of a growth wave – is likely to be the first to launch revenue services with the type.

However, argues Southwest, it should be considered as the launch customer regardless, thanks to its deep involvement in shaping the programme.

But does the cigarette-paper-thin distinction between launch customer and launch operator matter?

From a bottom-line perspective, almost certainly not. All Southwest should care about is the fuel saving from replacing its fleet of ancient 737 Classics. And for Norwegian, the launch of new transatlantic services is the goal.

In 20 years, it is unlikely that anyone will care about the current wrangling, but it seems important now, somehow. Maybe it is just a human desire to hark back to the pioneering days of early aviation, or simply that in a market where differentiation is vital, bragging rights are a good way of setting your business apart. ■

See Air Transport P13



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For more in-depth coverage of the global rotorcraft sector, go online to: [flightglobal.com/helicopters](http://flightglobal.com/helicopters)

# BRIEFING

## SAFRAN PICKS NEW CHIEF FOR CFM

**MANAGEMENT** Engine manufacturer CFM International has appointed G ael M eheust to replace Jean-Paul Ebanga as its president and chief executive. The appointment was disclosed by Safran, a partner alongside GE Aviation in the 50:50 joint venture. Ebanga, who has led CFM since February 2011, is moving to another position within Safran.

## 'DIFFICULT YEAR' FOR AIRBUS HELICOPTERS

**ROTORCRAFT** Airbus Helicopters saw net and gross orders climb slightly last year, despite describing it as "probably the most difficult year of the last decade" for the rotorcraft industry. Deliveries were up by 5% to 418, from 395 in 2015. Against a "challenging market backdrop", the Marignane, France-based manufacturer recorded 388 gross orders, up from 383 the year before. Its rate of cancellations also appears to have eased, with net orders at 353, against 333 during 2015.

## RUSSIAN FIGURES REVEAL ROSSIYA GROWTH

**AIRLINES** Rossiya's fleet expansion has been reflected in a doubling of passenger traffic over the course of 2016, official Russian air transport system figures show. The carrier took over assets from collapsed Transaero, and this expansion resulted in a 70% increase in Rossiya passenger numbers, to 8.1 million. Rosaviatsia's figures show a decline in passenger numbers by several carriers, including Ikar, Nordwind and Red Wings.

## TEL AVIV EASES UAV EXPORT RESTRICTIONS

**TRADE** Israel's defence ministry has eased previously severe restrictions on local companies seeking to export unmanned air systems. It has also become easier for its businesses to deliver on technology transfer requirements, an industry source says. The new guidelines are accompanied by strict "end user" agreements for customers, and penalties if terms are breached.

## ATSG DISCLOSES \$7 MILLION STRIKE IMPACT

**FREIGHT** US cargo company Air Transport Services Group (ATSG) estimates a pilot strike last year cost it \$7 million in lost earnings. ATSG has issued revised guidance for its 2016 financial performance, trimming adjusted earnings from \$218 million to \$211 million. The company, which operates aircraft on behalf of Amazon and DHL, attributes this to "a brief work stoppage in mid-November 2016 by pilots of its subsidiary ABX Air".

## HFORCE HITS FIRST SALES TARGETS

**WEAPONS** Airbus Helicopters has secured the first buyers for its HForce weapons system, according to chief executive Guillaume Faury. The company has not disclosed the operators or platform types involved, but has previously said the package is suitable for use with its H125M, H145M and H225M.

## DIAMOND POLISHES AVIONICS PACKAGE

**UPGRADE** Diamond Aircraft is replacing the Garmin G1000 integrated flightdeck in its piston-engined family with the next-generation G1000NXi. The first NXi-equipped DA62s, DA42s and DA40s are scheduled for delivery by the end of June, says Wiener Neustadt, Austria-based Diamond – which is also offering a retrofit programme for owners and operators of the more than 800 examples in service worldwide.



Super Puma remains grounded in Norway and UK in wake of crash

**SAFETY** DOMINIC PERRY LONDON

# H225 investigation creeping forwards

Design and certification requirements for type's gearbox are now part of Norwegian probe into last year's accident

Norway's SHT air accident investigation body is focusing its probe into the fatal crash of an Airbus Helicopters H225 on the "robustness" of design requirements covering a crucial component in the main gearbox.

"At the present time, the primary focus of the investigation is certification aspects of the main gearbox and the robustness of past and present design requirements," it says in an investigation update issued on 2 February.

"This includes the follow-up on safety recommendations issued by the [UK Air Accidents Investigation Branch] in connection with the accident involving G-REDL and continuing airworthiness of the gearbox," it says.

G-REDL refers to a 2009 incident in which an AS332 L2 was destroyed off the coast of Scotland. SHT says while it has yet to identify a root cause of the 29 April 2016 crash it has "strong similarities" with the earlier accident.

SHT's investigation has indicated that the crash was a result of a fatigue fracture of a second-stage planet gear in the H225's epicyclic module, which caused the main rotor to separate from the helicopter. The underlying

cause has still to be identified.

"It appears that the fracture propagated in a manner which was unlikely to be detected by the mandatory or supplementary systems intended for warning of an imminent failure," it says.

SHT says the complexity of the investigation means it cannot provide a timeframe for the completion of its report. However, a further interim update will be issued on 29 April.

A total of 13 passengers and crew were killed when the H225 (LN-OJF) crashed on the island of T ur oy on Norway's west coast.

The H225 and AS332 L2 remain grounded in Norway and the UK, with as few as 10% of Super Pumas in oil and gas transport roles currently in service.

Chief executive Guillaume Faury notes that it has been released to fly by the European Aviation Safety Agency and US Federal Aviation Administration "with a stringent set of protective measures", but acknowledges the "specific" situation in the North Sea.

Airbus Helicopters is "working with the stakeholders to restore confidence in the product and ensure a smooth and full return to service" in the region, he says. ■



Lufthansa and Etihad secure synergies  
This Week P8

PROCUREMENT LEIGH GIANGRECO WASHINGTON DC

# Air Force One, F-35C face cost reviews

High-profile procurements will receive increased scrutiny after incoming defence secretary orders focus on savings

New US Defense Secretary James Mattis has ordered his deputy to launch an immediate review of the Air Force One recapitalisation and Lockheed Martin F-35 programmes, following President Donald Trump's earlier pledges to lower costs on both.

Under the presidential aircraft recapitalisation review, the White House Military Office and deputy secretary of defence will identify specific areas where savings could be made. Mattis lists these as potentially including autonomous operations, power generation, cooling, survivability and communications capabilities.

Although Trump has previously criticised the entire F-35 programme, the review will cover only the US Navy's C-model variant, which accounts for the smallest share of Lockheed's programme of record for the type.

"In parallel, the deputy secretary of defence will oversee a review that compares F-35C and [Boeing] F/A-18E/F operational capabilities and assess the extent that F/A-18E/F improvements can be made in order to provide a competitive, cost-effective fighter aircraft alternative," Mattis says.

Andrew Hunter, an analyst at the US Center for Strategic and International Studies, says any decision by the USN to reduce or abandon its purchase of the carrier-variant F-35C would trigger a significant cost increase for the US Air Force, US Marine Corps and international partners involved in the programme. "If the navy [order] fell off the table, that would have a very profound impact on unit costs."

Speaking in Washington DC on 1 February, the USMC's deputy commandant for aviation expressed his confidence in the F-35. "We'll probably end up validating the imperative to have a fifth-generation aircraft out there," Lt Gen Jon Davis said. "We'll let Boeing and Lockheed make their case to what they think they can do. I'm highly confident we're on the right track."

The short take-off and vertical landing F-35B will form the bulk of the USMC's purchase of the Lockheed type, with 353 aircraft to be acquired.

The service also plans to buy 67 F-35Cs, including 10 already purchased and six which are supporting training. ■



USMC says it is confident in the carrier variant

Lockheed Martin

## NEGOTIATIONS

### Trump claims \$600m price cut for fighters

US President Donald Trump says a Lot 10 low-rate initial production contract for 90 Lockheed Martin F-35s will be \$600 million cheaper overall due to heavy pressure from the White House, but that Boeing will continue to be asked to compete for orders.

Made on 30 January, Trump's remarks indicate a resolution after a six-week effort to overcome a negotiating stalemate between Lockheed and the F-35 Joint Programme Office.

"They were having a lot of difficulty," Trump says. "There was no movement. I was able to get

\$600 million off those planes." His figure suggests a roughly \$6.7 million unit-cost reduction for each of the F-35s in the Lot 10 contract. He has not revealed a likely total value for the deal.

"I appreciate Lockheed Martin for being responsive," Trump says. While critical of the F-35's capabilities during his election campaign, he now says the stealth fighter is a "great plane" and "now in good shape".

He adds that Boeing's F/A-18E/F Super Hornet "will be competing during the process for the rest of the planes." ■

RECRUITMENT STEPHEN TRIMBLE WASHINGTON DC

# Output challenge for new P&W commercial head

P Pratt & Whitney has appointed Christopher Calio as president of the company's \$14.9 billion commercial engines business, making him the fourth executive to fill the division's top leadership post in as many years.

Calio replaces Greg Gernhardt after a remarkable two-year tenure that saw the introduction of P&W's breakthrough commercial product, with the PW1100G debuting on the Airbus A320neo in January 2016 and the PW1500G entering service with the Bombardier CS100 six months later.

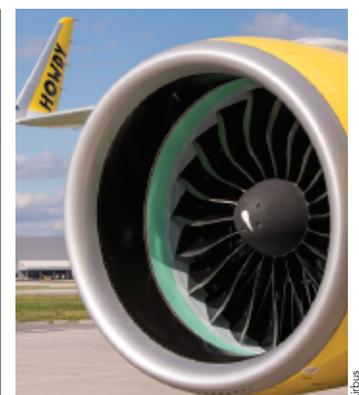
Although the geared turbofan engine family has earned rave reviews for meeting fuel-efficiency targets, the powerplants have also faced challenges.

Some customers have complained about a series of technical glitches that initially hindered engine deliveries, then component shortages delayed a planned production ramp-up. Most recently, two pending durability problems have caused some engines to be taken out of service temporarily.

Executives at parent company

United Technologies said last week the problems were nearly behind the company, allowing P&W's commercial engines leadership to focus on ramping up to 350-400 deliveries over the coming year.

"This is an exciting time in our company's history as we continue to ramp-up engine production and transform aviation with our geared turbofan engine," says P&W president Bob Leduc. "Chris brings significant depth of commercial aerospace experience to this role." ■



Delivery target for the geared turbofans is 350-400 this year

Airbus



AGREEMENT MICHAEL GUBISCH LONDON

# Lufthansa and Etihad secure synergies

Carriers to co-operate over catering and maintenance, with partnership in freight and passenger services also on table

**E**tihad Airways and Lufthansa have signed agreements to co-operate in the areas of catering and maintenance, as a first step in what the two airlines describe as a growing partnership.

The Gulf carrier has contracted Lufthansa unit LSG Sky Chefs to provide catering at 16 airports across Asia, Europe and the Americas. The four-year deal is worth around \$100 million, the two airlines said at a joint press briefing in Abu Dhabi.

Etihad has also signed a tentative agreement with MRO provider Lufthansa Technik (LHT) to “explore” opportunities for co-operation covering the Abu Dhabi carrier’s fleet, plus aircraft operated by its equity partner carriers. The memorandum also covers “opportunities for synergies” between LHT and Etihad Airways Engineering.

Lufthansa Group chief executive Carsten Spohr says that several potential MRO contracts are under discussion, with a total volume in the three-digit-million euros range.

Etihad is already a customer of LHT. But outgoing Etihad Aviation Group chief executive James Hogan argues that the two airlines could realise “huge synergies” in the fields of procurement and technology development.



Codeshare arrangement is to expand, giving German airline “increased access” to Indian subcontinent

Further co-operation is being considered in other fields, including air freight and passenger services. “This partnership is the platform for a much wider strategic collaboration between our two organisations,” says Hogan. He adds that the tie-up is the “most significant non-equity partnership with an airline we have ever announced”.

Spohr says establishment of a joint venture is a potential option.

A codeshare partnership disclosed in late 2016 – which covers, initially, Etihad’s flights to Frankfurt and Munich – became

effective on 1 February. Etihad will relocate its operations at the two Lufthansa hubs to the German carrier’s terminals, and place its codes on Lufthansa flights from Frankfurt to Rio de Janeiro and Bogota as soon as government approval has been obtained.

Hogan indicates that the codeshare co-operation is set to be expanded. He says the existing network agreement represents a “first phase” through which Lufthansa will gain “increased access” to the Indian subcontinent, while Etihad benefits from the German carrier’s European network.

Spohr reveals that the first Airbus A320-family jets of Etihad partner Air Berlin will be transferred on 10 February to Lufthansa budget unit Eurowings under a wet-lease deal the two groups arranged last year.

## RESTRUCTURING

That agreement is part of an Air Berlin restructuring programme under which the carrier’s fleet will be halved to around 75 aircraft and its network reduced to scheduled operations from Düsseldorf and the German capital, Berlin.

Spohr feels that Gulf carriers may need to trim capacity in the coming year as traffic growth projections might not “fully live up” to expectations. He says airlines in the region would need to discuss “limiting growth” and predicted that this issue would “play a bigger role in the next 12 months than in the last 10 years”.

Gulf carriers will need to seek “smart partnerships like Etihad has now done with us”, Spohr says, adding that “optimisation of capacity, rationalisation of capacity” will need to play “a bigger role” in Middle Eastern carriers’ strategies. ■

**Additional reporting by Oliver Clark in Abu Dhabi**

STRATEGY OLIVER CLARK ABU DHABI

## Etihad board supports equity partnerships, says outgoing CEO

Etihad Airways continues to enjoy the “full support” of its board as regards its equity partnership strategy, outgoing president and group chief executive James Hogan has affirmed.

Speaking in Abu Dhabi on 1 February, Hogan said that chairman Mohamed Mubarak Fadhel Al Mazrouei had initiated a review of the state-owned carrier’s equity partnership model, but added that it remained a “critical element” of group strategy.

“The overall mandate remains the same; to run a safe, best-in-class airline that operates on a sustainable, commercial basis,” says Hogan. “Our partnership strategy, which delivers 5.5 million passengers a year onto our network, is a critical element of that strategy.”

Etihad’s equity partners include Air Berlin, Air Serbia, Air Seychelles, Alitalia, Jet Airways and Virgin Australia.

Hogan, who steps down from his post this year, says that from a

“top line” perspective the equity partners have “achieved their revenue objectives”. He adds: “From a scale perspective, they have achieved their objectives.”

Despite 2016 having been a “tough” year for Etihad, the airline’s financial results for the year will be “positive”, says Hogan.

But he acknowledges that in 2017 the airline will need to “navigate the challenges of competition, capacity – that means we have to tackle our cost base”. ■



Gatwick imposes extra charge to cut A320 noise  
Air Transport P10

**ROTORCRAFT** DOMINIC PERRY FORT WORTH

# Bell confident 525 test campaign will resume in months

But airframer admits that certification has slipped on the back of fatal July 2016 crash of first Relentless prototype

Certification of the developmental 525 Relentless has been delayed following a self-imposed grounding in the wake of the 2016 fatal crash of a flight-test aircraft, Bell Helicopter has confirmed. But the manufacturer says it is confident that its two remaining prototypes of the super-medium-class helicopter will be back in the air “in the next several months”.

Two experimental test pilots died in the 6 July 2016 accident in Texas during high-speed trials involving aircraft FTV-1 (N525TA).

Since then, its two sister aircraft have been grounded pending the outcome of a US National Transportation Safety Board (NTSB) investigation, with Bell not even performing ground runs of the GE Aviation CT7-powered helicopters in the interim.



Bell Helicopter

Undisclosed modifications have been made to remaining helicopters

Larry Thimmesch, vice-president of 525 sales and business development, admits that Bell’s initial five-year certification window with the US Federal Aviation Administration expired in late 2016. This has now been extended for another two years, he says, taking it to “end-2018”.

Despite the grounding, Bell has already modified the rotorcraft pair to enable a swift re-

sumption of flight testing once the crash report is published. However, Thimmesch declines to detail the changes, citing a need to wait for the NTSB’s findings.

“The NTSB and Bell Helicopter have focused the investigation on a sequence of events for which corrective actions are being implemented,” he says. “We are coordinating with the NTSB and [FAA] to resume flight testing in the next several months.”

In addition, Bell has begun upgrade work on the two flight-test articles to bring them to a production-standard configuration, as well as performing other ground-based test activities.

Another two 525s are in final assembly – aircraft four and five – which will enter flight testing this summer and autumn, respectively, Thimmesch says.

As a result of the depleted prototype fleet, Bell has had to reallocate certification test points to the remaining helicopters, he adds. The three flight-test articles had accumulated about 200h before the crash. ■

**PRODUCTION**

## Retirement looms as 206 family gets set for a Jet Ranger X-it

Time has been called on the final variant of Bell Helicopter’s long-running 206 series still in production, with assembly of the L4 Long Ranger to end in the first half of 2017.

The airframer feels that with the type’s successor, the 505 Jet Ranger X, now in serial production, the moment is right to ease out the 206 line.

It entered service in 1967 as the original Jet Ranger which Bell

used to pioneer the light-single segment. However, that model was axed in 2010, with production since then confined to the stretched Long Ranger, and only the L4 iteration since 2010.

The 206’s popularity has waned in recent years and “only a handful” of airframes are left to be built, all destined for US emergency medical services operators. Deliveries will be complete early in the second quarter, says Bell.

Meanwhile, arrival of the initial 505 is imminent, following Transport Canada certification in December 2016. Bell’s own training centre in Fort Worth will take the first two production aircraft.

One of the pair is due to be ferried from the manufacturer’s Mirabel, Canada production facility in early February. However, the first delivery to an external customer is not scheduled until later in the quarter. ■



ATR

Sortie was conducted with fuel 45% produced from used cooking oil

**ENVIRONMENT** MICHAEL GUBISCH LONDON

# BRA offers support for initial ATR biofuel flight

Braathens Regional Airlines (BRA) has conducted a domestic flight with an ATR 72-600 partly powered by biofuel.

ATR says the Stockholm-Umea flight by the Swedish carrier on 1 February was the turboprop family’s first operation using biofuel, 45% of which had been produced from used cooking oil.

ATR asserts that “less than 2%” of Sweden’s annual forest growth would generate enough biofuel to make domestic air traffic in the country “completely fossil-free”.

The one-year-old airline operates a fleet of Saab 2000 turboprops, which are being replaced with ATR 72-600s. ■



POLICY TOM ZAITSEV MOSCOW

# Incentives scheme aims to lift Russian airliner production

Carriers could gain access to more profitable routes under plan to promote indigenous industry over Western imports

Russia's government has suggested granting carriers access to more rewarding routes as an incentive to acquire new domestically built airliners.

During a meeting with president Vladimir Putin on 23 January, deputy prime minister Dmitry Rogozin outlined a tentative plan under which domestic airlines could receive preferential treatment if they bought Russian-built alternatives to Western aircraft.

"In this case, we would give them certain benefits, including profitable route rights, and offer more attractive leasing terms," Rogozin says. He adds that these benefits will be especially important for carriers providing long-haul services.

The plan is intended to promote, in particular, the Irkut

MC-21 twinjet and modernised Ilyushin Il-96-400 widebody.

After viewing MC-21 strength trials at the Moscow Central Aerohydrodynamic Institute, Rogozin says the type's first flight-test aircraft is being prepared for a maiden sortie from the manufacturer's airfield in early spring.

"By then, we'll also draft a scheme to correlate production of the MC-21, Il-96-400 and Il-114 regional turboprop so that their entry into service is synchronised with phasing out ageing and Western-built models," he says.

Rogozin's update report has been approved by Putin. "As for assigning route rights [as an incentive to acquire domestic aircraft], this is a right thing to do," he notes. "It would be a good bonus."



The modernised Il-96-400 could benefit from the "bonus" proposal

The industry and trade ministry confirms that such a regulation is among proposed initiatives aimed at bolstering civil aircraft production.

"We support measures to develop competitive aircraft models in all segments and create favourable conditions for their users in the domestic market," it says. ■

## PRODUCTION

### UAC transfers plant for modernised Il-114

United Aircraft (UAC) has reassigned final assembly of the modernised Ilyushin Il-114-300 regional turboprop to another facility within RAC MiG's complex in preference to a previously-endorsed location.

The 64-seat commuter aircraft will be built in the town of Likhovitsy near Moscow, rather than at the Sokol aviation plant in Nizhny Novgorod, UAC president Yuri Slyusar says.

Original plans, proposed by Ilyushin and confirmed by Slyusar last August, involved establishing an assembly line on the Sokol premises in 2017 and restarting production of the mothballed Il-114 in 2018.

UAC and lessor GTLK have also recently consulted with potential operators of the Il-114 in order to shape the aircraft's requirements. First delivery is scheduled for 2021. ■

ENVIRONMENT DAVID KAMINSKI-MORROW LONDON

# Gatwick imposes extra charge to cut A320 noise

London Gatwick airport's management is to impose higher charges on Airbus A320 operators which have not modified the type to reduce noise on approach.

The increase will come in to force from 1 January 2018, the airport company states, following publication of an independent arrivals review – a scheme established in August 2015 to address airspace and noise issues.

It states that A320s account for more than half of Gatwick flights and have a design characteristic which results in a "high-pitched whine" during approach.

Airbus has developed a modification to eliminate the effect, and Gatwick's operator is prior-



EasyJet has already modified two-thirds of its planned 257 aircraft

itising implementing of this modification, stating that it "significantly" reduces disturbance.

The airframer says the A320

can emit a noise from the wing's fuel over-pressure protector cavities on approach, typically at 6.5-27nm (12-50km) from land-

ing. It says airflow deflectors fitted forward of these cavities can cut the noise by up to 11dB.

Gatwick's review says the proposed penalty charge for carriers has been set at a level which will "provide a strong financial incentive" to carry out the modification on A320s.

"Several airlines have confirmed that they are accelerating their modification programmes as a result of this new charging structure," it adds.

The five largest A320 operators account for 95% of the type's movements at Gatwick, it says, and four of these carriers have confirmed modification of their fleets by December 2017. ■



Qatar's A320neo has IndiGone Air Transport P13

PROGRAMME STEPHEN TRIMBLE WASHINGTON DC

# Boeing unfazed by 777X order freeze

Airframer insists that it is not coming under pressure to offer discounts to win new sales for next-generation of widebody

With less than three years before the 777-9 enters service, Boeing executives say they are feeling no pressure to heavily discount the new type to encourage orders.

"We're seeing airplane pricing holding up pretty well. It's competitive, but not unusual," Dennis Muilenburg, Boeing's chief executive, told analysts on a fourth quarter earnings call on 25 January.

The 777X backlog became a discussion topic because of concerns that Boeing's orderbook relies heavily on Middle Eastern carriers with declining balance sheets. Emirates, Etihad Airways and Qatar Airways account for 235 of Boeing's 306 firm orders for the 777X family, or 76.7%.

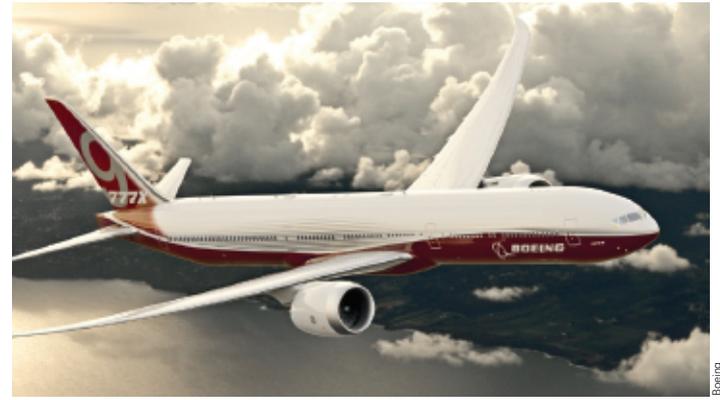
**"We're seeing airplane pricing holding up pretty well. It's competitive, but not unusual"**

**Dennis Muilenburg**  
Chief executive, Boeing

Iran Air also has committed to buy 15 777-9s, although that deal has yet to be finalised.

Boeing's sales efforts on the 777X also seem to have gone cold over the past two-and-a-half years: since July 2014 it has added only one firm order to the backlog – for 10 aircraft from an unidentified customer.

But Muilenburg insists there is



Deliveries are likely to sag during the transition to the new variant

nothing yet to worry about, saying the 777X backlog is in "very good shape".

Instead, Boeing's sales efforts are focused on filling the bridge from the existing 777 models, in-

cluding the 777-300ER and 777 Freighter, to the 777X, which introduces a new composite wing and GE Aviation GE9X turbofan engines.

Boeing had originally hoped to keep 777 deliveries on a steady pace through the transition to the 777X, but a soft widebody market scuppered those plans. Monthly production has fallen over the past year, from 8.3 to seven. It will continue declining to five by August, then fall to an effective rate of about 3.5 per month as the 777X enters the production system in 2019.

The 777 backlog is 90% sold out in 2018 and 2019 at planned rates, Muilenburg says. ■

## FLEET

### Arik Air realises its Dreams as Jumbo order switches to 787

Nigeria's Arik Air has finally converted a long-questioned order for two Boeing 747-8Is to smaller 787-9s, the airframer confirms.

The airline first disclosed its intention to convert the 747-8 commitment four years ago, citing a lack of airport infrastructure to support the larger widebody.

At that time, Arik executives expected to switch to the 777-300ER, but the carrier ultimately selected the -9 variant of the Dreamliner.

The Lagos-based airline has another seven 787-9s already in Boeing's backlog.

Arik placed the order for the

747-8 in June 2011, with its interest in the high-capacity type dating back even further, to a letter of intent for three aircraft signed in May 2008.

However, in late 2013 it indicated that infrastructure constraints had pushed it towards the 777. ■

SPECIFICATIONS DAVID KAMINSKI-MORROW LONDON

# Airbus outlines 10 weight variants for A330neo



Typical two-class seat capacity for the new aircraft has risen by 10

Documentation from Airbus has detailed five initial weight variants for both the re-engined A330-900 and A330-800.

It has released the details in airport compatibility and planning tables covering the Rolls-Royce Trent 7000-powered jets.

Airbus has based the re-engined aircraft on the A330-200 and -300, with a number of aerodynamic modifications.

Over the lifetime of the A330 it has developed several weight

variants, and lists 27 for the -200 and another 38 for the larger -300.

Its data for the re-engined aircraft covers 10 variants – designated WV800 to WV804 for the -800 and WV900 to WV904 for the -900. Maximum take-off weights range from 230t to 242t, the documentation states.

Airbus also lists the typical two-class capacity of the -800 at 257 seats and the -900 at 310: both 10 seats higher than their -200 and -300 counterparts. ■



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Pilot pay means trouble on the Horizon  
Air Transport P15

FLEETS EDWARD RUSSELL WASHINGTON DC

# Southwest remains in pole position for Max launch status

US carrier is jockeying for honour with Norwegian rival as first deliveries of re-engined Boeing narrowbody draw near

Texas-based Southwest Airlines is sticking to its guns over its status as the launch customer for the Boeing 737 Max, despite doubts over whether it will take delivery of the first of the re-engined narrowbodies.

First delivery bragging rights will be contested with Norwegian, which is likely to become the first airline to begin revenue flights with the CFM International Leap-1B-powered Max.

Southwest chief executive Gary Kelly says the US carrier's position as launch customer is secure, "regardless of when we take the first delivery".

He cites the Dallas-based airline's extensive involvement with Boeing on the development and testing of the latest iteration of the narrowbody as the rationale behind his claim.

In December 2011, Southwest became the first airline to place an order for the Max, with Norwegian's commitment coming one month later.

Kelly reiterates that Southwest

will not debut the 737 Max 8 on scheduled flights until the end of the third quarter of this year, when all of its 737-300s and -500s are retired.

"We don't really need [the 737 Max] for flying until 1 October," Kelly said during a 26 January earnings call.

Norwegian has confirmed that it plans to take delivery of its first example of the re-engined narrowbody in May and place it into service on transatlantic flights in June or July.

GROWTH GHIM-LAY YEO NEW YORK

## Copa pulls back from 737-800 and continues conversion spree

Panama's Copa Airlines has increased its orderbook for the Boeing 737 Max to 71 aircraft, after converting a number of slots for the 737-800.

The Star Alliance carrier was identified in 2015 as the customer behind a previous order for 61 of the re-engined jets, but has gradually added more of the type.



Dallas-based airline has ordered 200 examples of the new single-aisle

"Norwegian will now be the first airline to take delivery of the 737 Max, and will be the first airline in the world to operate this brand-new aircraft type," it says.

It will use the new type to open point-to-point routes across the Atlantic. At least the first four of its Max aircraft will be based in the USA, including at Stewart In-

ternational airport in Newburgh, near New York City.

The two carriers, and Lion Air, are scheduled to take their first Max 8s in May, Flight Fleets Analyzer shows.

Norwegian has firm orders for 108 Max 8s, while Southwest will acquire a combined 200 Max 7s and 8s. ■



PW1100G-powered aircraft is now flying in low-cost carrier's livery

ORDERS DAVID KAMINSKI-MORROW LONDON

## Qatar's A320neo has IndiGone

At least one of the Airbus A320neos formerly ordered by Qatar Airways has been repainted in the livery of Indian operator IndiGo.

Qatar had initially ordered 34 A320neos, but began cancelling individual airframes during a spat over the performance of their Pratt & Whitney PW1100G engines. Four had been cancelled by the end of 2016.

Three aircraft carrying Qatar colours remained parked and

without engines in Toulouse at the time of the airframer's annual orders briefing on 11 January.

Images of MSN6772 – the first example produced for Qatar and test-flown in its livery – have recently emerged showing the aircraft at Hamburg Finkenwerder repainted in IndiGo's scheme.

Qatar still has 30 A320neos on order, but Airbus recently indicated that it was negotiating to convert a number of these to the larger A321neo. ■



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New Superjet chief looks to the West  
Cover Story P17

DISPUTE JON HEMMERDINGER BOSTON

# Pilot pay means trouble on the Horizon

Union sues Alaska division over bonus scheme aimed at raising flightcrew numbers in time for arrival of Embraer 175s

The union representing pilots at Horizon Air is suing the regional carrier, claiming the company has violated an employment contract by offering bonuses to new-hire pilots.

A lawsuit, filed by the International Brotherhood of Teamsters and its Airline Professionals Association unit, lays bare details of a labour dispute intertwined with a pilot shortage and with Horizon's acquisition of new Embraer 175 regional jets.

According to the union's claim, the lack of flightcrew has forced Horizon, a division of Alaska Air Group, to cancel hundreds of flights.

"Alaska/Horizon violated the contract terms by avoiding the real issue at hand: not addressing the retention issues at the airline," the union says.

It alleges that the pilot shortage was responsible for the cancellation of 720 Horizon Air flights in December 2016, and caused Alaska Airlines to fly some routes with larger aircraft.

The lawsuit seeks to force Horizon to end recently-implemented programmes designed to help it attract new pilots.

Horizon launched the initiatives in January, under which it pays new-hire pilots up to



Lawsuit claims staff shortages led to hundreds of flight cancellations

\$10,000 in bonuses and up to the same sum in tuition expenses, according to the lawsuit.

The union says Horizon decided to pay the bonuses "unilaterally" without its consent, violating both employment contracts and relevant legislation.

Alaska and Horizon decline to address the lawsuit, but say they are committed to reaching a solution with the union "that is attractive to new pilots, while respecting the contributions of existing pilots and the competitive regional airline marketplace".

Currently, Horizon pilots work under a contract that took effect in 2012 and is amendable in 2018. It specifies that new pilots

will be "paid a salary only".

But in early 2015, Horizon approached the union seeking to renegotiate the agreement so as to achieve "labour concessions", the lawsuit says.

Parent company Alaska needed those concessions in order to award flying of new regional jets to Horizon, rather than to SkyWest Airlines, another regional operator.

In February 2016 pilots ratified a new contract that will take effect when the first E175 enters service – currently scheduled for May 2017, the union says.

Horizon announced the order for 30 E175s last April.

Meanwhile, the court papers say, Horizon began to face diffi-

culty hiring enough new pilots, a problem facing many US regional airlines.

Unions have argued that the shortage results from low pay, while regional carriers and their trade group have attributed the problem to a 2013 rule requiring new pilots to have a higher number of flight hours.

In response, in March 2016, one month after the new contract was ratified, Horizon requested the deal be amended to provide increased compensation to new-hire pilots. The union opposed the bonuses, instead calling for increased pay for all pilots.

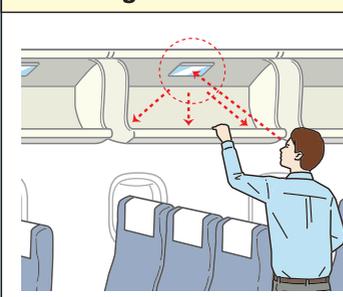
Negotiations continued into December 2016 without resolution, with the airline then informing the union in early January about the planned new-hire bonus programmes.

In a letter to pilots, contained within the court documents, Horizon defended the move, pointing out the short timeline ahead of the first E175 delivery.

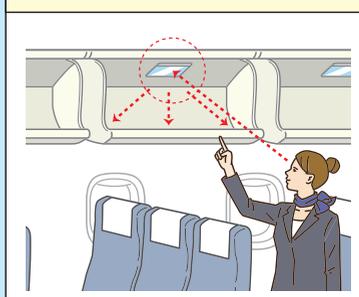
"With less than 90 days from the delivery of our first E175, it is critical that we start the process to staff for growth," the carrier says. "Horizon must take immediate action to hire more pilots into its training programme," it adds. ■

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SALES DAVID KAMINSKI-MORROW LONDON

# New Superjet chief looks to the West

Incoming SCAC president will draw on his past experience working with Boeing to offer a "world-class" airline product

The new head of Sukhoi Civil Aircraft (SCAC) appears unconcerned by the effects on international sales of the Superjet 100 following the political shift that has led Russia to become more insular and increasingly focused on localised production for its domestic aviation industry.

Russia's government understands the need for the Superjet to be attractive through use of the most advanced technology, SCAC president Kamil Gaynutdinov says.

"The priority is keeping the aircraft a reliable competitor," says Gaynutdinov, noting the 2015 selection of the SSJ100 by Irish carrier CityJet.

The airframer also retains a close relationship with its partners in the Superjet project, he adds, describing the SaM146 powerplant as a "piece of genius" and hinting that manufacturer PowerJet – a Franco-Russian joint venture between Safran Aircraft Engines and NPO Saturn – could unveil a significant development in the next few months.

Although Italian firm Leonardo is withdrawing as a SCAC shareholder – Gaynutdinov says this is a "lengthy process" that is still being worked on – the airframer insists it will maintain strong ties with the company's engineering capabilities.

## OVERSEAS PUSH

Gaynutdinov claims sales outside of Russia will be "much larger in future", adding that the manufacturer is reinforcing its after-sales network and investing in improvements to the aircraft. Winglets are set to be introduced in 2018 and the aircraft has undergone enhancement to its operational capabilities, increasing the number of airports to which it can fly.

SCAC wants to ramp up customer support, such as spares distribution, to provide a "world-class" product, says Gaynutdi-



Sukhoi Civil Aircraft is confident of building on its international success – including with Ireland's CityJet

nov, and offer a level of service to airlines that "they have come to expect from Boeing and Airbus".

He is also aiming to align some of the company's practices with those of Western airframers, drawing on his previous experience working with Boeing.

Gaynutdinov says that he wants to bring clarity to such areas as the Superjet orderbook.

SCAC expects to deliver at least 30 SSJ100s this year – possibly as many as 34-36, up from the previous figure of 28 – and Gaynutdinov says these would all be newly built.

He acknowledges that the company has previously counted redelivery of aircraft as part of its total, one aspect he wants to change.

"I don't see this as the approach going forward," he says, stressing that he wants to impose his own standard.

He adds that the airframer is also intending to redefine its orderbook process, because it has a "different contractual structure", and he wants to be able to "compare apples to apples" when fig-

**"I like to see a lot of fidelity, and thorough discipline, in making projections and in the market outlook"**

Kamil Gaynutdinov  
President, Sukhoi Civil Aircraft

ures are viewed from outside.

Gaynutdinov has similarly sought to revise the market demand forecasts for the Superjet, to give the company a foundation for its strategic plans, but it has yet to finalise the projections.

"I like to see a lot of fidelity, and thorough discipline, in making projections and in the market outlook," he says, highlighting the "huge amount of value" his experience at Boeing provided.

## CHANGE MANDATE

Gaynutdinov, who was appointed four months ago, previously served as Boeing's Moscow director of commercial aviation services and says he has "quite a bit of freedom" to bring changes to

the Sukhoi division, claiming a "lot of support" from the board of United Aircraft for his efforts.

He plans to increase the efficiency of the company's internal processes, but says: "That doesn't necessarily come through reducing headcount."

Greater economics can be achieved by establishing clearer definition of functions, he says, adding that processes can be streamlined in ways which are not always intuitive.

The airframer is establishing a central spares distribution facility at Moscow Sheremetyevo, sited close to the runway, to shorten the time to ship components to customers. By co-locating functions and shifting operations out of the city, the company can arrange quicker meetings with airline representatives.

Gaynutdinov adds that modern digital aircraft generate substantial data. "If we collect that, we can do miracles with it," he says, through integration with airlines and maintenance organisations. "It's something we've not been focused on before." ■



REQUIREMENT DOMINIC PERRY LONDON

# Faury 'monitoring' Polish procurement

Warsaw's needs continue to interest Airbus Helicopters, as chief executive considers legal action over Caracal rejection

Airbus Helicopters has still not ruled out taking legal action against the Polish government over the 2016 cancellation of a 50-unit order for H225M Caracals. The proposed deal was axed by Warsaw last October on the grounds that offset requirements had not been met by the manufacturer.

"We reserve our rights, and legal action is an option that we are contemplating, as we said before," Airbus Helicopters chief executive Guillaume Faury said as the manufacturer revealed its order and delivery figures for last year on 27 January.

Poland still needs new helicopters for all three branches of its armed forces, and appears to be moving towards acquiring aircraft under an urgent operational re-

quirement model – which would not require a tender process.

Faury says Airbus Helicopters is "monitoring" the nation's ongoing procurement activities, as "we want to play a role in those tenders". However, he adds that the abandoned 50-unit deal "will not be replaced, as far as I know".

Overall, 2016 was a better year for the Caracal, with Airbus Helicopters winning important contracts with Kuwait – for 30 aircraft – and Singapore, for an undisclosed number.

Although the €1.7 billion (\$1.8 billion) order from the Gulf state has yet to be finalised, Faury says he is "confident it will happen over the next few weeks".

Singapore's deal is the subject of a non-disclosure agreement by the airframer, but its requirement



Anthony Peccchi/Airbus Helicopters

Kuwait, Singapore and Thailand placed orders for H225M last year

is estimated as for between 12 and 14 rotorcraft.

Sales of the Super Puma family – including the commercial H225 and smaller H215 – totalled 23 aircraft last year. The airframer has not provided a sales split between

the models, but Faury says there "were H215s in the mix", as well as two H225Ms for Thailand.

Airbus Helicopters has already secured a contract in 2017 to supply another undisclosed customer with seven H215s. ■

INCIDENT

## Landing mishap dooms Osprey in Yemen action

A US Marine Corps-operated Bell Boeing MV-22 Osprey was destroyed after a landing mishap during a raid on an alleged terrorist compound in Yemen on 29 January, the US Department of Defense has confirmed.

"The aircraft did not take enemy fire and did not go down because of hostile action against it," the US Central Command says. "The aircraft was determined to be un-flyable and was destroyed in place by US forces."

The DoD did not identify other aircraft involved in the operation, which it says had been in planning for several months. Three special forces commandos were injured and a US Navy SEAL killed separately, it confirms.

Flight Fleets Analyzer records the USMC as having had an active fleet of 248 MV-22s prior to the loss. ■

CONTRACT LEIGH GIANGRECO WASHINGTON DC

## Boeing readies for the challenge as USAF orders third batch of KC-46As

Boeing has been awarded a \$2.1 billion contract by the US Air Force for the third lot of low-rate initial production (LRIP) of its KC-46A tanker.

Confirmed by the Department of Defense on 27 January, the contract covers 15 heavily-adapted 767s, five wing air refuelling pod kits and one pair of spare Pratt &

Whitney PW4062 engines. Work is expected to be complete by July 2019 under the deal.

Boeing launched the LRIP phase of the tanker recapitalisation programme last August, when the USAF awarded it a \$2.8 billion contract for the first two lots, totalling 19 aircraft and 10 wing air refuelling pod kits.

While the newly-placed Lot 3 contract may help Boeing to offset its total charges on the KC-46A, the programme could face further penalties if it does not stay on schedule. The company has so far announced five cost over-runs on the fixed-price activity, with its most recent disclosure – worth \$312 million – increasing its exposure to \$2.1 billion.

Last December, the DoD's outgoing senior weapons tester, Michael Gilmore, described the KC-46A's current schedule as "aggressive and unlikely to be executed as planned".

"Tanker deliveries will begin later this year," says Boeing. A four-strong fleet of test aircraft and the programme's lead production example have so far amassed almost 1,500 flight hours, it adds. ■



Boeing

Service now has its first 34 of the 767-based tanker under contract



Northrop lets the sun set on its T-X bid  
Defence P21

MILESTONE CRAIG HOYLE LONDON

# Moscow unveils MiG-35 with export sales as critical target

Roll-out event for multirole type draws delegations from 30 countries, as flight tests begin

Russia has rolled out its first RAC MiG-35 fighter and announced it will offer the multirole type to a host of potential export customers, including India.

Staged at the airframer's Likhovitsy site near Moscow on 27 January, the milestone event was attended by officials including Russian air force chief Col Gen Victor Bondarev and delegations from more than 30 countries including China, India, Peru and Vietnam.

Flight testing of the MiG-35 has also begun, with RAC MiG test pilots reporting a first sortie as having shown that "all systems worked normally".

To be capable of air-to-air, air-to-surface and anti-ship strike missions, the new model features a reduced radar cross section and an enhanced self-protection suite, according to its developer.

Russia's air force has previously expressed interest in acquiring an initial batch of up to 37 MiG-35s, with deliveries expected from around 2018, but Bondarev says: "[In] time we shall replace all light



Russian air force intends to replace light strike assets with new model

fighter aircraft with this type." Flight Fleets Analyzer records the service as today operating 258 earlier-generation MiG-29s.

RAC MiG had proposed the MiG-35 during India's medium multirole combat aircraft competition, but the type was ruled out of contention for the potentially 126-unit deal. New Delhi ultimately acquired 36 Dassault Rafales, but has identified a new requirement for an additional light fighter, with the Lockheed Martin F-16 and Saab Gripen E likely candidates.

Russia's deputy prime minister, Dmitry Rogozin, says Moscow is ready to again offer the MiG-35 to New Delhi, under the terms of its "Make in India" industrial strategy. A bilateral conference is to be held in India early this year, he reveals, to cover aspects including joint ventures, production and maintenance.

Fleets Analyzer shows India's air force as already operating 66 MiG-29s, with another 507 of the type in current use with 24 other export customers. ■

UNMANNED SYSTEMS  
ARIE EGOZI TEL AVIV

## Israeli rivals rise for land forces' Zur UAV battle

Four Israeli companies are competing to supply a multi-rotor vertical take-off and landing (VTOL) unmanned air vehicle to the nation's land command.

General specifications for the requested "Zur" system were defined by the land command's technical branch and Israeli defence ministry.

These requirements call for an air vehicle with a weight of 10-15kg (22-33lb) and the ability to carry a 1.2kg payload for between 50min and 1h.

Aeronautics Defense Systems, Aero Sentinel, Rafael, and an Elbit Systems team also involving Flying Production have already demonstrated their candidate systems. A selection is expected by mid-year.

Israeli ground units currently operate Elbit's Skylark UAV. The aircraft, designated "Sky Rider" by the military, is mainly deployed by artillery units and special forces personnel.

The need for a multi-rotor VTOL system has been identified during recent combat operations to support formations down to small infantry units. ■

AGREEMENT

# Ankara strengthens its TF-X fighter pact with UK

BAE Systems and Turkish Aerospace Industries (TAI) have advanced their collaboration on Ankara's fifth-generation TF-X fighter project. Signed by the prime ministers of Turkey and the UK, the new heads of agreement pact is expected to lead to a contract worth more than £100 million (\$127 million), BAE says.

In December 2015 Turkey picked BAE to work with TAI on a pre-contract study phase for the TF-X activity, which seeks to develop an indigenous successor to its air force's Lockheed Martin

F-16s. The nation's SSM defence procurement agency had explored a trio of aircraft configurations for the future platform, including single- and twin-engined designs.

"BAE Systems is in an excellent position to contribute technical and engineering expertise and experience of managing complex projects to this key Turkish programme," says chief executive Ian King.

Flight Fleets Analyzer records the Turkish air force as operating 245 F-16C/Ds, the oldest of which entered use 29 years ago. ■



Project is intended to develop replacement for Turkey's F-16 fleet

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Gulfstream predicts a better year as G500 approval nears  
Business Aviation P22

PROCUREMENT LEIGH GIANGRECO WASHINGTON DC

# Northrop lets the sun set on its T-X bid

Incumbent supplier opts against pursuing trainer renewal deal, to focus on “more interesting” business opportunities

Northrop Grumman has abandoned its pursuit of the US Air Force's T-X deal to replace an aged fleet of Northrop T-38C trainers with more than 300 new aircraft.

Speculation over Northrop's role in the contest mounted on 26 January, after chief executive Wes Bush told analysts: “We have not reached a conclusion” on whether to reply to a final request for proposals (RFP) issued on 30 December 2016.

Confirming the end of its T-X involvement along with partner BAE Systems on 1 February, Northrop said: “The companies have decided not to submit a proposal, as it would not be in the best interest of the companies and their shareholders.”

Another T-X contender, Raytheon, had withdrawn from the process on 25 January, leaving its partner Leonardo to consider its options for promoting a T-100 derivative of the Aermacchi M-346.

The European company says it is “evaluating how to leverage on the strong capabilities and potential of the T-100, in the best interest of the US Air Force”.

## NARROW FIELD

The actions potentially narrow the competitive field to just two bidders, with teams comprising Boeing and Saab, and Lockheed Martin and Korea Aerospace Industries. These are offering a clean-sheet development named T-X and the T-50A, respectively.

Asked on 26 January whether the air force's RFP – which placed a major emphasis on reducing cost and risk – had led to



Manufacturer has bailed out from a \$16 billion contest to replace the US Air Force's aged T-38 fleet

a price shoot-out among the potential competitors, Bush said: “There are others [contracts] where our customer is transmitting the message in their RFP that while cost is critically important, they see a little bit of a trade space between cost, performance and value. Those tend to be a little bit more interesting.”

He added: “It's more a reflection of the discipline in our company, of looking through the cold, hard lens of what does the RFP tell you and what's the business case look like.”

Northrop's Scaled Composites division developed a clean-sheet prototype for the T-X opportunity, registered as the Model 400. This was photographed on the runway in Mojave, California, last August, but the company had not released any images of the platform, which is not believed to

have been flown prior to the withdrawal decision.

## AGGRESSIVE PRICING

Defence analyst Jim McAleese suggests that Northrop's Aerospace Systems unit was reluctant to enter an “eye-wateringly aggressive pricing” battle on the USAF's trainer recapitalisation, especially as it is already focused on delivering the service's next-generation B-21 bomber.

Northrop reported sales worth \$10.8 billion last year for its Aerospace Systems unit.

The company attributes the 8.9% increase on its performance in 2015 to several factors, including higher production output on its E-2D airborne early warning and control system platform and Global Hawk family of unmanned systems, and its involvement as a manufacturing

partner on the Lockheed Martin F-35 programme.

Additional current opportunities for the company include a deal to replace the USAF's Northrop E-8C JSTARS ground surveillance fleet.

Worth \$6.9 billion for 17 adapted business jets and associated equipment, the JSTARS recapitalisation programme secured a waiver from the outgoing Obama administration late last year to proceed under a cost-plus incentive fee model, rather than a fixed-price award. Northrop's proposed solution is based on the Gulfstream G550 platform.

The USAF released a final RFP for the JSTARS replacement programme in late December 2016, with other bidders including Boeing and Lockheed. ■

**Additional reporting by Craig Hoyle in London**

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**APPOINTMENT**  
KATE SANSFIELD LONDON

## Industry veteran Wells ready for his latest Quest

Robert Wells has been appointed as chief executive of Quest Aircraft – the manufacturer of the Kodiak 100 single-engined turbo-prop – replacing Sam Hill, who retired in January.

Wells has held a number of roles during his 40-year career in the aviation industry, which included a stint with Beech Aircraft, now Textron Aviation, and more than 20 years with business aircraft services company Piedmont Hawthorne, which became Landmark Aviation.

He spent the latter part of his career with Swiss company TAG Aviation. Wells rose to become chief executive of parent company TAG Aviation Holding before retiring in 2015. He has remained as an adviser to the company's board.

Quest – owned by Japanese companies Setouchi Holdings and Mitsui – is seeking to increase its global fleet of about 200 Kodiaks through its network of international dealerships.

It has expanded its Sandpoint, Idaho headquarters to include a larger manufacturing plant and a research and development hangar. The latter will house development of Quest's next – and as yet undisclosed – programme. ■

**FORECAST** STEPHEN TRIMBLE WASHINGTON DC

# Gulfstream predicts a better year as G500 approval nears

Parent company General Dynamics upbeat for future, despite downturn seen in 2016

After a disappointing 2016, Gulfstream expects deliveries of outfitted business jets to increase slightly this year as the entry into service of the G500 replaces the venerable G450 in the market, executives of parent company General Dynamics said during a full-year earnings call on 27 January.

Gulfstream's one-year outlook forecasts deliveries of 90-95 outfitted large-cabin business jets – the G650/ER, G550, G500 and G450 – and 25-30 midsize aircraft – the G280 and G150, production of which will be halted this year. By comparison, Gulfstream delivered 88 large and 27 midsize aircraft in 2016, a significant decline from 120 and 34, respectively, in 2015.

The anticipated rebound in the large-cabin sector comes as Gulfstream is scheduled to deliver the first outfitted G500 by the end of the year. Unveiled to the public in 2014, the clean-sheet G500 is being prepared to receive an airworthiness certificate from the US Federal Aviation Administration later this year. The same milestone for the larger G600 is scheduled a year later, with entry



Deliveries of the clean-sheet model will commence before year-end

into service also to occur in 2018.

The arrival of the first G500 is likely to lag the final delivery of the G450 by several months.

As of 26 January, Gulfstream had only one order for the large-cabin business jet, which was expected to be delivered in the first quarter, according to Jason Aitken, senior vice-president and chief financial officer at General Dynamics.

Gulfstream has been encouraged by signals that a sales rebound began to gather momentum in the second half of 2016.

Although the backlog for the G450 is nearly exhausted, the G650 boasts a 24-month backlog at current production rates. The G550 has a roughly 12-month backlog, Aitken says.

For the first time, General Dynamics released long-range revenue and earnings guidance for Gulfstream. It projects a compounded annual growth rate of 5.3% for sales and 5.9% for operating earnings, with growth accelerating as production of the G500 and G600 gets into full swing by 2020. ■

**CERTIFICATION** STEPHEN TRIMBLE WASHINGTON DC

# HondaJet clears final hurdles with FAA validation



Operators of the light jet can now fly into known icing conditions

Honda Aircraft has secured US approval for its HondaJet to fly into known icing conditions and use reduced vertical separation minima.

The validation removes the only two operating restrictions previously imposed by the Federal Aviation Administration on HondaJets delivered to customers. It covers all aircraft after the first 10 serial numbers, which were assigned to flight test duties.

The light business jet received type certification and entered service in December 2015. Flight Fleets Analyzer records a current fleet of 25 HondaJets.

Honda Aircraft – based in Greensboro, North Carolina – designed the aircraft with an electromechanical deicing expulsion system on the horizontal stabilisers and a bleed-air anti-icing system on the leading edges of the aircraft's laminar flow wings. ■



Still on target  
Air-launched  
weapons P24

LAUNCH KATE SARFIELD LONDON

## JetEight serves up all-you-can-fly plan in Europe

German start-up JetEight is preparing to launch a business aircraft membership club in the third quarter of 2017, offering an all-you-can-fly scheduled service for a fixed monthly fee.

The venture will initially target travellers in Germany and Switzerland, but will expand across Europe as demand grows.

“We are currently talking to a number of small- and medium-sized companies, whose executives regularly use commercial airlines for short hops,” says JetEight founder Ruben Portz. “There has been a lot of interest so far, and we are confident we can sign up around 100 members by the time we launch.”

Portz says JetEight will fill a gap in the market for affordable,

efficient and reliable business transport. European airlines, he argues, have not treated their premium passengers well.

“These carriers are losing focus on value and underserving their business-class passengers,” he says. “While trying to compete with low-cost carriers, they have forgotten what short-haul business class stands for. Whereas the business traveller would like to travel quickly from A to B, he or she ends up in dreadful security checks, slow boarding procedures and waiting for transfer passengers.”

JetEight will operate from VIP terminals at commercial airports, which Portz says will cut travel time significantly.

The service will launch with three routes – Berlin to Zurich,



Services will be operated using Beechcraft King Airs and light jets

Frankfurt to Zurich and Frankfurt to Berlin. For a monthly subscription fee of €2,500 (\$2,680), members will be able to make an unlimited number of flights. “Our plan is to expand to all European business centres when demand is strong enough,” says Portz.

JetEight plans to offer a range of light business jets and turboprops, including the Cessna Citation CJ series and Beechcraft King Air family. Services will be operated on the company’s behalf by a handful of local charter companies. ■

SHIPMENTS STEPHEN TRIMBLE WASHINGTON DC

## Textron responds to pressure on prices

Cessna Citation deliveries will be kept flat this year to support values, and company says it will hold firm on Longitude

Stung by relentless pricing pressure lowering profit margins for its latest business jet, Textron Aviation plans to keep overall Cessna Citation business jet deliveries flat this year to constrict supply and shore up prices.

Cessna delivered 178 jets to customers in 2016, an increase of 12 units on the previous year, parent company Textron announced on 25 January. That total included 42 of Cessna’s new flagship: the midsize Latitude.

With a list price of \$16.8 million, the Latitude’s customers still seem unwilling to buy the aircraft at a rate that Textron Aviation considers fair, based on comments from Textron chief executive Scott Donnelly during a fourth-quarter earnings call.

Textron Aviation now faces a 2017 ramp-up of deliveries of the Latitude by 30% at prices negotiated last year which the parent company no longer considers acceptable. As a result, the airfram-



Deals negotiated for Latitude jets last year are seen as problematic

er will cut back deliveries of its legacy Citation jets and Cessna Caravan and Beechcraft King Air turboprops, Donnelly says. The company recorded 106 deliveries of King Air C90GTx, 250, 350i and 350ER variants in the 12 months ended 31 December 2016, down from 117 units the previous year.

“I am not willing to take the

prices down further to try to drive that demand, and end up in a situation we have today with the Latitude,” says Donnelly. “You have a great aircraft that delivers very, very well for customers, but is priced at a point that doesn’t make sense for us.”

Textron has complained about pricing pressure on the Latitude before. In July last year, Donnelly

pointed the finger at an unnamed competitor which he blamed for engaging in a damaging price war in the Latitude’s segment.

Although not specifically named, Embraer, which builds the newly certificated Legacy 450 and Legacy 500, denied Donnelly’s accusations.

The pricing pressure on the Latitude has taught Textron Aviation a valuable lesson. The large-cabin Longitude is scheduled to achieve certification by the end of this year, with a small number of deliveries planned before 2018. For new Longitude sales, the company will not bow to demands for rock-bottom prices.

“We’re going to start holding the price line from day one,” Donnelly says.

Revenues for Textron Aviation, which also includes King Air manufacturer Beechcraft, rose by \$99 million in 2016 to \$4.92 billion. Profits fell by \$11 million, to \$389 million. ■



# Still on target

Lockheed Martin

Developed continuously since the mid-1970s, Raytheon's AIM-120 remains a crucial combat capability, including for the stealthy F-35

The US Air Force's primary offensive missile shows little sign of running out of momentum, but what are its targets after AMRAAM to ensure continued dominance over adversaries?

STEPHEN TRIMBLE WASHINGTON DC

Raytheon will deliver the 20,000th copy of the missile that three decades ago changed air-to-air combat in a 31 January ceremony inside the company's factory in the desert on the outskirts of Tucson, Arizona.

It is not the end of the road for the AIM-120 AMRAAM. Several thousand more of the radar-guided weapons will be delivered to the US Air Force before the programme expires in 2024, with hundreds likely to be handed over to foreign operators for years to come.

The milestone speaks to the AIM-120 platform's unusual longevity, spanning three generations of fighters. The AMRAAM, conceived in an era of aerial combat highlighted by Vought F-8s and McDonnell Douglas F-4s, came into service to support a fleet of Boeing F-15s, F/A-18s and Lockheed Martin F-16s and remains the most important offensive weapon for US pilots now climbing into Lockheed F-22s and F-35s.

It has existed for so long the missile has outlived its acronym. Though introduced as a medium-range air-to-air weapon, the AIM-120D that entered service two years ago reportedly extends the AMRAAM's reach to nearly as far as the retired, long-range AIM-54 Phoenix, whose maximum reach was officially described as in "excess of 100nm [185km]" by the US Navy.

The AIM-120 was designed to change air combat based on painful lessons from the Vietnam War. The original Hughes missile designers introduced a radar-guided missile with autonomous targeting, allowing fighter pilots to for the first time simultaneously fire at more than one target while continuing to manoeuvre. Compared with the Vietnam-era AIM-7 Sparrow, the AIM-120 stretched the "no-escape zone" to dozens of miles.

Its longevity belies the missile's extensive evolution. The exterior profile of the AIM-120D remains almost identical to the original AIM-120A, except that a version of the preceding AIM-120C introduced clipped fins to ac-

commodate the cramped interior of the F-22 weapons bay. Under the surface, however, the AIM-120 has been transformed since the early 1990s with improved sensors, new electronics and a more powerful propulsion system.

Most importantly, the AMRAAM is now equipped with two weapons. It always had a 23kg (50lb) fragmentation warhead that detonates in proximity to or on contact with an aerial target. Since the mid-1990s, the AIM-120 has also needed the computing intelligence to electromagnetically blast through waves of attempts to jam the missile's radar.

## SHORTCOMINGS

In other ways, the AIM-120 appears almost anachronistic. Although the D-variant's range is reportedly several times longer than the version that entered service 26 years ago, it still falls short of the most advanced beyond-visual-range air-to-air missiles. From Europe to Russia and China, the focus of efforts over the past decade has been to extend the range and manoeuvring power of the radar-guided air-to-air missile to the limits of the most advanced sensors, such as active electronically scanned array radars. The preferred mechanism for extending the range has been exchanging the missile's solid-propellant motor with an air-breathing, throttlable ramjet engine.

The USA has favoured a different philosophy, leading detractors to argue that its approach is anachronistic. The US military's supporters argue that the AMRAAM offers a more holistic approach to defeating targets, including at shorter ranges. Moreover, ultra-long-range missiles suffer from the limits of rules of engagement (ROE), which often prohibit firing at targets at such distances.

**RANGE MATTERS**

“ROE are probably one of the main reasons why really long range can be rendered pointless, because you may not be allowed to shoot at those super-long ranges where you can’t identify friend or foe or if it’s after the first few hours of the war,” says business development manager Clyde Thayer. “The ramjet will give you really long range, but at the shorter range – certainly inside a normal tactical shot – something with a motor like [an] AMRAAM will get to a target much quicker.”

Michael Kofman, an analyst for the US Center for Naval Analysis, points out that the diverging philosophies on missile range derived from opposing military strategies.

“Russia and China always prepared to fight the United States, and countries armed by the USA. Thus they continued development of missiles intended to counter the manner in which the USA fights to achieve air superiority. This means long-range missiles for taking out [Boeing E-3] AWACS, jamming aircraft and the like,” Kofman says.

By contrast, the US military became preoccupied with less sophisticated threats, such as the Taliban in Afghanistan. Moreover, the USAF also invested in stealth technology, which “meant that we don’t need to shoot from far away, and the range of the AIM-120 is just fine, given they won’t see us,” Kofman says.

Besides range, the lack of a ramjet motor for the AIM-120 means the missile has significantly less energy at long ranges. The AMRAAM’s rocket motor fires for only several seconds after

a launch, then glides to the target using the remaining energy. Any manoeuvres made in the terminal phase further reduce its energy. Raytheon counters that the USAF’s focus on anti-jamming technology solves that problem. By having a clear view to the target, the AIM-120 can avoid the need to manoeuvre.

“Whether or not you can get to the range is one thing, but once you get to the target you have to be able to see it to kill it,” says Kurt Wuest, Raytheon’s deputy AMRAAM programme director. “Our philosophy is reducing the need to make those end-game corrections by having a better intercept.”

But some analysts are not convinced by the AIM-120’s superiority over the constantly evolving jamming threats. “I don’t know how well it works because we’ve thankfully not had a use case, but suffice to say that if they’ve spent decades working on how to jam the AIM-120 then they probably have come up with some answers,” Kofman says.

**“The ramjet will give you really long range, but at the shorter range... [an] AMRAAM will get to a target much quicker”**

**Michael Kofman**  
Analyst, US Center for Naval Analysis

Although the USA has preferred to take a “holistic” approach, Pentagon weapons planners have toyed with the idea of an ultra-long-range air-to-air missile for decades. In the 1990s, the USAF studied concepts for upgrading the AIM-120 with a variable-flow ducted rocket: an air-breathing ramjet with a speed-controlling throttle.

In more recent years, the US military considered other alternatives to simply improving the range of its most advanced air-to-air missile. In



Allied assets like Swiss F/A-18s rely on type

the middle of the last decade, the focus of modernisation efforts turned to expanding functionality. The USAF launched the dual-role air dominance missile (DRADM) programme in the hope of combining the abilities of the AIM-120 and Raytheon’s AGM-88 anti-radiation missile.

The US Defense Advanced Research Projects Agency went even further. The science and technology agency launched the triple target terminator (T3) programme, with the goal of replacing the AIM-120 and AGM-88 with the same missile, while adding the capability to destroy small and stealthy cruise missiles.

**OPERATIONAL PAUSE**

By 2012, DRADM and T3 were curiously discontinued, leaving some observers to speculate that research was continuing in classified budget accounts. In mid-2016, the USAF’s support for a next-generation missile to replace the AIM-120 popped back into the public sphere. Then chief of staff Gen Mark Welsh told journalists attending the Farnborough air show that the service’s fiscal year 2018 budget request could revive the formal pursuit of a “sixth-generation” missile, but the desired capabilities remain shrouded in secrecy.

So far, the talk about replacing the AIM-120 is only talk. The missile that entered development in the mid-1970s still has a lot of work to do. The USAF has no plans on the books to roll out an E-variant, but that does not mean that development will stop after the fielding in 2015 of the AIM-120D. The military’s operational testers judged that missile to be effective on entry into service, but improvements are still required. A first software improvement programme (SIP 1) is now being fielded, while SIP 2 – featuring undisclosed improvements to the missile’s electronics – will follow shortly.

Beyond SIP 2, Raytheon is developing a new baseline for the processors and circuit cards within the missile. When the form, fit and function replacement is ready to be introduced in a couple of years, it will give the AIM-120’s software developers a more powerful platform on which to develop new techniques and applications. ■



Weapon’s C-variant gained clipped fins to adapt it for internal carriage by the F-22

# Strength in numbers

Pentagon planners have embraced the swarming concept of multiple, expendable UAVs acting as one. The challenge now is making it an affordable reality



During collaborative flight demonstrations performed last year, Raytheon showed that its low-cost Coyote could transform reconnaissance

STEPHEN TRIMBLE WASHINGTON DC

**T**he swarm is coming. Packs of centrally monitored flying robots are now a hallmark of the Pentagon's strategy of future warfare.

Leveraging advances in robotics, big data, 3D printing and miniaturisation, the solo unmanned air vehicle will be replaced by the swarm – a dense network of collaborating, expendable UAVs that autonomously pool their resources to perform a mission.

The concept dates back more than a decade, to when the US Defense Advanced Research Projects Agency tried to develop the heterogeneous airborne reconnaissance team: an idea that was too far ahead of its time. A series of successful demonstrations performed in 2016 – along with the outspoken support of top Pentagon officials – suggests the swarming concept is rapidly becoming a practical reality.

Like so many innovative concepts, shifting swarming from the laboratory to an operational environment is not going to be straightforward. That step requires an even more radical change in the industrial world. The military must find suppliers that can deliver sophisti-

cated payloads, military hardened electronics and flexible airframes, yet somehow at a cost an order of magnitude lower than the typical small unmanned air system. The supplier must be innovative with technology and business models, yet intimately familiar with the Pentagon's acquisition bureaucracy.

Among a host of Silicon Valley-backed startups and university research teams, Raytheon Advanced Missile Systems (AMS) is positioning itself – and the 5.9kg (13lb) Coyote – as the optimal solution.

## ACQUIRED TECHNOLOGY

The AMS unit may not seem like the obvious place to start looking for a low-cost expendable UAS provider. Its engineers are well-known for developing the next generation of missile defence interceptors and air-launched weapons, each costing in the order of \$1 million with every shot. But Raytheon AMS came into the swarming business through the acquisition in 2015 of a Tucson neighbour.

Advanced Ceramics Research (ACR) was founded in 1989 to develop ways to produce the high-temperature material embedded in the company's name. The goal was to develop new ceramics to use in drill bits for the min-

ing industry. But among the company's founders happened to be model aircraft enthusiasts, which led to an interest in the burgeoning UAV industry of the late 1990s.

ACR developed the hand-launched Silver Fox and Manta UAVs, which had no need for ceramics but gained the company exposure with the Pentagon. An approach from the US Navy led to the development of the Coyote, a UAV that could be launched from the sonobuoy tubes in Lockheed Martin P-3C Orion maritime patrol aircraft and Sikorsky MH-60R Seahawk helicopters.

That design requirement for a small UAV that can survive a launch tube ejection in flight gave the Coyote a uniquely adaptive capability. If it can be air launched, the type can also be tube-launched from the ground or aboard ships.

John Hobday, business development lead for Raytheon, says: "It is not trivial where you can drop these things out of a tube on an airplane and make it fly, nor is it shooting out of a launcher and make it fly. There's a lot of people who have been working on this for a long time."

By 2009, the Coyote programme helped make ACR an acquisition target. BAE Systems

acquired the company, helping the former mining materials supplier navigate the Pentagon's labyrinthine acquisition system. By then, the Coyote had also gained interest as a weather reconnaissance system for the US National Oceanic and Atmospheric Administration. Six years later, Raytheon acquired ACR from BAE Systems.

**FRESH APPROACH**

By then, the Pentagon was rolling out a new strategy called the Third Offset, which seeks new ways of delivering advanced capabilities without breaking the bank. The formation of the Strategic Capabilities Office inside the Pentagon, which was not officially acknowledged until a year later, immediately focused on the possibilities of swarming UAVs.

The Office of Naval Research (ONR) had also taken an interest. A series of simulations by naval experts had reached a disturbing conclusion: swarms of small boats attacking an Aegis-class destroyer in a port environment would often be successful. The Aegis combat system was adept at thwarting advanced attacks by high-flying fighters armed with supersonic, sea-skimming anti-ship missiles, but less equipped to defeat a horde of small boats laden with explosives.

To overcome this new and low-cost threat, the navy began looking for its own low-cost solution.

Thus, the ONR's Locust programme was born, with Coyote as the selected platform. Until Locust, the Coyote had been operated as

a single-ship asset, performing missions solo. To be adapted to the swarm mission, the UAV needed a few upgrades. First, it required new software that centrally manages the swarm, assigning roles to specific aircraft in the network, then reassigning roles if priorities or circumstances change. Second, the Coyote needed a launcher that could dispense 30 aircraft within 1min.

In two demonstrations staged last year, the Coyote proved that it could be launched as a swarm and operate collaboratively, says Hobday. "They were very successful. Everything went exactly as planned. We met all objectives," he says.

**"It is not trivial where you can drop these things out of a tube... and make it fly"**

**John Hobday**  
Business development lead, Raytheon

The demonstrations showed how a swarm of Coyote UAVs can change how a reconnaissance mission is performed. When a single UAV or manned reconnaissance aircraft is used to observe a target today, its sensors are unable to see behind walls or around corners. The swarm approach solves that problem. Multiple UAVs can track the target from different angles, leaving no place to hide. In other scenarios, a low-cost swarm can be used to overwhelm an enemy's defences, flooding



Tube-launched air vehicle weighs just 5.9kg

the airspace with too many UAVs for them to shoot down.

First, however, the UAVs have to be truly expendable. Unmanned systems deployed by the military today are intended to be recovered after every mission, as their sensors and components are too expensive to discard.

The US Air Force Special Operations Command has commissioned Raytheon to develop a version of the Coyote that could be launched from a Lockheed AC-130 gunship. Instead of exposing the AC-130 to ground fire in low passes, it could launch a swarm of Coyotes to investigate the target and transmit video back to the mothership.

**SELF-DESTRUCT**

In that scenario, the Coyotes would not be recovered. The controller on board the AC-130 would command the UAVs to dive into the ground after completing their mission.

To afford hundreds of thousands of expendable, flying sensors, the US military needs a UAV sold at commodity prices. The wiring and circuit cards would still have to be military-grade: after all, the military cannot allow an enemy to remotely jam or take control of the Coyote swarm. The airframe must also be strong enough to survive a tube launch from either the ground or the air.

In phase 2 of the Locust programme, the ONR plans to have Raytheon demonstrate that it can solve this manufacturing problem. For swarming to work, Raytheon has to be able to build hundreds of thousands of Coyotes at a low enough price that the US military can throw them away after each mission. The company's engineers are already working on making changes. The Coyote's composite wings, for example, consist of dozens of plies that are laid-up by hand. Raytheon wants to switch to a mould injection system, yet preserve the strength characteristics of the wing.

The next step is to develop a way to manufacture the military-grade circuit boards and wiring. "It's working with those suppliers and pushing the cost down on them, because first off you're manufacturing a lot of them," Hobday says. "And it's changing the way that you look at some of those circuit boards and components." ■



The US National Oceanic and Atmospheric Administration deploys type from manned P-3

# Networked deterrence

The US Air Force's next-generation nuclear weapon will be able to communicate directly with its delivery platform, creating a challenge in ensuring security, safety and surety

LEIGH GIANGRECO WASHINGTON DC

**W**hen the US Air Force's Northrop Grumman B-21 bomber talks to the long-range standoff (LRSO) weapon, it will mark the first time a nuclear cruise missile communicates digitally with its delivery aircraft.

The USAF knows its next generation of nuclear weapons will be linked to a network. What it does not know is who else might be able to communicate with its arsenal.

That is part of what a 2017 USAF Scientific Advisory Board study will delve into, as it examines certification and surety concerns for the recapitalised nuclear force. As new threats crop up in a digital landscape, the board will try to understand what other criteria must be developed to assess nuclear systems.

"These systems are going to be quite different from the ones that they may replace," Scientific Advisory Board chair Werner Dahm told reporters during a December meeting at the Pentagon. "In particular, they will be much more like all systems today: network

connected. They'll be cyber enabled. That introduces potential surety concerns."

As other conventional platforms have evolved, the nuclear force's communication system has remained static. During a recent speech in Washington DC, USAF chief of staff Gen David Goldfein showed an 8in floppy disk – technology dating back to the early 1970s – to illustrate the intercontinental ballistic missile (ICBM) system's vintage communication system. While the floppy disks remain functional, the service plans to replace them, to address obsolescence concerns.

"It is tough to hack," Goldfein joked before striking a more sober tone, adding: "It's time to modernise."

## TECHNOLOGY UPGRADE

Michael Martinez, director of the Air Force Nuclear Weapons Center Directorate, tells FlightGlobal that creating a networked nuclear force represents a technology upgrade, plain and simple. Most conventional systems, as well as the B61 nuclear bomb, have been designed with a digital interface, he says.



Stealthy B-2 is one of the platforms which will carry the long-range standoff weapon

While an analogue system uses mechanical or electrical stimuli to direct an action, a digital system sends commands to software.

Once those weapons move into the digital age, the Pentagon must overhaul its nuclear certification process. Nuclear weapons are not certified once in their lifetime, but require an operational safety review every five years, Martinez says. The systems are also re-certified when even the smallest change occurs, such as adding a new antenna for the communications system housed near the weapon.

In the USA only the president can call for a nuclear strike, and surety assessments examine whether the weapon can be compromised outside of presidential authorisation. The study is not examining whether network connected nuclear weapons are safe, but how to go about certifying cyber-enabled nuclear systems and the surety concerns surrounding them.

"Safety is when you don't want it to go off," says Thomas Karako, a nuclear and missile defence expert at the US Center for Strategic and International Studies. "Surety is making it sure it goes off for us and not for somebody else."

Last July, the USAF released a classified request for proposals (RFP) for the LRSO weapon, which is expected replace Boeing's AGM-86B air-launched cruise missile (ALCM) in the 2030s. But that did not signal a solid path towards production. Former defence secretary William Perry has called the weapon destabilising, and Democrats in Congress urged then-



Aged B-52H can carry multiple AGM-86B air-launched cruise missiles on underwing pylons



US Air Force

President Barack Obama to cancel the programme last year. In his January Senate confirmation hearing, the new defence secretary, retired US Marine Corps Gen James Mattis, supported the B-21 bomber, ICBM and submarine elements of the triad recapitalisation, but deferred senators' questions on LRSO.

**EXTENSION PROGRAMMES**

Despite some partisan pushback, the USAF's official position is that the ALCM must be replaced. Lt Gen Jack Weinstein, the USAF's deputy chief of staff for strategic deterrence and nuclear integration, says: "LRSO will provide the same capability and options that exist today for the president and reinforce our commitment to the assurances guarantees the US provides to our allies around the world. ALCM life-extension programmes continue to ensure ALCM remains safe and effective, but these programmes cannot do so indefinitely."

While the LRSO effort could make it through the RFP stage, including a cyber capability could add costs and delay its schedule, says Jeffrey Lewis, director of the East Asia Nonproliferation Program at the Middlebury Institute of International Studies at Monterey. Lewis compares the LRSO to the AGN-129A advanced cruise missile, which the Pentagon cancelled in 2012 due to high maintenance costs. As a weapon becomes more complicated, the service risks going over budget, he says.



US Air Force

Current ALCM flies further than its successor

Still, the new Trump administration may be more amenable to spending on the nuclear recapitalisation. "I think the next two years, it's clear sailing for it," Lewis says. "You've got Republican majorities and a president who treats nuclear weapons the same way a 70-year-old man treats a McLaren: it's a luxury buy."

The air force's current timeline projects initial operational capability (IOC) for LRSO around 2030. Col Mark Suriano, director of the air delivered capabilities directorate at the Air Force Nuclear Weapons Center, tells FlightGlobal that source selection is ongoing and the service expects to award technical maturation and risk reduction contracts by the end of this fiscal year, barring protests.

The industrial base has shrunk since the original ALCM was introduced in the 1970s, he says, leaving companies hungrier, more aggressive and more likely to protest.

By the time LRSO reaches IOC, the USAF wants the weapon's reliability perfect in the first lot. The service compared the system to previous programmes, such as the ALCM, which needed more work after the first lot to improve reliability. Conventional weapons can afford to develop throughout production, but that cannot happen with a nuclear weapon, Suriano says. "With nuclear systems, we need to ensure these weapons work only with presidential authorisation," he says. "It's a very stringent and tough requirement. If a conventional system goes off it's bad and a mistake, but it's not a geopolitical incident."

**RANGE REQUIREMENTS**

More telling about the LRSO and its launch aircraft, the next-generation B-21 bomber, is the weapon's range. The LRSO will have a shorter range than the legacy AGM-86B, which can fly more than 1,300nm (2,400km), as USAF requirements constrained the length of the overall weapon system, Suriano says. The AGN-129A boasted a planned range of more than 1,700nm.

If the air force wanted the same range as the ALCM, the new cruise missile would need to be much larger, Suriano says. But then the weapon would have had problems fitting into the weapons bays of aircraft besides the Boeing B-52: namely Northrop's stealthy B-2 and B-21. As such, the LRSO's size could give clues to the scope of the B-21's internal weapons carriage, and suggests that the new bomber is not much larger than its predecessor.

"When you look at the legacy bomber, it has a very large capacity in the bomb bays or externally on the pylons," Suriano says. "When you're looking at new platforms such as B-21 and B-2, we're not expecting external carriage. You're really bound by internal space."

A shorter-range vehicle could also leave the way open for hypersonic speeds. In a February 2015 request for information (RFI), the USAF considered engine options that could support derivative subsonic, advanced subsonic or supersonic speeds. An extremely high-speed capability would compromise the missile's range and stealth aspects, but Suriano notes that low-observability (LO) loses its appeal when a vehicle is travelling at supersonic speeds. "Take an ICBM; the re-entry vehicle," he says. "It's hard to stop it. If something is moving that fast the LO is the least of your problems."

Not listed in the RFI was an engine that could support hypersonic ranges, although the USAF is not ruling that out. Suriano says he cannot not elaborate on the type of flight regime the LRSO would enter, but mentions considerations such as the programme's timeline and advanced integrated air defences.

"I wouldn't take anything off the table," he says. "There's a lot of technologies being investigated across the board." ■



Etihad Airways Engineering has been selected by Airbus to carry out A380 maintenance, and more MRO partnerships are in the pipeline

# Weighty challenge

The biggest passenger aircraft flying places unusually large demands on its maintenance providers, but many are cautious about investing heavily to service a small in-service fleet

MICHAEL GUBISCH LONDON

As the Airbus A380 nears its tenth anniversary of service entry and demand for heavy checks increases, the airframer is building partnerships with selected MRO specialists in an effort to expand maintenance capacity for the ultra-large type's comparatively small fleet.

Emirates operates almost half of the active A380 fleet and has the largest share of Airbus's order backlog. As the Gulf carrier services its fleet in-house, the number of aircraft accessible to other MRO providers is reduced, which makes investment to expand maintenance capacity a less attractive proposition.

In November 2016, Airbus tentatively recruited Etihad Airways Engineering as a partner to conduct A380 maintenance for third-party customers. Earlier last year, the manufacturer had formed a joint venture with Singapore Airlines' engineering arm to provide heavy checks for A330s, A350s and A380s.

Further partnerships with MROs are planned to support the A380 fleet, Airbus tells FlightGlobal. But the manufacturer insists there is no shortage of heavy maintenance capacity for its flagship type.

However, an A380 operator has told FlightGlobal that finding vacant heavy maintenance slots for the aircraft has been a challenge.

Lufthansa, for its part, has directed heavy

checks for some of its A380s away from its maintenance division's facility in Manila – Lufthansa Technik's (LHT) principal location for A380 heavy checks – partly because it lacked capacity during the required timeframe.

During the winter 2015-2016 period, Lufthansa Technik Philippines (LTP) completed 3C-checks – or intermediate layovers, which are scheduled after six years of operation – on two of the parent's 14-strong A380 fleet, while a third aircraft was serviced by SIA Engineering in Singapore.

LTP specialises in airframe maintenance of Airbus models and serves a range of A380 operators, including Asiana Airlines and Qantas. In 2016 it won a long-term contract with

British Airways to support its A380 fleet, and LTP has also supported Air France A380s.

But for the winter 2016-2017 timetable, LHT allocated the next round of 3C-checks for Lufthansa's fleet to its headquarters in Hamburg. The three aircraft in question were, it turned out, among the last to undergo scheduled heavy maintenance there, as LHT revealed late last year a decision to terminate aircraft overhauls at the site in 2017.

**“The A380 [MRO] market will continue to remain a niche market in the long term”**

Rainer Janke

Vice-president marketing and sales, Lufthansa Technik Philippines

Airbus's head of A380 programme support, Christian Fremont, says the manufacturer has been monitoring the fleet since service entry with the aim of ensuring enough maintenance capacity is available as the fleet matures. Since regular checks are scheduled over set timeframes, the manufacturer and operators know in advance what capacities will be required. “Up to now, we didn't have any issues [or] problems of lacking MROs for supporting major layovers on A380s,” Fremont says.

**PLANNED INCREASES**

At the end of 2016, some 11 maintenance providers were capable of completing C-checks for A380s, Airbus information indicates. These are mainly technical departments of the aircraft's operators, such as Air France Industries (AFI), Emirates Engineering and Korean Air's maintenance division. But the list also includes Elbe Flugzeugwerke – Airbus's German-based modification joint venture with ST Aerospace – and Guangzhou Aircraft Maintenance Engineering, which is part-owned by A380 operator China Southern Airlines.

A further three or four maintenance providers will be added to the group in 2017, says Airbus's head of services marketing and business development, Serge Panabiere. “In anticipation with the market request, we will continue to strengthen the capacity and partner with [MRO] companies,” he says. “We have planned [capacity increases] for 2017 and we have planned for 2018. It is not a reactive mode, it is really a proactive mode... to avoid a capacity shortage.”

Ameco Beijing is not part of the group today, but might be a suitable candidate for co-operation. The joint venture between Air China and Lufthansa has a hangar that can accommodate four A380s; and it completed A380 wing-rib modifications on Airbus's behalf in the past, as one of four manufacturer-appointed MROs. But today, Ameco does not list A380 base-maintenance capabilities on its website.

All of the hangars at Emirates Engineering's sprawling base in Dubai can accommodate A380s, and the carrier naturally has extensive experience with the type. But Emirates has in the past told FlightGlobal it has no intention of conducting airframe checks for third-party customers.

**INVESTMENT TO EXPAND**

Airbus's partnerships with SIA Engineering and Etihad Airways Engineering have so far not led to additional hangar space for A380s. Both already serviced the type at their facilities before the tie-ups with Airbus. However, the manufacturer says it has made investments in training, tooling and spare parts that have expanded heavy maintenance capacity for the entire fleet. “We recognise that Etihad already had experience with [A380] maintenance. [But] being ready for the 3C-check is a different story,” Panabiere says. “Even though we are playing with very well-known companies and

MROs, we have brought up the capacity to a level which was not the same [as in 2015].”

Panabiere indicates that financial support by Airbus is necessary to expand maintenance capacity, as a “fair balance between needs and resources” is required to ensure enough capacity is available on the market. “It is... about having maximum capacity everywhere to absorb any surge of workload, which is quite difficult to do, because it is a lot of money [that needs to be] invested.”

This raises the question whether MRO providers have been reluctant to make the required investments on their own in view of the limited business opportunities for the comparatively small A380 fleet. With the exception of All Nippon Airways – which in 2016 confirmed a three-unit order – operators have already selected maintenance providers for their A380s. Furthermore, as both the number of A380 operators and the number of aircraft per airline are relatively small – ex-▶

**Age profile of in-service commercial A380s**

Operator	No of aircraft	Build years
Air France	10	2009-2014
Asiana Airlines	6	2013-2016
British Airways	12	2012-2016
China Southern Airlines	5	2011-2012
Emirates	92	2006-2016
Etihad Airways	8	2014-2015
Korean Air	10	2010-2014
Lufthansa	14	2009-2014
Malaysia Airlines	6	2011-2012
Qantas	12	2008-2011
Qatar Airways	7	2013-2016
Singapore Airlines	19	2006-2012
Thai Airways	6	2012-2013
<b>Total</b>	<b>207</b>	

Source: Flight Fleets Analyzer, January 2017



Air France is one of several operators using in-house technical divisions for maintenance

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» cepting Emirates' fleet – there appears limited scope for MRO providers to generate scale efficiencies.

Meanwhile, the aircraft's size demands more resources – such as large teams of technicians and specialised tooling – than other types. The 3C-check, in particular, covers cabin maintenance and requires the removal of interior equipment. Such efforts on the A380 are equivalent to servicing two conventional widebodies. And, Fremont argues, airlines tend to pay special attention to high cabin standards on their A380s as the aircraft is seen as the flagship of their fleet.

LTP vice-president marketing and sales Rainer Janke tells FlightGlobal that “the A380 [MRO] market will continue to remain a niche market in the long term” because Emirates' large fleet is not accessible to third-party maintenance specialists. He adds that there may be opportunities for cabin modifications on aircraft with expiring lease contracts, if new operators can be found for such aircraft.

AFI and LHT both set up their purpose-built A380 hangars – at Paris Charles de Gaulle and Frankfurt, respectively – such that they could be expanded, but this has not yet happened.

Janke says the A380 base-maintenance market will be characterised by “limited growth” over coming years, and that this will be driven mostly by increased heavy check demand for an ageing fleet. Meanwhile, he adds, “capacity demand for structural modifications [such as mandated work on cabin doors and flap track fairings] will continue to be high”.

## NO SPECIAL TREATMENT

Asked whether Airbus was forced to make investments for the expansion of A380 maintenance capacity because the market would not by itself provide enough, Fremont responds that “it is in the DNA of Airbus to accompany the customers” throughout a product's lifecycle. He acknowledges that no such

## A380 backlog

Operator/lessor	No on order
Air Accord	3
Air France	2
All Nippon Airways	3
Amedeo	20
Emirates	50
Etihad Airways	2
Qantas	8
Qatar Airways	3
Singapore Airlines	5
Virgin Atlantic	6
Undisclosed commercial customer	10
<b>Total</b>	<b>112</b>

Source: Flight Fleets Analyzer, January 2017

investment was required for the A320 family, because a wide range of aftermarket players – such as MROs, spare-parts suppliers and lessors – was available as a result of that family's large fleet size and long production run, plus the fact that narrowbodies tend to change between operators more frequently than larger types. The situation is different for widebodies, Fremont suggests. “On the long-range types and on the A380, I think the customers expect more from us,” he says, adding: “There is no specific process for the A380.”

Closer co-operation between manufacturers and MRO providers has been a trend for some time, as OEMs target a bigger slice of the aftermarket business. Airlines and manufacturers arrange long-term service agreements as part of aircraft acquisitions, and maintenance companies form partnerships with OEMs to gain access to repair know-how for new-generation equipment.

Limited business opportunities in the A380 MRO market have been a reason that operators and maintenance providers have teamed up with Airbus to support the type, Panabiere

concedes. But he argues that “there are a lot of different factors”. For example, some airlines want to concentrate on core air transport operations, while others are opting to outsource maintenance for new-generation aircraft until support for that equipment has become more widely established.

In the aircraft-painting arena, Airbus admits there has been a capacity shortage for the A380. It says: “A380 paint capacities could not match the expectations of our customers in the recent past.” This is echoed by LTP's Janke: “In the medium term, the market requires additional painting capacity. But the investment requirement is too high, considering the market potential.”

Airbus says it has “encouraged” several paint specialists to build hangars for the A380. Three service providers will open A380 paint facilities in 2017, and a fourth will join that group in 2018, says Fremont. One of these companies is the aircraft storage and dismantling specialist Tarmac Aerosave, which is co-owned by Airbus, Safran and French waste-management firm Sita. But Fremont says the others are independent companies and that “we are not speaking of partnerships or JVs” with Airbus.

## EVENT HORIZONS

In order to gain further efficiencies in the support of the A380 fleet, Airbus is making efforts to increase intervals between scheduled checks and thus reduce the number of required maintenance events per aircraft. The European Aviation Safety Agency has already approved increasing the interval between A-checks by 250h to 1,000h. Now, Airbus is targeting an increase in C-check intervals, from two to three years.

Today, A380 operators need to complete two C-checks before an intermediate layover, or 3C-check: after six years of service, and again after 12 years. If the planned C-check interval increase is approved, operators will need to complete only a single C-check before the intermediate layover. This would not only raise efficiency for operators but, perhaps more significantly for MRO providers, vacate maintenance capacity for the A380.

Airbus says the maintenance programme escalation is partly a result of a “low findings rate” during checks on the existing fleet. The omission of a C-check during a six-year cycle will not be a trade-off that leads to intensification of other base-maintenance events, the manufacturer stresses. “We don't expect to have more work during the two remaining C-checks, because what we are doing is expanding the interval between the tasks rather than just splitting the work,” it says.

The engineers in Toulouse expect that EASA approval for the C-check interval increase will be granted by early 2018. ■



Lufthansa has the capacity to expand A380 work but is cautious about prospects for growth

From yuckspeak to tales of yore, send your offcuts to [murdo.morrison@flightglobal.com](mailto:murdo.morrison@flightglobal.com)

## A new race to save last Vulcan

Fifteen months after her final flight and 57 years after her maiden sortie, the last Avro Vulcan faces an uncertain fate. Vulcan to the Sky Trust, the charity that restored XH558 and flew her at air shows for eight years, has been forced to tow the bomber from her period hangar home at Doncaster Sheffield airport and place her in storage.

This creates a funding challenge for the trust, which cannot earn money from the Vulcan necessary for her upkeep and will have to lay off two-thirds of its 22 staff. VST has launched an appeal to raise £100,000 – to be matched by corporate and other supporters – to successfully hibernate the Cold War veteran until a new display area can be built.

Ultimately, VST wants to develop a Vulcan Aviation Academy & Heritage Centre at the airport, focusing on the restoration of UK jet-age aircraft and including educational and training facilities as well as a display hangar from which XH558 could be maintained and taxi regularly. In the meantime, the organisation needs cash simply to keep the Vulcan from deteriorating.

VST chief executive Dr Robert Fleming, who led the efforts to keep XH558 in the skies, says that time is running out to raise the money.

“The trust needs these funds urgently to survive. I encourage everyone who shares this vision to do whatever they can to



As used by Val Kilmer...



help,” he urges, arguing that the aircraft’s role in technical education is vital.

“The Vulcan is one of the most significant steps forward in aerospace technology, and it is thoroughly British. She fires young people with a passion for engineering and innovation,” he says. “We intend to build on those qualities to inspire the new generations of engineers that Britain needs so badly.”

## Keep it simple

“Under LessorCare, customers will sign one, simple agreement covering all Rolls-Royce Trent engine types,” a press release from Derby informs us.

A case of, when it comes to paperwork at least, Lessor’s less rather than more.

## Salt seller

Budgie staffer Stephen Trimble @FG\_STrim is impressed with this winter product (left). He tweets: “Finally! Ice-melting salt marketed to appeal to both commercial and military aviation geeks.”

## Pie in the sky

Strategically Holistic Autonomous Radios Existing in Temporary Heterogeneous Environment Participating in an Intelligent Ensemble = Share The Pie.

Thanks to @TheWoracle, formerly of this parish (now whatever did happen to him?), for tweeting that tasty piece of US Air Force yuckspeak – a yuckronym, if you will.

## Nice work

Business aviation lobby groups preach relentlessly that private jets are overwhelmingly business tools – “time machines” for busy executives.

But statistics from one online private jet charter programme may do little for the image of airborne offices zipping their precious cargo from one power meeting to the next. Three of PrivateFly’s top five enquired-about destinations are those cauldrons of commerce Ibiza, Nice and Las Vegas. We are relieved it is not all work and no play for the high-flyers.

## India taking off

In Lord Montagu’s opinion mails and passengers

**100 YEARS AGO**

between India and England will in ten years’ time be conveyed by air ... and that the time taken would be from three to five days.

## Churchill returns

After the flight of 3,365 miles across the Atlantic,

**75 YEARS AGO**

the British Airways’ flying-boat *Berwick* [a Boeing 314]

which bore the Prime Minister and his party on their journey home from the United States, touched-down at Plymouth within one minute of its estimated time of arrival.

## Short-haul jet

The Fairchild Hiller Corporation announced

**50 YEARS AGO**

plans to build the first short-haul jet to be designed specifically to

suit the needs of America’s regional air-lines – an estimated market of 250 aircraft. Designated F-228, the aircraft is a 50-seat short-bodied version of the 60-seat Fokker F.28 Fellowship.

## Not a victory

The USA has not, as President George Bush

**25 YEARS AGO**

claims in what must surely rank as the silliest statement of the

decade, “...won the Cold War”. What it has won ... is a precious, small amount of time in which to restructure its economy in the absence of a Cold War.

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### Engineers, not professors

I agree with most of the points raised in Peter Bishop's recent letter on the new generation of engineers: "Engineers must learn the basics" (*Flight International*, 17-23 January). I would add a few points.

University grading systems reflect the aptitude of the student to be a future academic. Higher education for engineers must change to accommodate the needs of the engineering profession. The assessment must reflect the student's ability to be a proficient engineer, not a professor.

His other points about the dearth of practical hobbies are more contentious. Those of us who are ancient cannot expect young people to have the same hobbies as in days of yore. The examples quoted by Mr Bishop – building model aeroplanes, rebuilding cars etc – are historic indicators of a desirable mindset and ability. A study of the hobbies that are common today could identify equally effective indicators of aptitude.

**David Nixon**

Los Altos, California, USA

### ENGINEERING

## 'Old dinosaurs' eager to return

I wholeheartedly agree with the Peter Bishop's recent letter (*Flight International*, 17-23 January) concerning the need for a "back to basics" approach to the training of young aerospace engineers.

And with regard to Richard Masters' letter, "From coalface to classroom" (*Flight*

*International*, 24-30 January), may I suggest that there is a large pool of knowledge and experience waiting to be tapped by the colleges. "Old dinosaurs" like myself would be only too pleased to spend a few hours a week (for a suitable fee to help with the pension) boring the socks off the youngsters with tales of the "good old days".

With over 50 years' stressing experience in the industry, I would be pleased to relate, for example, how I helped to calculate the perturbation shear flows on the fuselage of Concorde, by hand.

Perhaps *Flight International* would consider starting a register of people such as myself for circulation to the colleges, before it is too late?

**Peter Gambardella**

Farnborough, Hampshire, UK



Bored by tales of the "good old days"

### Futile theorising

In the last paragraph of his letter, "Don't give up on MH370 theory" (*Flight International*, 17-23 January), Richard Lloyd correctly remarks on the "black mark" on commercial aviation, but links hypothesis with unreliable evidence.

There is a dearth of dependable evidence available, so there is little point in theorising. All we really know is that there was a sudden and complete loss of HF and VHF communication with MH370, but it continued to follow a controlled flight path throughout the night for hours afterwards.

The so-called "radar evidence" is extremely dubious. Without an active transponder, the military radar operators can have no idea of who it is they are picking up. Moreover, they have bearing but no altitude information, so their statements about MH370 climb and descent are pure guesswork – and irresponsible. Perhaps their "evidence" is more driven by a cultural desire to please than reality. It should also be noted that all this took place in the dead of night – and how many military radars are likely to be manned intensively at night in the absence of any military threat?

There is nothing to substantiate

the statements that "the crew lost control within 20min" nor that "fire is a likely cause".

If it were a catastrophic fire, it is incredible that MH370 should survive for many hours. If it was a suicide, the changes in direction of its flight path and its duration indicate a most devious mode of execution – and quite unlike the aviation suicides on record.

If one chooses to ignore the radar evidence and rely on the satellite data, the flight path suggests that MH370 might have remained under crew control, but had no accurate bearing information and its turns were misjudged in attempting to return to base – but who knows? Why would the standby magnetic compass not have met their need – unless they were in total darkness?

**Malcolm Bowden**

McDonald, Tennessee, USA

### Duplicate entry

In your Airline Safety feature (*Flight International*, 17-24 January), you publish a useful table of 2016 accidents and incidents.

To be useful, though, it has to be accurate. The table shows: 13 June. Trigana Air Boeing 737F (PK-YSY) – the hull was written off. Then on the next page: 13 September. Trigana Air 737F (PK-YSY) – heavy landing.

Please publish the explanation, or is one of the registrations misquoted?

**Graham Woodward**

via email

*Editor's reply: Due to a transcription error in FlightGlobal's Ascend database, the accident was recorded on the wrong date and inadvertently added to the tables. The correct entry was for 13 September 2016.*



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aviationafrica.aero

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Avalon 2017  
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airshow.com.au

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Big Sky, Montana, USA  
aeroconf.org

### 6-9 March

HAI Heli-Expo  
Dallas, Texas, USA  
helixpo.rotor.org

### 14-16 March

IATA World Cargo Symposium  
Abu Dhabi, UAE  
iata.org/events

### 19-21 March

Routes Asia  
Okinawa, Japan  
routesonline.com

### 21-25 March

Langkawi International Maritime & Aerospace Exhibition  
Langkawi, Malaysia  
limaexhibition.com

### 4-6 April

Aircraft Interiors Expo  
Hamburg, Germany  
aircraftinteriorsexpo.com

### 4-7 April

LAAD Defence & Security  
Rio de Janeiro, Brazil  
laadexpo.com.br/2017/en.html

### 8-11 May

Xponential unmanned systems and robotics  
Dallas, Texas, USA  
xponential.org

### 22-24 May

European Business Aviation Convention & Exhibition (EBACE)  
Geneva, Switzerland  
ebace.aero

### 4-6 June

IATA Annual General Meeting  
Cancun, Mexico  
iata.org

### 19-25 June

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siae.fr

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airtattoo.com

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- Proposals/Offers are to be submitted to General Manager (Corporate Planning), Biman Bangladesh Airlines Limited, Head Office, Balaka, Kurmitola, Dhaka-1229, Bangladesh latest by 1000 hours BST (0400 hours UTC) on 22 February 2017 through Courier Service or dedicated e-mail to [dacpm169@bdbiman.com](mailto:dacpm169@bdbiman.com) The Proposal(s)/Offer(s) will be opened on the same day immediately after the closing time and date in presence of the Bidder(s), if any. No Proposal/ Offer will be accepted after the closing time.
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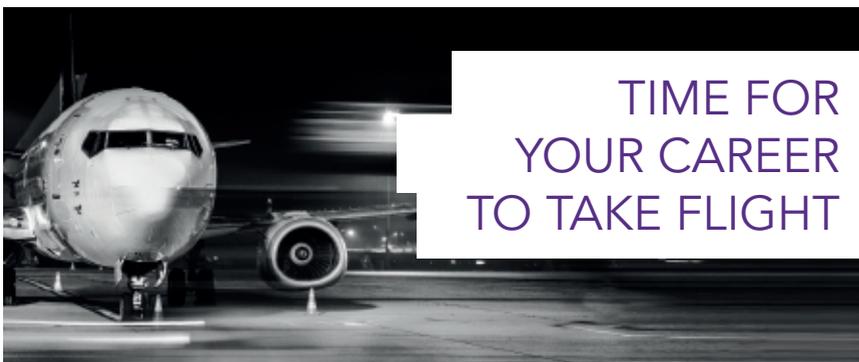
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**Alternatively you can contact Mike Sparrow, Airport Manager, London Oxford Airport, on 01865 290685 or email [mssparrow@londonoxfordairport.com](mailto:mssparrow@londonoxfordairport.com).**

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WORK EXPERIENCE PEGGY CHABRIAN

# Inspiring flyers from the ground up

Founder and president of Women in Aviation International Peggy Chabrian is an educator, pilot and qualified flight instructor. WAI represents around 12,000 women – and men – from across the industry

## How did your career in aviation begin?

The summer between my junior and senior years in college, I took my first airplane flight in a 1946 Ercoupe and began taking flight lessons a few weeks later. While working on my cross-country time, I was looking for ways to make money to help pay for my instruction. The airport I was training at didn't have a ground school, so I decided to start teaching ground school one night a week. I then taught ground school classes or flight instructed in Georgia, Alabama and Tennessee while working on my bachelor and master degrees in aviation at Middle Tennessee State University. I earned my doctorate degree at the University of Tennessee and then went to Georgia State University to teach, and within a year was their aviation department chair. A year later, I joined the faculty of Embry-Riddle Aeronautical University – Daytona Beach. It was a great way to connect my passions of aviation and education. I still fly today and own a Cessna 150, my favourite to fly. My certificates include commercial, instrument, commercial flight instructor, and helicopter, private, single- and multi-engine ratings.

**What is your role as founder and president of Women in Aviation International?**

I am a facilitator for our staff and membership. Our annual international Women in Aviation conference, scheduled for 2-4 March 2017 near Orlando, Florida, takes



Peggy Chabrian (right) with WAI members at an industry event

a lot of organisation bringing together speakers, educators, tours and exhibitors, as well as executing Girls in Aviation Day, Orlando. I also oversee how all these resources can be provided to our members. We provide a myriad of benefits, including hundreds of scholarships, mentoring and discount programmes, and resources such as the Pioneer Hall of Fame, and Women Ventures.

## What do you enjoy about the job?

I enjoy meeting and interacting with our members at various aviation events. In 2016, our scholarship programme hit the \$10 million mark. This significant milestone now provides us the opportunity to hear the inspiring stories of our more than 1,300 past winners in a series in our *Aviation for Women* maga-

zine called "Where are they now?" You can find yourself in the day-to-day work routine, but then when you put all the pieces together – hearing about the successes of our past scholarship winners and talking to people at the conference – it's a very rewarding job.

## What's your biggest challenge?

Some four years ago social media spread the word that many of the airlines that were hiring were exhibiting at our upcoming conference. When the exhibit hall opened, we had long lines of people (mostly men in suits!) waiting for the opportunity to interview with an airline. We have refined the process since then. Another example is the decision to dedicate an event to "bring your daughter to the

conference" – a step to inspiring future female aviators. This conference event eventually grew into the now annual organised Girls in Aviation Day. Since WAI became an organisation in 1994, it was never the intent to exclude men from becoming members. In fact, many of our speakers, conference attendees and volunteers are men. I think this has actually been a part of our success. While the Ninety-Nines (I've been a member since 1978) is only for women, WAI is proud to have men making up about 30% of our membership.

## What do the next 12 months hold for WAI?

As part of our strategic plan, we will continue to expand our membership base by focusing on all aviation and aerospace career options, including flight attendants, engineers and maintenance technicians. We will continue to grow the Girls in Aviation Day programme as the third annual event is planned for 23 September 2017. While this important programme – to interest girls aged 8-17 in aviation – is in its infancy, last year 68 WAI chapters held 71 GIAD events across the world. ■



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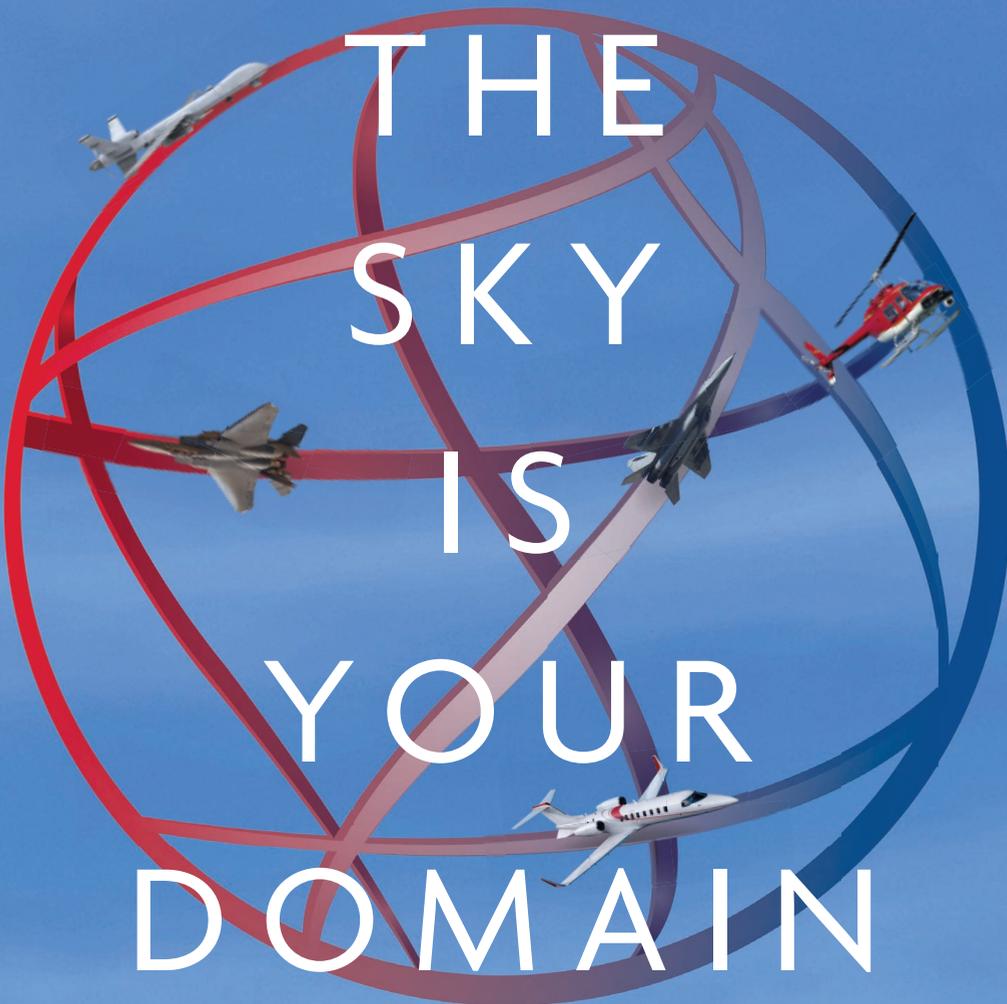
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