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Domestic ARJ21 soars for Chinese carriers **12**

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Wellington goes in search of 757-200 combi successor P20

New Zealand Defence Force

BEHIND THE HEADLINES

Alfred Chua assesses the significance of China's big three airlines simultaneously introducing the ARJ21 to domestic service (P12). Greg Waldron interviews the chief of the Royal New Zealand Air Force (P20). And our reporting team looks ahead to Farnborough's online FIA Connect gathering (P24)



Markus Mairhofer/Shutterstock

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AirTeamImages

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With Farnborough 2020 falling victim to the pandemic, its replacement is FIA Connect, a series of virtual events with FlightGlobal as official media partner. To set the scene, we take a look at three hot topics as the industry slowly climbs out of lockdown



Sydney Seaplanes

Crash probe finds carbon monoxide evidence P22



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Image of the week

A Qantas Airbus A380 (VH-OQE) is pictured arriving at Victorville airport in California on 6 July: one of two superjumbos to be placed in long-term storage at the site by the carrier. The coronavirus downturn earlier this year has prompted Qantas to mothball its 12-strong A380 fleet for at least a three-year period

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Gene Blevins/Zuma Wire/Shutterstock

The week in numbers

10-15%
MTU Aero Engines

Planned workforce reduction by end-2021 at MTU Aero Engines, owing to impact of the coronavirus pandemic

\$400m
FlightGlobal

El Al rescue package – \$250m state-backed bank loan and \$150m share issue. Israeli flag carrier could be renationalised

10m
FlightGlobal

Europe-China transit passenger volume managed pre-crisis by Aeroflot, a 'very profitable' flow it is 'eager' to recover

NEXT WEEK DIGITAL ONLY

We ask whether hydrogen fuel cells – already being tested by companies such as ZeroAvia – could overtake battery technology in aviation's pursuit of carbon-free operations. Plus, more coverage from the run-up to the FIA Connect event

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The Fund an Angel Cocktail Reception will raise critical funds for Corporate Angel Network, which helps cancer patients access the best treatment centers in the country by arranging free travel on corporate aircraft. Held on the second evening of NBAA-BACE, the event will feature light refreshments, an exciting silent auction and networking with business aviation leaders.



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– Caregiver of CAN Patient

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Early warning system

Miner improvement

Some safety issues are only solvable with sophisticated solutions, but the dangers of carbon monoxide poisoning in general aviation are easily abated

Close to half a century ago, a 1974 edition of the Australian government's *Aviation Safety Digest* – a publication freely distributed to the country's pilots – wryly remarked that keeping a canary in the cockpit to warn of the presence of carbon monoxide was probably an impractical measure.

"Most pilots would agree that this method of detection is hardly appropriate for use in aircraft," it said, recommending that pilots suspecting a problem should arrange a cabin air sample test with the government.

The lethal nature of carbon monoxide – a colourless, odourless, molecular gas capable of hijacking the transport by haemoglobin of oxygen through the bloodstream – is a quirk of chemistry, whereby elements ordinarily harmless, or even essential to life, become toxic through simple atomic combinations.

Using caged canaries as a rudimentary warning system – an idea credited to the Scottish physiologist John Scott Haldane – had long been a feature of the mining industry.

The birds were sensitive to concentrations of carbon monoxide, and reacted to the gas far sooner than workers in the pits. Some cages were fitted with small oxygen cylinders – not for the miners' benefit, but to revive the birds if they were overcome.

Canaries were still a part of mining more than a decade after the *Aviation Safety Digest* comment, before tradition was inevitably overtaken by technology.

Miners carry alarms underground because the carbon monoxide threat, like firedamp

and coal dust, was part of the job, a risk during every descent.

Not so in general aviation, where the complexities of flight push the relative improbability of carbon monoxide contamination down the priority list.

"Pilots often overlook or dismiss the onset of symptoms and don't connect them with the possibility of exposure," says the US National Transportation Safety Board.

Pilots often overlook or dismiss symptoms and don't connect them with the possibility of exposure to carbon monoxide

Safety regulators have urged aviators to become familiar with engine exhaust systems and the hazard posed by leaks from cracked or fractured pipes. But their simplest advice to pilots is to take a "canary" into the cockpit, a modern sensor-detector which will sing an electronic warning before dizziness, nausea and disorientation set in.

If pilots cocooned in a cabin at altitude are as vulnerable to poisoning as miners working the tunnels beneath the earth's surface, the wisdom of a modern take on a decades-old idea is surely beyond question.

As below, so above.
See **Business Aviation P22**

Learning curve

From a certain standpoint it is easy to dismiss the Comac ARJ21. Cynics scoff that it is nothing more than a warmed-over McDonnell Douglas MD-80, offering airlines yesterday's technology today.

A development cycle that stretched across decades and early production examples that appeared to lack sophistication – Wikipedia describes the regional jet as "structurally conservative" – have done nothing to dispel the impression of a deeply underwhelming programme.

Until nearly \$4 billion-worth of orders arrived from China's big three carriers last year, the ARJ21 appeared destined solely for the country's second-tier operators.

Of course, with Beijing holding a stake in all the businesses involved, there will always be doubts about the motivation for the orders in the first place, but the success of the programme should not be judged on those deals in isolation.

It is the simultaneous delivery of the first examples to those blue chip carriers – Air China, China Eastern Airlines and China Southern Airlines – and the increasing maturity of the twinjet and Comac's manufacturing and support processes that are the key measures.

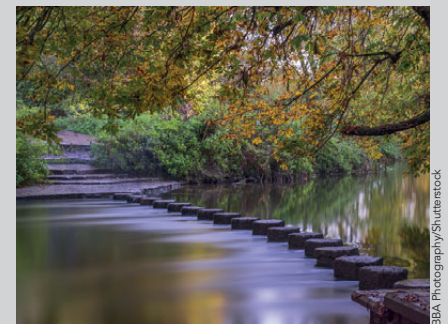
Yes, the ARJ21 can be viewed as a modest success in its own right, but its value will be seen further down the line as the airframer's future programmes progress.

Compared with its Western rivals Comac is an aerospace fledgling.

That is the point of the ARJ21 – to allow the manufacturer to hone its design, integration, manufacturing and support capabilities before the arrival of more sophisticated jets such as the C919 and CRJ929.

Whether Comac has learned these lessons remains to be seen, but to assess the regional jet against purely financial benchmarks is to misread the programme's true purpose. ■

See **Air Transport P12**



One step at a time

BRIEFING

NOLINOR'S NEW CARRIER READY TO GO

AIRLINE Canadian passenger and freight charter carrier Nolinor Aviation will launch a new airline later this year, despite the coronavirus-driven downturn. The Montreal-based company says it acquired several Boeing 737-400s fitted with 158 seats earlier this year for OWG (which stands for "off we go") and on 6 July received permission from Ottawa to launch international services.

LITHUANIA CLEARED FOR BLACK HAWK BUY

ACQUISITIONS Lithuania has gained approval from the US Department of State to acquire six Sikorsky UH-60M Black Hawk transport helicopters for an estimated \$380 million. The NATO nation last October selected the type to replace its Mil Mi-8s, with deliveries due from 2024. Washington has also cleared a potential \$23 million deal to supply the Royal Jordanian Air Force with one UH-60M for VIP transport duties.

AEROMEXICO SEEKS LEASE DEAL EXITS

FINANCIAL Grupo Aeromexico, parent of Mexico's flag carrier, has petitioned to be released from aircraft and engine leases as it seeks to shrink its fleet to reduce costs. Aeromexico, which filed for Chapter 11 bankruptcy protection in a US court on 30 June, says it is looking to be released from leases of 10 Boeing 737NGs and nine Embraer 170s. The carrier will continue to operate its fleet of 19 787 Dreamliners.

ATR LAUNCHES CHINESE CERTIFICATION BID

TRIAL ATR has embarked on flight testing to obtain Chinese certification for its ATR 42-600 turboprop. An initial 3h sortie was conducted from Toulouse Francaral airport on 3 July, with personnel from the Civil Aviation Administration of China co-operating with European Union Aviation Safety Agency pilots. The company believes an ATR 42-600 configured with 30 seats offers an "ideal solution" for Chinese regional connectivity.

BELGIAN, DUTCH NAVIES WILL FLY SKELDAR

SURVEILLANCE UMS Skeldar has been selected to supply its Skeldar V-200 unmanned air vehicle in support of a mine countermeasures programme for the navies of Belgium and the Netherlands. From 2023, the company will supply an undisclosed number of V-200s as part of a so-called "toolbox" of unmanned systems employed by a combined 12 surface ships.

SUPERJET TESTS DOMESTIC EQUIPMENT

TECHNOLOGY Irkut has begun testing of a Russian-built inertial navigation system that will feature on a modified version of the Sukhoi Superjet 100. The KRET-supplied BINS-2015 equipment is intended to replace Honeywell-supplied technology currently used on the regional jet. Involving a prototype aircraft, the work is being carried out in connection with the "SSJ New" programme.

ATHENS ORDERS MEDEVAC KING AIR PAIR

PURCHASE Textron Aviation has sold two Beechcraft King Air 350C medical evacuation aircraft for use by Greece's ministry of health. Norwegian charter operator Sundt Air will acquire the 350Cs and deliver them for service entry by mid-2021, the airframer says. To be based in Athens, the twin-turboprops will be outfitted with cargo doors, patient oxygen systems and will be capable of carrying two stretchers.



XB-1 demonstrator will test aerodynamics, construction and engines

PROPULSION JON HEMMERDINGER BOSTON

Projects progress in supersonic race

US start-ups advance rival designs, with Boom preparing flying testbed while Aerion concentrates on synthetic fuel

Two US developers are progressing their supersonic civil aircraft projects, with Boom Supersonic planning to roll out a demonstrator aircraft this year and Aerion Supersonic launching an effort to help develop clean synthetic fuel.

Denver-based Boom plans to publicly unveil its XB-1 one-third-scale demonstrator on 7 October. The aircraft will precede the supersonic Overture commercial jet.

Boom has been advancing XB-1 development during the coronavirus pandemic. In recent months, workers have completed static wing-load tests, mated the XB-1's wings to its primarily titanium fuselage, built the aircraft's vertical stabiliser and completed landing gear tests.

The XB-1 will be powered by three GE Aviation J85-15 engines and will help test aerodynamics, carbonfibre construction technology and supersonic propulsion.

Boom, which had \$160 million in funding as of April, intends to conduct XB-1 ground and low-speed taxi tests at Centennial airport near Denver.

Flight tests, however, will be carried out from Mojave Air & Space Port in California, with assistance from local company Flight Research.

Under Boom's plans, the Overture will have capacity for

55-75 passengers and fly at Mach 2.2. First flight is planned in the mid-2020s.

Meanwhile, rival Aerion has signed an agreement with Canadian company Carbon Engineering (CE) to develop a clean-energy synthetic fuel that would power its in-development AS2.

Aerion, Boom and third supersonic contender Spike Aerospace have all been vocal about their commitment to clean engine technology.

Aerion intends for the AS2's triple GE Affinity powerplants to burn synthetic fuel manufactured through Carbon Engineering's "direct air capture" process.

That involves extracting carbon dioxide (CO₂) from the atmosphere using large fans to pull air over a potassium hydroxide solution, which binds to the CO₂.

The CO₂ can then be combined with hydrogen to create synthetic fuel with "little or no carbon footprint", it says.

Under the agreement between the pair, Aerion and Carbon Engineering will "explore ways in which CE's synthetic fuel... will power Aerion's AS2".

The companies will "also explore a potential collaborative project" to construct a synthetic fuel production facility for the AS2 programme. ■



Hi Fly thinks bigger with A380 freighter
This Week P10

PROPULSION DAVID KAMINSKI-MORROW LONDON

Rolls-Royce clears parked 787 backlog

Engine manufacturer completes upgrade work to fleet grounded by succession of Trent 1000 blade durability issues

UK-headquartered Rolls-Royce has eliminated the backlog of Boeing 787s that were grounded while awaiting maintenance in relation to Trent 1000 blade-durability issues.

The engine manufacturer had expected to reduce the number of 787s awaiting work to single digits by the end of the second quarter of this year.

R-R says the clearance of the backlog means it has “met and exceeded” its own commitment.

“It has been a difficult journey, and one we could never have undertaken without our customers’ patience and support,” it adds.

Three specific blade issues – which emerged in close succession – have affected Trent 1000s over the past four years.

The initial problem centred on sulphidation corrosion on the intermediate-pressure turbine blades, spurring the manufacturer to develop a new blade with improved protective coating.

R-R says the new blade, for all package versions of the Trent 1000, has been installed in more than 99% of the operational fleet.

Resonance vibration originating from fan blades under certain conditions led to the cracking of intermediate-pressure compressor blades, and prompted the modification of the components, initially for Package C engines, with a similar subsequent redesign for the TEN version.

R-R expects the compressor blade roll-over programme for these engine variants to be

completed by the end of 2021, while a redesigned blade for the Package B engine will be available from the fourth quarter of this year.

“We deeply appreciate the understanding of our customers who have been impacted by this situation”

Chris Cholerton

Civil aerospace president, Rolls-Royce

The third durability problem relates to premature deterioration of high-pressure turbine blades.

This has been due to sub-optimal design of small holes in the

blade, through which cool air is blown to protect it from high temperatures.

R-R has developed enhanced blades for Package B and C high-pressure turbines, improving the efficiency of this “film cooling” process, with over half the fleet since modified.

But a modification for blades on the TEN variant remains outstanding. The company says this modified design is undergoing endurance testing – which is over 75% complete – after a “rigorous root-cause investigation” and it expects incorporation into the fleet within the first half of 2021.

R-R says the emergence of the three issues “at the same time” made the matter “more challenging to resolve”, forcing the company to expand its servicing capacity to deal with parked aircraft awaiting blade changes.

Civil aerospace president Chris Cholerton says the elimination of this 787 backlog is an “important milestone” but that the company will remain focused on assisting customers with returning the twinjets to post-crisis service, and completing upgrade work across the fleet.

“We deeply appreciate the understanding and co-operation of our customers who have been impacted by this situation for a long time,” he adds. ■

FORECAST

Long-haul market set to stay ‘subdued’ amid partial recovery

Widebody engine flying hours are forecast to recover to around 70% of last year’s levels during 2021, while engine deliveries will remain depressed, Rolls-Royce says.

It forecasts a 55% overall decline in engine flying hours for widebody aircraft over the course of this year, after a 50% drop in the first half – including a 75% slump in the second quarter and a “low point” of 80% in April.

“We have seen early signs of recovery with a marginal improvement in May and June, led by an increase in flights in China, Asia-Pacific and the Middle East,” says the engine manufacturer.

R-R is expecting further gradual uptake of long-haul routes during the fourth quarter, subject to easing of crisis travel restrictions. However, engine deliveries are likely to remain

“subdued” for this year and next, the company says.

R-R delivered 130 large civil aircraft engines over the first six months of 2020, and is continuing to plan for 250 deliveries for the full year, following production cuts from the major airframers.

Some 8,000 jobs are being shed from R-R’s civil aerospace division, which is having to absorb the main impact of the crisis. ■



Three separate problems have affected Dreamliner powerplant

Phuong D Nguyen/Shutterstock

LOGISTICS LEWIS HARPER LONDON

Hi Fly thinks bigger with A380 freighter

Lessor capitalises on higher cargo demand as coronavirus raises prospects of fresh interest in superjumbo conversion

Portuguese wet-lease operator Hi Fly has brought into service a freight-optimised Airbus A380, which has been temporarily converted from a passenger configuration in a project overseen by Lufthansa Technik (LHT).

The MRO and modification specialist was responsible for technical and engineering support, Hi Fly says of the project, while the work was executed by line maintenance provider, Mesa, at its Lisbon facility.

The economy-class seats have been removed from the former Singapore Airlines widebody, which means the superjumbo can carry “close to 60t of cargo”, Hi Fly says. With the seats removed, pallets can be fitted to the seat tracks.

The aim is to tap into the “high [air freight] demand during the



LHT oversaw modification allowing pallets to be fitted to seat tracks

Covid-19 crisis”, the carrier says.

LHT said in May that it had been awarded the technical and engineering task to support the “operational change” for the double-deck type, but did not name the customer.

Hi Fly notes that the modification is temporary and complies with passenger-to-freight regulatory exemptions drawn up to meet demand during the coronavirus crisis.

LHT says that it will also offer

the conversion as a permanent solution.

The project marks the emergence of A380s for freighter work some 13 years after a dedicated double-decker freighter programme was halted by a withdrawal of customer interest.

With many operators of the A380 either removing the aircraft from their fleets or putting them into long-term storage, this year could see renewed interest in a freighter configuration of the type.

Of the A380’s potential in that regard, Henning Jochmann, LHT’s aircraft modification base maintenance senior director, told FlightGlobal in early June: “At the moment the oil price is very good, and there are logistical limitations, but I expect to see more A380s on the market.” ■



PROGRAMME

KF-X prototype assembly on target

Korea Aerospace Industries (KAI) has issued a first image of a KF-X fuselage undergoing assembly in its Sacheon factory. The company says the first prototype of the twin-engined fighter will be rolled out by April 2021, with test flights to occur between 2022 and 2026. Five prototypes will be produced for South Korea, and another for 20% programme partner Indonesia, as part of a projected \$7.2 billion programme. Series production of a first batch of jets is scheduled to start by 2028, KAI says. The KF-X will be powered by two GE Aviation F414 engines – the first flight-test example of which has already been delivered – with Hanwha Systems to supply an indigenous active electronically scanned array radar for the type.

CANCELLATIONS JON HEMMERDINGER BOSTON

Avolon axes more Max in fresh blow for Boeing

Lessor Avolon has cancelled orders for a further 27 Boeing 737 Max aircraft, striking a further blow to the airframer’s backlog, even as it works to get the narrowbody back in the air.

The 27 cancellations, disclosed by Avolon in a 7 July second-quarter business update, add to the 75 of the type axed by the Dublin-based lessor in April.

Avolon still holds direct orders for 37 737 Max jets, according to Boeing. That is 18 fewer than the 55 Max commitments the firm had after the April cancellations. The figures suggest nine of the latest tranche were for aircraft Avolon had intended to purchase from third parties, likely through sale-and-leaseback deals with airlines.

Avolon did not respond to a request for more information.

“In light of the Covid-19

pandemic, we continue to work with our customers to balance supply and demand with market realities, especially in the leasing sector,” Boeing says.

“We have come to an agreement with Avolon to further restructure their orderbook. We appreciate Avolon’s ongoing commitment to the 737 family through their outstanding orders.”

Boeing has been hit by a string of recent Max cancellations. In late June, Norwegian cut orders for 92 examples, while in early July, lessor BOC Aviation erased 30 aircraft from its orderbook.

So far this year, Boeing’s customers have scrubbed roughly 450 Max orders, according to their disclosures and Boeing data.

Boeing has said it expects Max deliveries will resume late in the third quarter. ■



Why ARJ21's value
is hard to measure
Air Transport P12



Emergency finance measures
are also being investigated

RESULTS GREG WALDRON SINGAPORE

AirAsia Group reels from coronavirus

Auditor warns of 'material uncertainty' over continued ability to trade, but sees some future booking improvement

AirAsia Group's future has been called into question after its auditor raised concerns about the business's ability to continue as a going concern due to deteriorating finances amid the coronavirus pandemic.

However, accountancy firm Ernst & Young (E&Y) says there are signs of hope with an improvement in forward bookings and higher load factors in geographies where domestic flights have resumed. Talks with governments and finance houses over support are also ongoing, it says.

E&Y's statement came as the group released its first-quarter results for the period ended 31 March. "In early 2020, the global economy, in particular the commercial airline industry, faces uncertainty as a result of the unprecedented Covid-19 pandemic," says E&Y's "material uncertainty" disclosure.

"The travel and border restrictions implemented by countries around the world have led to a significant fall in demand for air travel which impacted the group's financial performance and cash flows. These events or conditions indicate existence of material uncertainties that may cast significant doubt on the group's and the company's ability to continue as a going concern."

In 2019, the group suffered a full-year net loss of MYR283 million (\$66 million) and had liabilities exceeding its assets by MYR1.8 billion.

That situation was exacerbated during the first quarter: AirAsia Group was in the red to the tune of MYR953 million, compared with a MYR102 million profit for the same period a year earlier.

However, the auditors note that easing restrictions on interstate travel and domestic tourism in Southeast Asia have provided some relief, with improved seat booking and frequencies. Load factors are ranging between 45-65% in countries where domestic flights have resumed.

INVESTMENT TALKS

Nonetheless, E&Y stresses that the fate of the AirAsia Group depends upon recovery from the pandemic, in addition to the successful conclusion of talks with financial institutions and investors.

AirAsia Philippines is expected to obtain a government-backed loan as part of a local stimulus package. The company is also deferring payment of operating leases, restructuring fuel hedges, and reducing pay.

"The group is currently in the process of negotiating further waivers or deferrals of lease rentals, and restructuring the remaining fuel hedge exposures with supportive lessors and counterparties," says the report.

Chief executive Tony Fernandes describes the coronavirus crisis as the "toughest challenge" the airline has faced since it began operations in 2001. He says the group has been restructured into a

"leaner and tighter ship", reducing cash expenses by at least 50%.

He adds that the company has received proposals from banks and investors in regard to shoring up its capital and liquidity.

Airbus data to end-June shows AirAsia and AirAsia X have a combined 489 narrow- and wide-body jets on order. Fernandes has previously said the group will take no new aircraft this year. ■

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ANALYSIS ALFRED CHUA SINGAPORE

Why ARJ21's value is hard to measure

Regional jet is now delivered to China's three biggest carriers, but programme's true worth may only be realised later

When the “big three” Chinese carriers – Air China, China Eastern Airlines and China Southern Airlines – each took delivery of their first ARJ21s on 28 June, Comac did not miss the opportunity to emphasise the significance of the moment.

“The simultaneous delivery of the three aircraft marks the official entry of the ARJ21... into the fleets of international mainstream airlines,” the Shanghai-based airframer said.

Indeed, the deliveries represent a significant milestone in the development of the Chinese aerospace industry and for the serially delayed ARJ21, which has the distinction of being China's first indigenously designed and built commercial jet.

For many years the regional aircraft had seemed destined to find a market solely with the smaller Chinese airlines. However, that changed in August 2019 when the big three each placed orders for 35 examples in deals worth a combined \$4 billion.

Explaining the commitments, the carriers said the ARJ21s would fill a shortage of feeder capacity and also strengthen trunk routes.

Of course, little happens in China without official government sanction, and all three carriers – as well as Comac – are majority-owned by Beijing.

But is the arrival of the ARJ21 at the big three a sign of a programme that has matured – shrugging off years of delay and initial difficulties – or political window dressing combined with a compliant or captive domestic market?

The answer is likely to be a mixture of the two.

Rob Morris, global head of consultancy at Ascend by Cirium, thinks it probable that pressure would have been brought to bear on the airlines to order domestically-built aircraft – but that may have been accompanied by favourable pricing or finance rates to sweeten the deal.



Lead customer Chengdu Airlines operates 21 examples

But he observes that the West's big two airframers have also been beneficiaries of a political leg-up themselves.

“In this regard it is actually no different to European or US markets from the early days of Airbus and its competitors, where pressure was often evident upon airlines to select domestic technologies,” he says.

“The delivery of the three aircraft marks the official entry of the ARJ21 into the fleets of international mainstream airlines”

Comac

Chengdu Airlines is the lead operator for the GE Aviation CF34-powered ARJ21 by some margin: it has 21 examples in its fleet, plus a further 10 on order. It is followed by Inner Mongolia-based Genghis Khan Airlines, with five ARJ21s delivered and another 20 on order.

Morris points out that although average daily utilisation

appears low, at less than 5h, it is hard to tell how much is due to the coronavirus crisis and how much due to conservative scheduling “in the face of low confidence in dispatch reliability to date”.

“It is likely a mix of both, but as experience builds, so will confidence, and the aircraft should be able to meet typical levels of regional jet utilisation with time,” he says.

Production appears to have overcome early issues, which saw early-build examples returned to the manufacturer for upgrades, and Comac is now assembling the jet at facilities in Pudong and Shanghai at a combined rate of around four aircraft per month.

“As the fleet in service begins to increase, Comac can begin to demonstrate a track record of programme delivery, including product support, which will allow the airlines to become increasingly confident in operation of the aircraft,” Morris says.

But it is worth bearing in mind that for Comac, the ARJ21 programme is not happening in isolation. Morris argues that success for the regional jet should not be measured simply in

dollars earned or the number of aircraft sold.

Comac, he says, has faced a “steep learning curve” just to reach 32 deliveries, and he stresses that the experience gained in “design, integration, series manufacturing and operational support” will be vital for future programmes.

“At present, 27 of the aircraft delivered to airline customers are in service, and will generate some 1,800 flights next month according to the schedules,” he says.

“As more aircraft are delivered to more operators, Comac will gain more experience of supporting the aircraft in service which it can apply to its C919, CRJ929 and other future programmes.”

PRACTICE RUN

Although it seems dismissive to characterise the ARJ21 as merely a practice run for more complex programmes, the lessons learned by Comac – essentially an aerospace start-up – will be key.

And while the service entry date for the C919 narrowbody has slipped, so far there are no signs that the long hiatus between the ARJ21's first flight in 2008 and its 2016 service entry will be replicated. ■



'Slip-up' behind 787's Oslo wing strike
Air Transport P14

SAFETY DAVID KAMINSKI-MORROW LONDON

Trent-engined 787 operators must check for disc fin cracks

EASA set to mandate one-off inspections after assessment of low-pressure turbine parts

Operators of Rolls-Royce-powered Boeing 787s are set to be instructed to conduct inspections of certain Trent 1000 low-pressure turbine discs, over a possible cracking risk.

Assessment of certain discs in service has revealed that rubbing contact with interstage static seals can lead to cracks in the front seal fins – which, in turn, could lead to cracks in the disc.

As an interim measure, the European Union Aviation Safety Agency (EASA) is preparing to mandate inspections of seal fins on the third- and fourth-stage

discs – with specific part numbers – in the low-pressure turbine. The one-time ultra-high-sensitivity fluorescent penetrant inspections should take place at the next engine refurbishment shop visit, according to the proposed directive.

If any cracking is indicated on the seal fins, the disc parts must be replaced.

EASA warns that the condition could lead to propagation of cracking, possible low-pressure turbine disc failure, and expulsion of high-energy debris.

R-R has drawn up a service bulletin, dated 29 June, which

covers the issue. EASA has opened the directive for consultation until 3 August.

Separately, EASA has also warned over unanticipated fuel-pump deterioration, particularly on high-life Trent 1000 engines.

While the issue had originally been thought to affect certain pumps with a specific part number, R-R has developed a service bulletin that extends to additional pumps.

As a result EASA has broadened the applicability of a proposed directive from three to 19 variants of the engine.

EASA says an “unexpected reduction” in fuel-pump performance has been recorded during testing of high-life units – the result of internal components wearing out.

This loss of fuel-pump efficiency is “more pronounced” on higher-rated engines, EASA says, and could result in reduced engine thrust.

As a result, the life limit of the pumps has been reduced and EASA is ordering operators to replace them before this revised limit – depending on the engine model – is exceeded. ■

RESTRUCTURING
LEWIS HARPER LONDON

Lufthansa halves short-term fleet modernisation

Lufthansa will halve the number of new aircraft it takes through to end-2023 and cut 1,000 jobs as part of a second set of restructuring measures announced on 7 July.

Among resolutions approved by the company’s board, a maximum of 80 new aircraft will be added to the group’s fleet through to 2023 – around half the number planned pre-coronavirus.

The targeted aircraft have not been specified, but Cirium fleets data shows Lufthansa Group has almost 200 jets on order.

Lufthansa mainline’s outstanding orders comprise 96 Airbus A320neo-family jets, 27 A350-900s, 20 Boeing 777-9s and 20 787-9s. Swiss’s orderbook includes 23 A320neo-family aircraft, and a single A220-300.

Further measures include cutting 1,000 administrative jobs from the group’s German mainline operation, while leadership positions will be reduced by 20%.

The group’s first set of measures, announced in April, included the reduction of its fleet by 100 aircraft, and an end to operations by its Germanwings unit.

The group’s carriers had around 750 aircraft in service when the coronavirus crisis began. ■



Rolls-Royce

Rolls-Royce has prepared a service bulletin addressing engine issue



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INQUIRY DAVID KAMINSKI-MORROW LONDON

Wet runway warning follows A330 near-overrun

Taiwanese regulators are advising Airbus A330 operators to consider the effects of wet runways on aircraft deceleration after a near-overrun incident at Taipei's Songshan airport.

As the aircraft landed on the wet runway and the thrust reversers

were activated, says the Taiwan Civil Aeronautics Administration, the crew "noticed the loss" of all three primary flight computers.

The aircraft's thrust-reversers, automatic braking system, and spoilers were also unavailable, which affected the A330's deceleration.

"Maximum manual braking was applied, and the aircraft was stopped right before the end of the runway safely," says the administration in a 24 June safety bulletin. The crew then requested towing.

The administration states that the root cause of the failure is "still under investigation".

But the bulletin recommends that A330 operators consider "possible deceleration deficiency" if such conditions occur while conducting an approach to a wet runway.

"If the landing distance available is a concern, consider diverting to an alternate airport," it says. It adds that, if automatic braking is unavailable, the crew should "promptly" switch to an alternate

system or apply manual braking.

The administration's bulletin does not identify the airline involved in the incident – beyond stating that the jet was Taiwanese-registered – or the location.

But Taiwanese newspaper *United Daily News* has reported that a China Airlines A330-300 arriving at Songshan from Shanghai on 14 June experienced the flight computer malfunction and other systems failures.

It reports that the crew initiated manual braking but the aircraft stopped just over 9m (30ft) from the end of the runway. The newspaper indicates that the twinjet – identified as B-18302 – was only lightly loaded, with 80 occupants. ■



Local media reports say China Airlines jet was involved in incident

SAFETY DAVID KAMINSKI-MORROW LONDON

'Slip-up' behind 787's Oslo wing strike

Widebody hit de-icing station lighting mast when staff sent it to wrong position while reorganising aircraft queue

Norwegian investigators have revealed that a de-icing vehicle driver vainly attempted to stop an Ethiopian Airlines Boeing 787-9 from taxiing onto the wrong de-icing stand, before the jet's right wing struck and felled a lighting mast at Oslo Gardermoen.

The aircraft (ET-AUP), which was preparing for departure to Stockholm and Addis Ababa on 18 December 2018, had been given the wrong stand number, despite two de-icing co-ordinators agreeing on the correct stand allocation.

Investigators state that the Ethiopian 787 was part of a queue for de-icing. It was followed by a Lufthansa Airbus A320 an Atlas Air 747.

Gardermoen's B-North de-icing platform has nine parking stands, in three groups of three, of which only the centre stand of each group – numbered 992, 995 and 998 – was suitable for large aircraft.

The two co-ordinators thought the most practical option was to allow the larger 787 and 747 to



Investigators recommend that larger types have anti-collision aids

taxi respectively to stands 992 and 995, ahead of the A320.

This meant reorganising the queue. The inquiry believes this became the "main focus" of one of the operatives and "may have contributed" to his subsequent "slip-up" when he instructed the 787 to use stand 991 instead of 992.

Stand 991 was too narrow for the 787's wingspan. But there was no information in Norway's aeronautical information publi-

cation (AIP) or notices to airmen about which aircraft types could use which de-icing stands, and no signage to warn aircraft crews.

Although the 787 captain saw the lighting mast as the jet taxied slowly onto the stand, and thought the clearance was marginal, he was confident about the instructions he had been given.

He asked the first officer if he could see the distance between the wing-tip and the mast but the

first officer had a limited view.

As the 787 edged forward, the driver of an SAS Ground Handling de-icing vehicle parked at the front edge of stand 991 realised the aircraft was too large.

But the vehicle was an older model and did not have a VHF radio to warn the 787 crew directly, so the driver had to resort to calling the de-icing co-ordinators over an internal radio.

One of the co-ordinators, about 8s before the collision, tried relaying a message to stop the 787 but the jet struck the mast, badly damaging its right wing and causing the mast to collapse.

Accident Investigation Board Norway recommends the AIP is reviewed to state aircraft limitations for de-icing stands, and that technical solutions are found for Gardermoen to stop aircraft being directed to the wrong stand. It is also recommending that European regulators consider requirements to fit large aircraft with anti-collision aids for taxiing. ■

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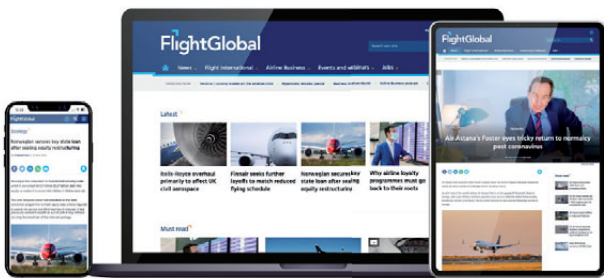
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French navy nears launch of Advanced Hawkeye addition Defence P18

Why resilience is key for aspiring pilots

Covid-19 may have put careers on hold, not least for those still training, but cadets must be prepared to stay the course



DANIEL LAMBETH
FIRST OFFICER,
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If you are a commercial pilot at the moment, there is a good chance that you've been made redundant, furloughed, or at the very least signed off on a sizeable pay cut, as airlines around the world try to navigate the economic fallout of coronavirus.

That career that you've worked so hard and for so long to achieve is approaching a deep stall, and if you have a family or any financial commitments, you may well be asking yourself: "Now what do I do?"

Even those still flying regularly will be concerned about their futures, given that many international and domestic borders remain closed and no clear recovery is in sight; a global pilot shortage has, in the space of a few months, turned into a massive oversupply.

TALES OF WOE

With every day, more individual stories of hardship come to light and a satisfying career to date is little consolation as this dreadful narrative develops.

But there is another group of people for whom the adversity is just as real, even while their aviation aspirations remain unfulfilled. The next generation of professional pilots, those who have invested heavily in their training in the hope of gaining airline employment, are questioning their futures and wondering whether they should stay the course or bail out now. And as a collective, they are wondering: "Now what do we do?"

As aviators, we tend to approach things in a calculated way, looking for and assessing alternatives and quickly formulating the best course of action



Mario Hagen/Shutterstock

Those that use the current hiatus to learn a new skill or gain flying experience will be at an advantage

based on the information at hand. Others, like scientists, have the luxury of time, and that allows them to collect all the evidence before committing to a position.

Although as pilots it is tempting to act based only on what we can see before us in the moment, this is a situation that requires a step back to look at the bigger picture and gain better situational awareness. That's the advice I'd give to anyone questioning their career path at a time when we are all susceptible to getting caught up in the moment.

This is a situation that requires a step back to look at the bigger picture and gain better situational awareness

The industry has been through this before. In the immediate aftermath of the global financial crisis, the 9/11 terrorist attacks, and other crises before that, major airlines around the world ceased hiring, and anyone without a seat in

a commercial jet airliner was left with two alternatives: work in a low-paid general aviation job waiting for demand to rebound, or give up on their aviation dream.

But after each crisis the industry recovered, and as demand for flying surged again, airline flight departments were given licence to resume hiring.

Those that stayed the course reaped the rewards, and not a single one of those pilots would ever talk about their pre-airline experiences in disparaging terms.

In a world more reliant than ever on the connectivity that aviation provides, we can be confident that history will repeat.

SLOW GOING

But that is not to suggest that recoveries are quick or painless: it took six or seven years before hiring by major airlines in the US returned to levels seen before the financial crash and three years after 9/11 for passenger numbers to surpass pre-attack levels.

Remember, too, that not 12 months ago there was an acknowledged airline pilot shortage and the industry was expecting that 800,000 new flightcrew would be needed over the next 20 years. With a wave of retirements due, it

would be folly to suggest that this demand has now vanished.

If there is one characteristic that serves airline pilots well throughout their careers, it is resilience in the face of adversity.

Your career plans may be on hiatus, but those that take the opportunity to complete or extend their studies, learn a new aviation-related skill, get some, any, flying experience, and build resilience, will not be disappointed. History is on your side. There will be a recovery from the economic fallout of this pandemic, and you will be well placed to capitalise on it.

So, let's turn to the question: "Now what do we do?" My response is this: if you ever wanted to be an airline pilot, then be an airline pilot. Your training in resilience starts now. ■

If you are a commercial pilot and fancy writing for *Flight International*, we would love to hear from you. Just send us a brief outline of what you would like to cover and we will get back in touch. We will also be happy to feature your contributions anonymously where needed. Email dominic.perry@flightglobal.com

ACQUISITION
GREG WALDRON SINGAPORE

Further Russian fighters will raise Indian inventory

India's Defence Acquisition Council has approved the purchase of 33 new Russian fighters, comprising 21 RAC MiG-29s and 12 Sukhoi Su-30MKIs. The deals will be valued at Rs74 billion (\$964 million) and Rs107 billion respectively, with the Su-30MKIs to be produced locally by Hindustan Aeronautics (HAL).

Forming part of a Rs389 billion package of spending approved for India's armed forces, the new purchases will be supplemented by a programme to upgrade the Indian air force's 59 in-service MiG-29s to an M-model standard. The service will also receive an unspecified number of the locally developed Astra beyond-visual-range air-to-air missile to enhance its capabilities.

A follow-on MiG-29 acquisition received fresh impetus after a recent border squabble with China, in which several soldiers from each nation were killed.

While the addition of new fighters and upgrades to older types will go some way to shoring up New Delhi's defensive capabilities, the pace of India's air power development has lagged that of China's for the past two decades.

The Indian air force has several outstanding requirements for new aircraft, including a long-running need for 110 advanced fighters. Candidates include the Boeing F/A-18E/F Super Hornet and F-15EX, Dassault Rafale, Eurofighter Typhoon, Lockheed Martin F-16V/F-21, and Saab Gripen E.

However, New Delhi's direction on this requirement is far from clear, with officials publicly flirting with the idea of modernising the air force fleet with locally-produced types; namely the HAL-built Tejas and developmental Advanced Medium Combat Aircraft.

The re-emergence of great power tensions could give these and other Indian air force needs a renewed emphasis. ■

See Feature P32

PROCUREMENT ALFRED CHUA SINGAPORE

French navy nears launch of Advanced Hawkeye addition

Washington endorses potentially \$2 billion order for three airborne early warning assets

The US Department of State has given its approval to the potential sale of three Northrop Grumman E-2D Advanced Hawkeyes to France.

To be completed using Washington's Foreign Military Sales funding mechanism, the deal for the airborne early warning and control system aircraft will total around \$2 billion.

In addition to the carrier-based surveillance aircraft and their Lockheed Martin APY-9 radars, the proposed sale will also include four spare Rolls-Royce T56 engines, self-protection equipment, and logistics and support services.

The French navy currently operates a trio of E-2Cs, including from its lone aircraft carrier, the *Charles de Gaulle*. Cirium fleets



Paris is seeking a replacement capability for carrier-based E-2C fleet

data shows that the fixed-wing assets are aged between 16 and 22 years.

"The proposed sale will improve France's capability to meet current and future threats by providing its naval air forces with a sustainable follow-on capability

to their current, legacy E-2C Hawkeye aircraft," the US Defense Security Cooperation Agency notes.

Paris would follow the US Navy and Japan Air Self-Defence Force in fielding the next-generation E-2D. ■

UNMANNED SYSTEMS IGOR SALINGER BELGRADE

Belgrade gains armed Chinese UAVs

Serbia has taken delivery of six China Aerospace Science and Technology-built Cai Hong ("Rainbow") CH-92As, marking the first acquisition of a Chinese armed unmanned air vehicle (UAV) by a European military.

Recently displayed to military officials at Batajnica air base, the tactical UAVs can be armed with the FT-8C laser-guided missile,

which the defence ministry says has an effective range of up to 3.7nm (6.8km).

Serbian defence officials say the nation has acquired "two complete systems, including six drones", along with an initial 12 FT-8C weapons. However, they note that work with Chinese counterparts to transfer technology including avionics equipment

for integration with Belgrade's developmental Pegaz ("Pegasus") UAV is "much more significant than the purchase itself".

Two Pegaz prototypes are to be redesigned in China by year-end, and an order for 12 examples is expected.

Serbian air force chief General Dusko Zarkovic says that an acquisition of six more armed UAVs would be "optimal" for the service. Using the type, it plans to re-establish its 353rd reconnaissance squadron, which previously operated versions of the Soko J-22 Orao and Mikoyan MiG-21.

Meanwhile, Nenad Miloradovic, assistant minister responsible for defence technologies and procurement, says the nation plans to develop its own platform "larger than CH-92", and a laser-guided missile to arm the type. ■



Aircraft have been handed over with 12 FT-8C laser-guided missiles



Wide remit drives a versatile approach
News Focus P20

PROGRAMME GREG WALDRON SINGAPORE

Seoul set to produce surveillance UAV

Medium-altitude, long-endurance type readied for manufacture as Korean Air examines possible overseas partnerships

Korean Air is preparing to begin mass production of its Medium Altitude Unmanned Aerial Vehicle (MUAV), but its 500MD unmanned helicopter effort has been placed on hold.

The company confirms development activities for the MUAV programme are nearly complete, with a production start imminent.

“We are looking into overseas partnerships and considering various options,” the company adds.

Citing customer sensitivity, Korean Air declines to reveal the number of unmanned air vehicles to be built, or to disclose when the type will enter service.

A full-scale mock-up of the MUAV, designated the KUS-15, was displayed at last year’s Seoul ADEX defence show. The medium-altitude, long-endurance type

is intended to provide surveillance of South Korea’s challenging geopolitical neighbourhood, particularly North Korea.

Meanwhile, Korean Air says its 500MD programme, which would see elderly MD Helicopters MD500s converted into armed unmanned rotorcraft, is “currently on hold as military requirements and funding are still pending”.

Discussions continue with the South Korean government, but until the 500MD programme resumes, the company’s follow-on ambitions to create unmanned versions of Sikorsky UH-60 Black Hawk helicopters and Northrop F-5 fighters are also in limbo.

“While extending the capabilities of its current [UAV] fleet, Korean Air is also looking to extend its programme to include stealth



Full-scale mock-up of KUS-15 was displayed at ADEX show in 2019

UCAVs [unmanned combat air vehicles], manned to unmanned conversions of multi-purpose helicopters, unmanned CAVs [cargo air vehicles], UAM [urban air mobility] and 2h-endurance hybrid-powered drones,” it says.

Separately, Korean Air says it still holds periodic discussions with Raytheon in regard to Seoul’s requirement for four intelligence,

surveillance, target acquisition and reconnaissance aircraft.

The pair signed an agreement at the ADEX show last October to offer an adapted Bombardier Global 6500 business jet using Raytheon’s “multiple intelligence” technologies. Its South Korean partner will perform aircraft modification work should their bid be successful. ■

REQUIREMENT GREG WALDRON SINGAPORE

Indonesian swoop for Ospreys gets US approval

The US government has approved a potentially \$2 billion sale of eight Bell Boeing MV-22 Osprey tiltrotor transports to Indonesia. If finalised, the deal would be conducted via the US

government’s Foreign Military Sales process.

Outlining the prospective order on 6 July, the US Defense Security Cooperation Agency (DSCA) said an Osprey sale to

Jakarta would “enhance Indonesia’s humanitarian and disaster relief capabilities and support amphibious operations”.

“It is vital to US national interest to assist Indonesia in developing and maintaining a strong and effective self-defence capability,” the DSCA adds.

In addition to providing eight MV-22s produced in a Block C configuration, the deal would also include personnel training, technical support and eight spare Rolls-Royce AE 1107C engines.

“This proposed sale will support the foreign policy and national

security objectives of the United States by improving the security of an important regional partner that is a force for stability and economic progress in the Asia-Pacific region,” the DSCA says.

Cirium fleets data shows that the Indonesian air force has 40 in-service rotorcraft with an average age of almost 25 years, with some of its youngest assets being six Airbus Helicopters H225Ms.

The nation’s army operates around 144 rotorcraft of multiple types, including 56 Bell 412 transports and eight Boeing AH-64E Apache attack helicopters. ■



Potential sale would include eight MV-22 tiltrotors

US Marine Corps

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OPERATIONS GREG WALDRON SINGAPORE

Wide remit drives a versatile approach

As the Royal New Zealand Air Force modernises its fleet, sustainment is emerging as key challenge during coronavirus era

With a broad array of missions to perform across a vast geography, ranging from idyllic Pacific islands to Antarctica, the Royal New Zealand Air Force (RNZAF) is a highly versatile organisation.

In any given week, the service is likely to be engaged in missions close to home such as search and rescue, economic zone surveillance and disaster relief, while also conducting more traditional military duties. These can range from deploying Lockheed Martin C-130H tactical transports to the Middle East, or dispatching a Lockheed P-3C Orion surveillance aircraft to support UN sanctions enforcement against North Korea.

“It’s quite a wide spectrum of operations we get involved in,” RNZAF chief Air Vice-Marshal Andrew Clark – a former P-3C pilot – tells FlightGlobal.

The air force is making some major acquisitions to modernise its fixed-wing fleet, including replacing the venerable P-3C with Boeing P-8A Poseidons, and its legacy Hercules with new-generation C-130Js.

A deal for four P-8As was confirmed in July 2018, while Wellington last month formally committed to buying five C-130Js.

“They’ve filled a really important niche, performing that wide distribution of duties that we have as a defence force,” Clark says of the outgoing types. He gives the example of a P-3C performing fisheries surveillance one day and switching to its classic anti-submarine warfare mission the next.

The RNZAF’s first P-8A will arrive in 2023, with initial crew training under way at the US Navy’s NAS Jacksonville site in Florida. Its personnel will also have the opportunity to work on operational Poseidons with allies such as Australia.

C-130J deliveries will commence in 2025, with training



Combi-configured 757-200 is used for multiple duties – and service must find successor by around 2027

likely to begin in 2022.

One thing Clark has in common with airline chiefs is needing a replacement for the Boeing 757-200, with the air force’s two examples due to retire around 2027. Operated in a passenger/cargo combi configuration, its twinjets have been used for a range of missions, including flights to Antarctica.

FEW ALTERNATIVES

“[The 757] really sits in a niche almost of its own,” says Clark. “When you look out on the market, there’s not much with that same combination of range, size, capacity and utility.”

Clark says the search for a successor has not “kicked off in anger yet”, with the service in the “early phases of scouting around”.

“What we will do in the early phases of that project is actually just go back to basics... instead of just diving in and trying to find another aircraft in the same niche as the 757, we will confirm again what are the main things we want out of this.”

Illustrating the RNZAF’s flexible approach to obtaining capability was its 2013 decision to obtain eight Kaman Aerospace SH-2G Super Seasprite maritime helicopters disposed of by Australia,

replacing five examples that had been in its service since the late 1990s. It bought the rotorcraft – plus two “spare attrition airframes” and full-flight simulators – for NZ\$242 million (\$156 million), drawing some criticism from local media.

“What we have to bear in mind is what we were able to pick up for what we paid,” says Clark. “For us, the Seasprites provide a good mix of capabilities from that warfighting side through to general utility. It’s a good size for our ships and the purchase came at a really good time for us.”

However, with only two dozen Seasprites in service globally, the air force faces a challenge to keep them operational until replacements arrive some time in the late 2020s, requiring it to work with both local and US suppliers.

“We got into this knowing that obsolescence management was going to be a challenge, but we also got a lot of capability for what we paid,” he notes.

The RNZAF has already fielded eight NH Industries (NHI) NH90 transport helicopters, replacing Bell UH-1s.

“[The NH90s] have demonstrated their abilities a number of times, both domestically and on deployed operations,” he says,

adding: “We’re very happy with the aircraft.” However, he notes: “I think, like a number of NH90 customers, that we would prefer to have a higher availability rate out of them”.

MAINTAINING FOCUS

One challenge in particular is the long supply chain back to Europe, but Clark says NHI partner Airbus Helicopters’ establishment of an in-country rotor blade servicing capability has “significantly shortened the logistics chain for us”.

Another future acquisition listed in the country’s Defence Capability 2019 plan calls for a layered enhanced maritime awareness capability to complement its P-8As. This would include medium-sized surveillance aircraft, unmanned air vehicles and space-based assets.

But the coronavirus pandemic, and particularly how this will affect sustainment, is Clark’s more immediate concern.

“The key thing for most air forces looking at the next 18 months to two years is the challenges around the global supply chain, logistics support chain, the industrial support base, and making sure that we’re all able to keep our fleets of aircraft going.” ■

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INVESTIGATION DAVID KAMINSKI-MORROW LONDON

Exhaust poisoning clue in DHC-2 crash

Inquiry reports high levels of carbon monoxide found in pilot's blood after fatal crash of Sydney Seaplanes piston-single

Australian investigators have urged operators of piston-engined aircraft to carry out inspection and repair of exhaust systems, after finding that the pilot of a crashed De Havilland Canada DHC-2 floatplane had elevated levels of carbon monoxide in his blood.

The Sydney Seaplanes aircraft, with six occupants, had departed Cottage Point, initially heading northeast along Cowan Creek, but entered an inlet known as Jerusalem Bay at altitude lower than surrounding terrain, where it commenced a steep right turn and dived into the water.

None of those on board the aircraft survived the 31 December 2017 accident.

Medical specialists sought toxicology tests on blood samples, says the Australian Transport Safety Bureau, while the draft investigation report was being reviewed.

The results of the tests came back in March, indicating that the

pilot and two passengers had elevated carbon monoxide levels.

After scrutinising the validity of the findings, the bureau states that the levels of carbon monoxide were "likely to have adversely affected the pilot's ability to control the aircraft".

All three victims were probably exposed within the aircraft cabin, it says, and a further examination of the aircraft has determined that a crack in the engine exhaust collector ring could have leaked exhaust into the engine bay.

This exhaust would not have been contained in the engine bay because three of the eight bolts used to secure magneto access panels beneath the instrument panel were missing.

Cracks in the exhaust system, and a firewall breach, provided a gas path to the cabin.

"Any breach in the firewall can allow gases to enter the cabin from the engine bay," the inquiry points out.



Aircraft had undergone scheduled engine change two months earlier

The aircraft (VH-NOO) had undergone a scheduled engine change in early November, about eight weeks before the crash.

The engine was taken from Sydney Seaplanes' other DHC-2 and had been disassembled and inspected, with no defects found, before being reassembled and fitted to VH-NOO.

Investigators state the aircraft's logbook indicates it was serviced in accordance with the operator's approved maintenance system, with daily inspections, engine

checks every 50h, and airframe checks every 100h or six months.

While the inquiry has yet to reach final conclusions, it is reminding aircraft maintenance organisations of the need to carry out regular and thorough inspection of exhaust systems and firewalls given the risk of potential carbon monoxide exposure.

It is also urging pilots and owners of piston-engined aircraft to carry or fit carbon monoxide detectors with alarms to warn of the presence of the lethal gas. ■

PROGRAMME KATE SANSFIELD LONDON

Stratos 716X enters test campaign with first flight

Stratos Aircraft has launched the flight-test campaign for its 716X, with the very light jet (N716X) performing its maiden sortie on 2 July from the airframer's base in Redmond, Oregon.

Flown by test pilot Sean VanHatten, the milestone sortie last-

ed 22min starting with a full-power take-off and climb to 13,500ft. "A series of manoeuvres were then conducted to evaluate handling characteristics," says Stratos.

The sortie is the first of "an extensive flight-test programme that

will span the next several months", it adds.

Launched in 2018, the carbon-fibre, single-engined 716 programme represents a longer and wider version of the 714, which it replaces.

The 716X is the kit-built version of the six-seat aircraft, which Stratos chose to bring to market ahead of the US Federal Aviation Administration FAR Part 23-certificated model. This is to allow the company to refine the product, lower development costs for the 716, and help attract investors who will assist in bringing this version to market.

While structurally both aircraft are identical, the 716X is powered by the same 2,900lb

(12.9kN)-thrust Pratt & Whitney Canada JT15D-5 engine as the 714 and features a Garmin G3X flightdeck. The certificated variant will use a 3,400lb-thrust PW535E, and feature either G3000 or G5000 avionics.

"When we introduced the proof-of-concept 714 three years ago, the marketplace interest was tremendous," says Stratos chief technical officer Carsten Sundin.

"It was clear that the market is looking for the performance and comfort we were offering, but in a true six-place aircraft.

"We have achieved this with the 716X. With a cabin width of 4ft [1.2m] and height of 4.8ft, there is plenty of room for passengers to relax on long flights." ■



Very light jet's maiden sortie lasted 22min



Network solution
Special Report P24

PROPULSION KATE SARSFIELD LONDON

Pro-Avia utility win helps keep Red's flag flying high

Russian start-up Pro-Avia has selected Red Aircraft's A03 500hp (370kW) diesel engine to power its in-development multi-purpose piston-twin.

Adenau, Germany-based Red Aviation describes its powerplant as an "all-aluminium, 12-cylinder, high-compression-ignition engine" that can run on Jet A or diesel fuel.

"The A03 is a game-changer as there are currently no diesel engines in the 500hp range," says Red Aviation's head of business development Sebastian Gluck.

It was selected by Pro-Avia, he adds, as it can deliver lower emis-



Start-up's multi-purpose aircraft is now at preliminary design stage

sions and better fuel efficiency than similar-sized engines running on leaded aviation fuel like the Lycoming IO-580, TIO-720 and Continental IO-550 pistons.

The A03 secured European and US certifications in December 2014 and January 2015 respectively, and the engine is now installed on platforms including the Yakov-

lev Yak-52 and -152 trainers, and Fletcher FU-24 agricultural aircraft. "We are aiming to achieve supplemental type certifications for the A03 soon on the De Havilland Canada DHC-2 Beaver and Air Tractor AT-301," says Gluck.

Pro-Avia's as-yet unnamed aircraft is now in its preliminary design phase. Targeted at the passenger, cargo and utility markets, the model has a projected maximum take-off weight of 4,800kg (10,600lb), a maximum cruise speed of 185kt (340km/h), and a range of 1,190nm (2,200km). It will be able to seat nine to 14 passengers. ■

SALE KATE SARSFIELD LONDON

Administrator trims bidders for Piaggio

Extraordinary commissioner invites 11 of the 19 companies seeking to acquire Italian airframer into due diligence phase

Piaggio Aerospace's administrator has invited 11 of the 19 bidders for the company to enter due diligence – and says he is confident a suitable buyer can be selected before year-end, with a deal to close in the first half of 2021.

The Italian airframer – developer of the P180 Avanti twin-pusher and its unmanned surveillance variant, the P1HH Hammerhead – entered extraordinary receivership in December 2018 after Abu Dhabi wealth fund Mubadala, its sole shareholder, pulled out of the company.

Bidding for Piaggio ran from 26 February until 29 May.

Extraordinary commissioner Vincenzo Nicastro says offers "have arrived from all over the world", including companies in Canada, China, France, Germany, Italy and the USA. He declines to reveal their identities due to confidentiality agreements.

However, he says the "vast majority" of the bidders are interested in acquiring the whole company – which is Nicastro's preferred outcome. "Those parties who are interested only in

one of the two businesses – aircraft manufacturing and development, or engine support – have indicated that they are ready to reconsider the possibility of acquiring it in full, once due diligence is completed," he says.

This process is expected to end on 31 August, when parties will be invited to submit binding offers. "Our aim is to select a buyer before the end of the year, and complete the sale in the first half of 2021," says Nicastro.

He describes the ideal owner for Piaggio as "a solid company" with a long-term strategy for the firm. "It must be ready to develop Piaggio's existing portfolio, invest in its future and its skilled workforce and, of course, pay the right price."

He does not expect the worsening global economic climate, triggered by the coronavirus pandemic, to have "much of an impact" on the acquisition price or sale process. "Even if some interested parties have been discouraged by the pandemic, receiving 19 expressions of interest in Piaggio confirms that there is a huge inter-



P180 Avanti developer filed for bankruptcy protection in late 2018

est in the company," he says.

Piaggio's appeal to a potential buyer is sweetened by a lifeline package of orders and commitments secured by Nicastro from the Italian government, worth around €900 million (\$980 million). This includes a deal for nine new Avanti Evos, and the retrofit of 19 earlier-generation examples of the twin-engined turboprop operated by Italy's armed forces.

Rome has also committed to

financing the completion of P1HH certification and will acquire at least one system, comprising two aircraft and one ground station.

Hammerhead development has been on hold since the company entered receivership. Piaggio says its long-term objective is to maintain "company know-how" and participate in future Europe-wide unmanned air vehicle programmes. ■



What now for the 737 Max (above) as it faces a market with dramatically reduced demand? State programmes to support airframers and embattled supply chains under scrutiny (bottom right). Recession puts strain on air power procurement and budgets (below left)

NETWORK SOLUTION

With Farnborough 2020 falling victim to the pandemic, its replacement is FIA Connect, a series of virtual events with FlightGlobal as official media partner. We will host three webinars and cover breaking news and announcements throughout at FlightGlobal.com/Farnborough2020 – and to set the scene for the event, we take a look at three hot topics as the industry slowly climbs out of lockdown

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US 'cash for clunkers' initiative of 2009 encouraged consumers to replace older motor vehicles with more fuel-efficient new ones

Positive stimulus

Could an adapted version of scrappage schemes incentivising new car buying work in the aviation sector – or are there more effective methods to combat the severe demand downturn?

DAVID KAMINSKI-MORROW LONDON

Just 35 days before air traffic levels in Europe halved under the coronavirus onslaught, Airbus had declared that it would deliver 880 aircraft this year – ironically, a relatively conservative target, after the airframer was forced to row back on its 2019 expectations, owing to difficulties in ramping up A321neo production.

At the time, Airbus was planning to introduce a new A321neo assembly line in Toulouse to support efforts to increase production of single-aisle jets. The airframer had been exploring the limits to which it could push the supply chain as it sought to take A320neo-family output beyond the level of 63 per month that it had already planned for 2021. But coronavirus has shredded the airline industry's forecasts and the five-figure combined backlog of 737 Max and A320neo-family jets

– close to 10,400 aircraft – now appears to represent a mountain of uncertainty.

Airbus and Boeing managed to deliver a total of just 220 aircraft over the first five months of 2020 – barely 40% of the combined figure they achieved in the same period last year. Boeing output had already been affected by the 737 Max grounding and both airframers were continuing to feel the pressure of slack demand in the long-haul aircraft market.

This initial delivery disruption has largely been due to logistical problems. The longer-term impact, given the predictions of a slow recovery, with inevitable reluctance by financially pressured airlines to take on unnecessary extra capacity, is yet to become clear. But Airbus has slashed A320neo production by one-third, to 40 per month, while Boeing's 737 Max line is operating at a trickle. As they say in Toulouse when desperate times call for desperate measures: "Aux grands maux les grands remèdes."

One such radical proposal for stimulating the aerospace industry emerged in March, when the idea was floated to adapt a controversial US scrappage and incentivisation scheme intended to jump-start the automotive sector in the aftermath of the 2007-2008 economic crisis.

Derived through the Consumer Assistance »

» to Recycle and Save (CARS) initiative, the car allowance rebate scheme was dubbed “cash for clunkers”, to reflect its basic premise – to allow consumers to surrender their older, inefficient cars in return for partial credit towards a newer model with better fuel economy. Trade-in vehicles would subsequently be destroyed, preventing them from being resold or otherwise reintroduced to the active market.

Set to run for four months – from 1 July to 1 November 2009, assuming funds were not exhausted – CARS was overseen by the National Highway Traffic Safety Administration and intended not only to stimulate the automotive industry during an economic downturn but also to address concerns over the environment, by reducing the emissions of the vehicle fleet.

Qualifying trade-in vehicles had to meet specific criteria on age, fuel economy, insurance and licensing and, in return, consumers were given a rebate of up to \$4,500 that depended on the improvement in efficiency obtained through the trade-up.

While the government originally earmarked \$1 billion for CARS, the funds rapidly ran out and the allocation was increased to \$3 billion. Even so, the scheme closed on 24 August, just a month after the opening claim date, with almost \$2.9 billion in applications submitted and almost 700,000 older vehicles eliminated, according to the Department of Transportation.

FOLLOW-UP SCHEME

Earlier this year a bill containing a similar-sounding initiative – named Airline Assistance to Recycle and Save – emerged in Congress, laying out proposals for the US

government to purchase “high-polluting” aircraft from carriers in exchange for a commitment from those operators to acquire fuel-efficient models. Like CARS, the initial authorised allocation amounted to \$1 billion.

The proposal outlined tasks including the publication of lists comprising aircraft eligible for trade, as well as those that qualified as fuel efficient, plus a determination of timing for the measure. It also indicated that aircraft purchased by the government under the scheme could be salvaged for spares and components, which would then be sold to domestic or foreign operators.

“How do you avoid a trade war when both sides are exporting into other markets with heavy government help?”

Richard Aboulafia

Vice-president of analysis, Teal Group

Financial services firm Jefferies Group brought up a similar idea, but amended the principle by suggesting that governments take the initiative by directly acquiring new aircraft from the airframers in order to sustain aerospace production, and acting as the bridge to maintain delivery schedules.

Jefferies analyst Sandy Morris describes the “novel” proposal as an “inverse cash for clunkers”, intended to use government financial resources to calm the uncertainty over the air transport sector. “Modern aircraft have been good investments,” says Morris, claiming that the “tough but effective” measure would lead

to a quicker uptake of new aircraft and, consequently, environmental benefits.

Stepping in to pick up some of the slack in Airbus production – perhaps as many as 500-600 aircraft over the next three years – would cost up to €34 billion (\$38 billion). Such a figure would not be a heavy burden if shared among major governments, who would then own the assets and be able to redeem them once the air transport market rebounded. At the time, Jefferies had been working on the assumption that Airbus deliveries would sink to around 650 aircraft this year, a fall with which the airframer would be able to cope.

But government intervention is not necessarily a welcome resort. Airbus and Boeing are already mired in a long-running transatlantic dispute over subsidies, which support schemes could complicate.

“If it is a globally co-ordinated effort, with the USA and Europe on the same page, it might be a fantastic idea,” says Teal Group vice-president of analysis Richard Aboulafia. But he highlights many potential conflicts if not, such as the reactions of European carriers to European subsidies for US operators taking Airbus aircraft – and the reverse situation for European operators taking US-subsidised Boeing jets.

“In either case, how do you avoid a trade war when both sides are exporting into other markets with heavy government help?”

Global co-ordination, he adds, does not resolve a sensitive issue relating to maintenance, as the artificially accelerated fleet modernisation upsets the profitability balance for companies focused on aftermarkets.

The operating and financial leasing sector also throws an additional ingredient into a complex mix. Close to half of the world’s commercial aircraft fleet is leased and a number of carriers have turned to sale-and-leaseback transactions to shore up financial defences in the face of lost revenues and cash bleed.

WIDER RAMIFICATIONS

While leasing firms might be keen to accept a payment to shelve older aircraft in their fleets, the downturn in the airline market means there is no immediate incentive to use that capital to invest in newer aircraft types without a customer that would accept them on long-term lease.

Bert van Leeuwen, head of aviation research at financial firm MUFG, points out that if lessors ended up being paid by governments for trading in older aircraft, the taxpayer would be subsidising financial investors. “Sale-and-leasebacks are a good alternative for airlines to manage the transition from old to new-generation aircraft,” he says. “In a way, this is an open-market alternative to the ‘clunkers for cash’ scheme.”

Scrapping older aircraft would reduce



Airbus argues manufacturers will need financial support to fund green technology investment



Scrappage schemes might help manufacturers but are unlikely to boost airlines, which have been forced to park fleets during the pandemic

supply, potentially lifting residual values, but this effect could be offset by lower demand for older aircraft arising from the availability of discounted new models. Van Leeuwen argues that airframers and the supply chain might benefit from a scrappage scheme, but stresses: “I don’t think this industry needs it. It won’t kick-start the airlines as the sale-and-leaseback instrument is still available.”

Although current low fuel costs somewhat diminish the operational advantage of newer models and act as a counter-incentive to trade up, several carriers have already outlined plans to operate modern types as part of the post-crisis recovery.

Part of this planning is the result of pressure from governments to ensure environmental concerns are not pushed aside by the desperation of airlines to ensure their survival. One of the notable aspects to emerge from the coronavirus fallout is the conditional linking of bailout funding to sustainability measures – in essence, a more-stick, less-carrot version of the scrappage strategy that nevertheless amounts to government funds being offered to reduce environmental harm.

While there is no formal EU scrappage programme in play, Airbus believes that the principle of creating a “green stimulus” through the “right conditions and financing support” to enable airlines to retire older, less-environmentally friendly aircraft early is “in the short term, the best way to reduce emissions”.

“Longer term, with the sector seriously cash constrained due to the exceptional dam-

age caused by the current crisis, we will need support to allow us to continue to make the huge investments necessary to develop green technologies,” the airframer adds. It stresses that attention on sustainable fuels, updating of Single European Sky initiatives, and the UN’s CORSIA carbon offset scheme must be maintained in the meantime.

Boeing declines to comment about the extent to which a specific scrappage scheme might benefit its operation or otherwise. The US airframer has previously backed a broad \$60 billion support programme for the aerospace manufacturing sector as a whole, stating that it would amount to a crucially important “bridge to recovery”.

“Much of any liquidity support to Boeing will be used for payments to suppliers to maintain the health of the supply chain,” it states, adding that the long-term outlook for the aviation industry remains strong.

LIMITED IMPACT

In the decade since the US government attempted to stimulate the automotive industry out of an economic dip, researchers and analysts have scrutinised the scrappage scheme to evaluate its impact, and whether it achieved its intended aims. There is evidence from various academic papers that the scheme managed to improve the environmental balance, at least to a degree, and that the government succeeded in incentivising the sale of more fuel-efficient vehicles.

But the effect was short lived. Some 45%

of the participants would have bought a new vehicle anyway during the course of the scheme, which meant that little more than half the car trades amounted to additional new sales. Figures indicated that the stimulation was largely negated over the following 10 months by a depletion of sales in regions with high numbers of older cars, and there are arguments that the job-creation aspect was relatively expensive, compared with alternative stimulus policies.

High jet fuel prices that followed the 2007-2008 downturn helped encourage take-up of efficient re-engined aircraft, and, while a number of 737 Max orders have been cancelled, there is no immediate evidence of a broader shying away from commitments, even as traffic has evaporated.

This single-aisle market, Airbus believes, will lead the recovery from the crisis. Around 80% of last year’s Airbus deliveries were narrowbody types, and the impact of the downturn on the long-haul sector could mean that a higher proportion of this year’s overall deliveries – potentially around 550 aircraft – will be single-aisle models.

Teal Group is expecting the recovery to follow an “L-shaped” trajectory, lasting about two or three years. It predicts that narrowbody deliveries will be protected, to an extent, by the situation with the 737 Max and by a shift in airline models through which certain routes will migrate away from being served with twin-aisle aircraft and towards single-aisle jets. ■



Recertification of the 737 Max may be close, but clearing that hurdle is only the first step towards recovery for Boeing as the type will return to service in a radically altered market

JON HEMMERDINGER BOSTON

With Boeing 737 Max jets flying again this month on Federal Aviation Administration (FAA) test flights – the first movements since a March 2019 crash which followed a similar tragedy in October 2018, leading to a combined 346 deaths and prompting regulators to ground it globally – recertification of the troubled narrowbody may finally be in sight. Indeed, analysts consider a third-quarter 2020 approval as a reasonable expectation.

But restarting production and deliveries will be just the start of a long process of recovering the financial and reputational damage done to Boeing by the long-running Max saga. Compounding the troubles heaped upon the airframer via the failings of its best-selling product is the onset of what looks to be a long and deep aerospace recession sparked by the coronavirus lockdown of the airline industry.

As far as liquidity is concerned, Boeing at

least looks to have averted any short-term crisis by raising some \$25 billion in financing earlier this year. But while the Chicago-headquartered airframer may not face an imminent cash crunch, its underlying financial health depends on revenue from Max deliveries. “Their liquidity issues are basically entirely based on the Max not flying, and piling up inventory,” says Sheila Kahyaoglu, aerospace equity analyst at investment bank Jefferies. “It puts a strain on the stock.”

Boeing also needs 737 Max production and deliveries to flow to support a struggling supply chain – companies Boeing will need to underpin its eventual 737 replacement, says Michel Merluzeau, aerospace analyst at consultancy AIR. “All the other associated suppliers [must] get themselves back into a cash-flow positive situation,” Merluzeau says. “Failure to do so by the [autumn] introduces all sorts of issues.”

While 737 Max recertification may be imminent, the bar has been set high. FAA administrator Steve Dickson insists his agency

will clear the Max only when it is safe.

In a recent hearing he laid out the remaining steps before certification. In addition to flight testing, a Joint Operations Evaluation Board composed of representatives from the FAA, other countries’ regulators and pilots, must complete a pilot training assessment. Then, a Flight Standardization Board must develop pilot training requirements and a Technical Advisory Board must evaluate final Max design documents.

The FAA will lastly issue an airworthiness directive laying out actions airlines must take to resume Max flying, Dickson said.

GAINING APPROVAL

Although issues with the Max’s Maneuvering Characteristics Augmentation System (MCAS) triggered the grounding, *The Seattle Times* recently reported that European and Canadian regulators are seeking other, non-MCAS-related changes to its flight-control system. However, regulators may allow those

Operation of larger -9 has also been suspended, while validation efforts for further variants are ongoing



changes to be addressed after certification.

In addition to the grounded Max 8 and Max 9, Boeing is still seeking certification for its Max 7, Max 10 and a high-capacity, 200-seat Max 8 variant. It has disclosed few recent details about those certification efforts.

After the March 2019 grounding, Boeing continued producing Max aircraft, resulting in a stockpile of about 450 undelivered jets before halting production in January this year. Then in late May, it resumed work at a “low” but unspecified rate. The airframer says it will ramp up production at a “very gradual pace” that will increase to 31 aircraft per month in 2021.

Jefferies expects Boeing to produce and deliver 45 Max aircraft in 2020, but it predicts that deliveries will outpace production next year as stockpiled examples are also delivered. It estimates the airframer will produce 198 and deliver 360 Max aircraft in 2021, then produce 372 and deliver 480 in 2022.

At that rate, Jefferies reckons it will be mid-2024 at the earliest before Boeing draws down its 450-unit stockpile.

But the Max will be returning to a market that bears little resemblance to the ramp-up days of 2019. Today, “nobody needs new jets”,

says Teal Group vice-president of analysis Richard Aboulaflia. Speaking during a recent webcast hosted by the American Institute of Aeronautics and Astronautics, he noted that in a typical down year, airlines might ground 12% of their aircraft, but this year, groundings hit an “all-time high” of 65%. However, some airlines, such as those that already secured financing, will surely want to take Max deliveries once regulators clear the jet, he adds.

Today’s aircraft market reminds Merluzeau of the 1990s-2000s technology bubble and the past decade’s real estate boom: “You have a surplus of capacity, of available assets, that you need to process through before you get back to an equilibrium of demand.”

Between January and May, Boeing logged 313 Max cancellations and removed from its backlog another 320 aircraft ordered by customers that Boeing suspects may be unable to take delivery. Those adjustments brought Boeing’s May backlog to 3,776 Max aircraft.

The world’s airlines may cancel more orders for the Max and other types, including the competing Airbus A320. But additional cancellations might be minimal because government aid packages have kept most airlines out of bankruptcy, says Aboulaflia. He also notes that Boeing headed off some cancellations by renegotiating sales contract provisions that can otherwise allow customers to axe orders for aircraft grounded for more than a year.

“So far, backlogs are holding up,” Aboulaflia says, noting airlines have cancelled less than 1% of commercial aircraft orders since the pandemic started. “Deferrals are another story. Deferral requests are coming thick and fast.”

Boeing has said it is working to accommodate customers by deferring deliveries and swapping Max orders for other jets when

possible. This year’s Max cancellations include at least 19 aircraft that airlines converted to other types, Boeing says.

Jefferies views orders from lessors and airlines from Latin America and the Middle East as most “at risk” for deferrals. Those customers hold some 1,200 Max orders, or 30% of the backlog. The Jefferies report cites particular uncertainty about orders from Flydubai, Lion Air and SpiceJet – carriers that have far more Max orders than aircraft in their current fleets.

WHAT NEXT?

The size of the Max backlog and the programme’s financial recovery may also affect Boeing’s plan to develop a replacement narrowbody. In Merluzeau’s view, “Boeing needs [the Max] for at least the next decade to just prepare themselves financially for what’s coming after.”

Boeing’s current Max backlog would allow for about seven and a half years of production at a rate of 42 aircraft per month. And although more cancellations could materialise, so too could new orders, especially post recovery. But the Max’s struggles, and risk that Airbus might act first, could lead Boeing to launch its own narrowbody replacement a bit earlier than the ideal time. “Boeing will probably... do something sooner to gain customer traction,” Merluzeau says, suggesting a programme launch could come between 2025 and 2028 with service entry in the early 2030s.

But jumping too early has risks; the aircraft could be unable to accommodate advanced power-generation technologies, new composite structures or improved production automation. “One wonders”, he adds, “how much can Boeing regain from a strategic initiative standpoint? How much can Boeing prepare for what is coming from Airbus?” ■



Analysts predict the 450-unit stockpile of undelivered jets will take until 2024 to draw down

Tough times, hard choices

With recession looming large, even the mighty US defence budget is not looking immune from cutbacks, as economic realities force a rethink of programmes and capabilities

GARRETT REIM LOS ANGELES

The US Department of Defense (DoD) budget looks vulnerable to cuts as the federal government budget deficit is projected to surge to \$3.7 trillion in 2020, a result of economic fallout from the coronavirus.

The pain is likely to be delayed, however. That is because planning for fiscal year 2021 and FY2022 is already under way.

It is also because the US Congress would hate to cut defence programmes and the people they employ in the midst of a deep economic recession, say defence industry researchers.

Instead, expect a shrinking Pentagon budget in the mid-2020s. Although the USA might have tamed coronavirus and started to see its economy grow again by the middle of the decade, Washington will have to face up to the hard fiscal and economic realities of years of lost revenue.

Even if the defence budget stayed at a constant 3.2% of US GDP, a coronavirus-shrunk economy, which could be \$10-19 trillion smaller over the decade, would give the government less tax revenue, says Ted Harshberger, vice-president and director of the RAND Corporation's Project Air Force campaign.

"You end up with about \$350 billion to \$600 billion less to allocate to defence over that 10-year time frame than would have been the case if we didn't have the pandemic," he says.

Even before the coronavirus pandemic hit the US treasury, the DoD was expecting a flat or slightly smaller budget and was adjusting its plans. For example, the US Air Force (USAF) laid out plans in its FY2021 budget proposal to retire dozens of older aircraft to save money on operational costs. Aircraft on the chopping block included 16 Boeing KC-10 and 13 KC-135 tankers, 24 Lockheed Martin C-130H tactical transports, 17 Boeing B-1B bombers and 24

Northrop Grumman RQ-4 Global Hawk Block 20/30 unmanned air vehicles.

With the money saved, the service wants to develop its Joint All Domain Command and Control network, Next Generation Air Dominance fighter, Northrop B-21 Raider stealth bomber and hypersonic missiles, among other modernisation priorities. Still, cutting the USAF's fleet to reinvest the savings in future technologies is not a proven strategy.

"Can we shrink our way to new technology? The answer is: it's not easy. There are jobs there," says Richard Aboulafia, vice-president of analysis at Teal Group, noting the work tied to production and MRO activity on military aircraft. Plus, a smaller air force does not sit well with some. "Some people just really like force structure," says Aboulafia. "They might not be prepared to spend what's necessary to sustain it, but they like the idea of big forces in place. Bragging rights, diplomacy, whatever it is, they like it."

VULNERABILITIES

Facing political pressures from Congress, the Pentagon may have to spread cuts across many programmes in a haphazard way.

"What you always see in downturns is some squeezing across the board," says Mark Cancian, senior adviser with the Center for Strategic and International Studies (CSIS) International Security Program. "You know, forces get a little smaller, retire some legacy platforms, maybe an acquisition programme would be reduced, but not necessarily terminated. [For example] instead of building 80-ish [Lockheed] F-35s a year, we would buy 50."

Sometimes budget cuts are not well thought out, says Todd Harrison, director of defence budget analysis and director of the Aerospace Security Project at CSIS. "Historically, we tend to go into these things fairly unprepared," he says. "When you need to make last-minute cuts in defence spending, those cuts tend to be focused on things like military



construction funding, and operation and maintenance funding, particularly things like training and readiness."

The whims of Washington may ultimately target programmes that get bad headlines.

"It's going to depend upon what's performing well and poorly when the knives come out," says Harshberger. He points out that hypersonic missiles, directed energy weapons and missile defence systems typically have been difficult to turn into operational weapons and might stumble.

"You're definitely going to see an emphasis on shovel-ready platforms," says Aboulafia. "That might disadvantage [the US Army's] Future Vertical Lift."

Instead, the service might be forced by Congress to continue to buy Sikorsky UH-60 Black Hawk, Boeing AH-64 Apache and CH-47 Chinook helicopters, rather than spending cash on futuristic rotorcraft that would not produce substantial manufacturing jobs until 2030.

Several defence industry researchers point out that the Future Vertical Lift programme, which includes the army's Future Long Range Assault Aircraft and Future Attack Reconnaissance Aircraft, could be vulnerable to cuts, especially when compared against China and Russia's sophisticated anti-aircraft defences. "It's hard to imagine a lot of utility coming from rotary-wing aircraft that have a large radar signature," says Harrison.

Budget priorities might also depend on who wins the White House. "A [Joe] Biden administration would cut nuclear modernisation. You don't get a whole lot of money out of that, but



Tightening finances increase likelihood of fewer F-35s being acquired

US Air Force

Other cuts are likely to target redundancies between the five US military services. “The army wants to invest in low Earth orbit satellites to support its concept of providing future multidomain operations. Well, why shouldn’t that be the responsibility of the Space Force?” says Mark Gunzinger, the Mitchell Institute’s director of future aerospace concepts and capabilities assessments. “I think that’s where the real savings are: across-service trade-offs.”

If so, the Pentagon may start to ask tough questions about the equipment that each military service wants. “You do start to have to wonder, what is unique? What’s different about Marine Corps aviation? Why does the navy’s army need an air force?” says Harrison. “That kind of roles and missions review could lead to some significant structure savings, as we look to combine and eliminate redundancies across the services.”

RESHUFFLING ASSETS

That may mean moving aircraft from one service to another. For example, the US Navy’s Boeing P-8A Poseidon maritime patrol aircraft could be transferred to the USAF, where the type might also play a role in the service’s Joint All Domain Command and Control network. “We have four different air forces and they do overlap quite a bit,” says Harrison.

In some cases, aircraft might be able to >>

that is one very clear difference between the Republicans and the Democrats,” says Cancian. “The Democrats tend to take more of a foreign policy with a human rights perspec-

tive, so they would be much less enthusiastic about selling weapons to the Saudis, for example, or the Gulf states, whereas the Trump administration has been quite happy to do that.”

EUROPE CRAIG HOYLE LONDON

Coronavirus fallout means defence sector will have to fight harder for investment

How a looming period of recession initiated by the coronavirus crisis will impact European defence budgets remains to be seen, but it is highly likely that a recent upward spending trend will be slowed – if not halted altogether.

After facing years of criticism from the USA, more European NATO members had been making strides over the past couple of years towards a target of spending at least 2% of their GDP on defence. But with economies now derailed after coronavirus disruption and business lockdowns, achieving such a metric could mean a real-term reduction in investment.

Speaking at a Brussels Forum event on 23 June, NATO secretary general Jens Stoltenberg stressed the need for nations to continue raising spending, despite the impact of the pandemic.

“The reasons why we decided to invest in our security: terrorist threats, cyber, the shifting balance of power with the rise of China or a more assertive Russia – all of that is still there. So, we need to continue to invest in our security,” he says, while pointing to the positive contribution made by NATO militaries throughout the pandemic in supporting civilian society.

The EU, meanwhile, is working on the detail of its long-term budget plan for 2021-2027, including commitments to defence, aerospace



UK’s Tempest commitment awaits funding clarity

BAE Systems

and security. Its allocation via the Multiannual Financial Framework will account for around 20% of NATO’s entire spending.

Airbus Defence & Space chief executive Dirk Hoke in mid-June also urged European nations to hold firm on defence and security investment.

“I strongly believe that more than ever, we have to secure the [European] defence, space and security budgets in order to cope with the challenges that we are currently facing,” he says. “Strong programmes can accelerate the recovery phase. By supporting defence projects, we also can stabilise the whole aerospace industry.”

In the UK, a follow-on to its Strategic Defence and Security Review of 2015, originally sched-

uled for completion earlier this year, is now likely to be delayed into 2021, leaving uncertainty around some long-term investment priorities.

With an outline business case for the UK’s ambitious Tempest future combat air system programme due for delivery before the end of this year, funding clarity around its commitment to this and other major acquisitions will be eagerly awaited in the future Integrated Review.

The economic impact of the coronavirus will last for many years, so for defence ministries across Europe, the need to fight for long-term investment represents a significant battle, as other sectors such as health care and social welfare also call for increased backing. ■

ASIA-PACIFIC GREG WALDRON SINGAPORE

Pandemic exposes gaps in regional spending capabilities as China flexes muscles

The coronavirus pandemic is hitting Asia-Pacific economies at a time when the deterrent capabilities of air power are more essential than ever.

Air power is a peculiar sub theme of the pandemic in the Asia-Pacific region. Globally, air forces have used transport assets to ship urgent supplies to allies. China's Xian Y-20 and other aircraft were instrumental in flying equipment and personnel to the Chinese city of Wuhan, for example, where the virus originated in 2019.

As China recovered from the pandemic, however, its use of air power took a more menacing turn. It took the opportunity to mount aggressive probing flights into the airspace of Taiwan, a vibrant democracy that Beijing claims as a breakaway province. The US Air Force, for its part, defied the challenges of coronavirus to conduct training sorties to the region with long-range bombers, demonstrating its power projection capabilities.

Given Beijing's rapid arms build-up of the past two decades, the need for improved regional air power is abundantly clear. What is less apparent is how the economic fallout of coronavirus will affect defence spending and – by extension – air power acquisitions.

Beijing announced in May that it would boost its annual defence budget by 6.6% to CNY1.3 trillion (\$178 billion). While most China observers believe the true figure is much higher, what is certain is that the government will continue to invest in acquiring more Chengdu J-20 stealth fighters, advanced variants of the Chengdu J-10, and a broad array of other types. Chatrooms dealing with Chinese air power suggest a new naval fighter, possibly based on the AVIC FC-31, will appear in 2021.

Malcolm Davis, senior analyst, defence strategy and capability at the Australian



Airpower Teaming System forms a key plank of Australia's defence plans over next 10 years

Strategic Policy Institute, contends that the impact of coronavirus on defence budgets will be a mixed bag.

"For Asia, the big uncertainties are states like Indonesia, India and the Philippines – states with poor health care and high population densities," he says.

"The potential for rapid spread in these states is high. That would inevitably erode their economic growth, and it's likely that that would undermine any ability to sustain defence acquisition."

All three countries have ambitious plans for new fighters and other aircraft. India, which recently saw a border dispute flare up with China, has long required well over 100 new fighters, but was unable to close this deal even before the pandemic. Similarly, Jakarta was already quibbling with Seoul about costs involved with the joint Korea Aerospace Industries KF-X fighter, while the Philippines may have to push back

a decision about new combat aircraft.

On the other hand, Australia, citing great power competition, has committed to a huge A\$270 billion (\$187 billion) of defence spending over the next decade, of which A\$65 billion will go to air power, including more Lockheed Martin F-35As and other new systems.

Japan has not disclosed its post-coronavirus defence budget, but has plans to buy up to 147 F-35s, as well as developing a new Future Fighter programme.

"My guess is that poorer states will choose butter over guns, but larger states will prioritise increased defence expenditure," says Davis.

"Air power is obviously important, but like any modern military technology, it takes time to acquire new capabilities – and frankly, there may not be that much time. Australia's prime minister suggested that today's environment is in some ways like the 1930s, and I think that's accurate." ■

» replace ground- or sea-based weapons. In particular, aerospace technologies with speed, range and the ability to penetrate enemy defences are likely to be winners in future defence budgets. With likely conflict zones such as the Baltic states and Taiwan located thousands of miles away, the USA needs a way to quickly respond.

"Air forces are optimised versus ground forces, which are going to take many weeks to deploy to the theatre, marry up with your equipment and move to the battlespace – and by that time the war is over," says Gunzinger.

That bodes well for the B-21 stealth bomber, which will fly long distances and penetrate enemy air defences. The USAF has said it wants to buy at least 100 examples of the aircraft. Moreover, while the service's Ground Based Strategic Deterrent ballistic missile is

only intended to deliver nuclear weapons, the B-21 can carry nuclear and conventional weapons, making it more versatile, says Aboulafia.

Long-range cruise missiles also appear to be likely future winners. Last September, the DoD increased potential long-term production quantities of the Lockheed AGM-158 Joint Air-to-Surface Standoff Missile from a possible maximum of 4,900 to a potential 10,000 units.

"All of the visions about great power conflict include long-range precision munitions," says Cancian. "And long range [is important] because you don't want to try to fight your way inside their defensive bubble."

A need to peer into an adversary's territory could also be good news for space-based intelligence, surveillance and reconnaissance (ISR) technologies. "Large constellations of

synthetic aperture radar satellites in low Earth orbit could cover any place 24/7, regardless of weather, and see deep into an adversary's territory, see moving targets on the ground, on the sea," says Harrison.

But, notes, Aboulafia: "Space isn't a panacea. Whether it's ease of re-targeting and re-prioritisation or all-weather applicability, inner-atmospheric platforms have their advantages."

Ultimately, while the US defence budget is likely to shrink, the number of regions around the world where the USA might be drawn into conflict continues to grow. That is also likely to fuel demand for ISR technology. "Whether you believe in a hard line or a more diplomatic line, you can't get enough information," says Aboulafia. "Distance and range, all those other things also argue for information. It is a very big potential battlespace." ■

Online opportunity

Farnborough International is ready to replace the biennial gathering with a virtual event, and, despite the crisis, sales director Joe Muir is confident the industry will turn up in force

MURDO MORRISON LONDON

In around a week, much of the world's industry should have been on course for a Hampshire airfield for the biggest aerospace gathering of the year. Among the hot topics at the 2020 Farnborough air show would have been the Boeing 737 Max's return to service, and progress on the UK-led Tempest combat aircraft project, as well as the usual flurry of surprise aircraft orders.

But the show, like every other face-to-face event this side of October, is, of course, not happening, after falling victim to the coronavirus crisis in March. However, the sector will still have a chance to meet this summer – albeit virtually – with the launch of FIA Connect, taking place during what would have been the 20-24 July show week. And, while the pandemic has changed every aspect of the industry, many of the talking points will be the same – even if aircraft orders are in short supply.

Preparations for the original air show were well under way as the coronavirus began to wreak havoc beyond China. By early March, contractors were preparing the site for the arrival of hundreds of exhibitors and thousands of trade visitors. Almost every hotel room within a 6 mile (10km) radius would have been booked, and indications were that the show would be a success.

PULLING THE PLUG

However, as March went on, signs were growing that coronavirus was going to have a devastating effect on the industry calendar. Countries were banning flights in and out of China, and the Singapore air show in February became the first casualty of a domino effect of event cancellations. Although the Southeast Asian event limped ahead, almost half of its major exhibitors pulled out at short notice and visitor numbers were depleted.

The news that Farnborough 2020 would join a growing list of axed air shows and conventions came days before the UK entered lockdown on 23 March. By then, hopes were vanishing fast that the impact of the outbreak could be short and contained.

When your business is largely based around delivering a biennial show, its cancellation at short notice is inevitably going to be,



A lack of static displays – and face time – will be novel for participants in this year's event

as Farnborough International said in its announcement at the time, “a major shock”. The organiser has since been in delicate negotiations with many of its exhibitors over refunds for deposits and says that, while most are “understandably frustrated”, they have been supportive of plans for a virtual replacement.

In late May, Farnborough International confirmed plans for FIA Connect, as a “platform to connect the global aerospace industry”, hosted on its own Farnborough International News Network web site. Comprising a series of free conferences, the five days also include a “meet the buyer” opportunity and a virtual version of Farnborough Friday, a day offering careers advice and inspiration to young people.

As official media partner, FlightGlobal is staging three live webinars during the week, on disruptive propulsion from electrics to supersonic power, Europe's future combat aircraft requirements and next-generation airliners. Moderated by FlightGlobal editors, they are free to attend, although delegate places are limited. FlightGlobal will also be providing its own independent coverage of FIA Connect via a dedicated hub that goes live on 15 July.

FIA Connect – which will include updates, announcements and sessions from several of the show's most prominent regular exhibitors – will help generate a “conversation among the industry that will point to how we can come back from the pandemic”, believes Farnborough

International's aerospace sales director, Joe Muir. “It will be a focal point for recovery.”

Muir admits that a “virtual” air show – without displays, chalets, exhibition halls, or social interaction – will be a new experience for most. However, Farnborough is “such a staple of the aerospace calendar” that regular attendees, many of whom are home-working and well used by now to the daily rhythm of online meetings, will be happy to tune in, he says.

Time differences will mean visitors connecting from around the world, rather than meeting in one place. However, Muir says that because Farnborough's own sessions are pre-recorded and available for download, this will be less of a challenge.

Although there will be an e-commerce “meet the buyer” element – a piece of “intelligent match-making” software that helps connect vendors with potential customers – Farnborough International rejected a “virtual exhibition” model, which Muir says would have entailed exhibitors “sitting on their computers all day. We didn't think that was right for us.”

With support from the UK government and industry trade body ADS, involvement from major industry players is “snowballing as the event gets closer”, says Muir. “Content is key to this, both in terms of the topics and the seniority of panellists,” he adds. “We have real thought leaders and this will be the driving force for audience engagement.” ■

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

Firefighting finger trouble

With the onset of summer, a courageous band of aerial firefighters is again having to perform its daredevil routine of low-level suppressant drops.

Some spectacular footage has been captured of the McDonnell Douglas DC-10 firebomber doing its stuff over burning brush in Arizona in mid-June, with one video showing the trijet emerging from over a ridge and passing firefighters on the ground.

“That’s as low as she gets, boys!” one of them exclaims.

Well, almost. A quick squint at the US Forest Service’s aviation safety reporting system reveals an interesting filing from 24 June 2018 involving the DC-10.

During pre-flight set-up at California’s McClellan reloading base, it states, one of the pilots “accidentally bumped” the emergency dump button while the jet was parked: “It caused the tank doors to open and jettison the load of retardant onto the ground.”

Any investigation into this event was probably brief. The filing lists the corrective action taken. “During pre-flight procedures,” it says, “ensure that the button is not touched.”

Spell check

It’s only one letter, but it means red faces for Korea Aerospace Industries’ press team after they issued a release listing Iran –



T-50: not Tehran-bound



This year marks 25 years since the final flight of the Hawker Siddeley Trident. But does anyone remember the uniquely-designed 24h cockpit clock? Did anyone actually master it? And the little hand is on...

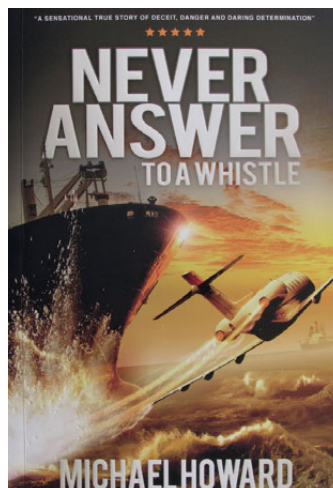
instead of Iraq – among T-50 export customers.

The supersonic trainer was designed with help from Lockheed Martin and uses the all-American GE Aviation F404 engine as well as a US weapons suite. We suspect Washington would not be too happy with military chiefs in Tehran – rather than Baghdad – getting their hands on it.

African adventure

The truth, they say, is sometimes stranger than fiction. Well, in Michael Howard’s case it was certainly more exciting – and more dangerous.

In *Never Answer To A Whistle* (Griffin Publishing, 320 pages),



Flying into the unknown

Howard – a professional pilot – describes how what started as a straightforward mission to repossess an HS 125 Series 400 business jet from Nigeria ended up taking on the narrative of a Stephen Coonts thriller.

Following an unauthorised take-off from Lagos, Howard had to avoid being shot down by the local air force before being arrested on his landing in Ivory Coast.

A planned kidnapping of a diplomat in London, Mossad agents, colleagues jailed in Nigeria and illegal currency dealing all add colour to this fascinating and true account of an aviator’s adventures in the 1980s.

Great escape

The first recorded case of escape by air from the law

100 YEARS AGO

seems to be that of a man who, much wanted by the authorities, and knowing that all the other outlets from the country were watched, hired a special machine at Croydon to fly him to Paris.

Pacific strategy

A Tokyo Press report quoted by the Japanese News

75 YEARS AGO

Agency has said: “The outcome of the battle of Japan will be

decided by aircraft.” It certainly applies to the present operations of the Americans in the Pacific. They are hitting hard with land-based and carrier-borne aircraft at Japanese air bases.

Relief for Boeing?

Award of the USAF contract for an Awacs version of the

50 YEARS AGO

Boeing 707 is likely to provide some respite for a beleaguered

Seattle area, where the run-down at Boeing is causing serious unemployment. By May Boeing had made redundant some 17,900 workers in and around Seattle.

Safety statistics

A survey by the UK Civil Aviation Authority’s General

25 YEARS AGO

Aviation Safety Department (GASD) reveals that male

general-aviation pilots in the UK are more than four times as likely to have a fatal accident as their female counterparts. The GASD cautions, however, that the study is in its early stages, and female pilots constitute only 6% of UK general aviation pilots.

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London, UK
terrappinn.com/conference/
aviation-festival/index.stm

5-8 October

AUVSI Xponential
Dallas, USA
xponential.org/xponential2020

19 October

Airlines 2050
London, UK
FlightGlobevents.com/
airlines20502020

27-28 October

Mexico's Aerospace Summit
Queretaro, Mexico
mexicoaerospacesummit.com

10-12 November

European Rotors
Cologne, Germany
europeanrotors.eu

10-15 November

Airshow China
Zhuhai, China
airshow.com.cn

2-6 December

Eurasia air show
Antalya, Turkey
eurasiaairshow.com

8-10 December

MEBAA Show 2020
Dubai, UAE
mebaa.aero

21-22 January 2021

International Conference on
Aircraft Design and
Aerodynamics
London, UK
waset.org

16-18 February

Saudi International air show
Riyadh, Saudi Arabia
saudiirshow.aero

24-25 March

Aerospace Tech Week
Toulouse, France
aerospacetechnology.com

30 March-1 April

Aeromart Montreal
Montreal, Canada
montreal.bciaerospace.com

13-15 April

Aircraft Interiors Expo
Hamburg, Germany
aircraftinteriorsexpo.com

18-20 May

EBACE
Geneva, Switzerland
ebace.aero

10-12 June

AeroExpo UK
Wycombe, UK
aeroexpo.co.uk

21-27 June

Paris air show
Paris, France
siae.fr



For a full list of events see
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IN THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
COMPANIES COURT (ChD)

CR-2018-009677

IN THE MATTER OF
CERTAIN OF THE MEMBERS AT LLOYD'S FOR ANY AND ALL OF
THE 1993 TO 2020 (INCLUSIVE) YEARS OF ACCOUNT, REPRESENTED BY
THE SOCIETY OF LLOYD'S

AND
LLOYD'S INSURANCE COMPANY S.A.
AND

IN THE MATTER OF

PART VII OF THE FINANCIAL SERVICES AND MARKETS ACT 2000

NOTICE IS HEREBY GIVEN that on 12 November 2018 an application (as amended on 12 May 2020) (the "Application") was made under section 107 of the Financial Services and Markets Act 2000 (as amended) (the "Act") in the High Court of Justice, Business and Property Courts of England and Wales Companies Court, (ChD) in London (the "Court") by: (1) The Society of Lloyd's ("Lloyd's"), acting as transferor on behalf of certain of the members, former members and the estates of former members of Lloyd's who have underwritten liabilities under non-life insurance policies originally allocated to all or any of the 1993 to 2020 (inclusive) years of accounts (the "Members"); and (2) Lloyd's Insurance Company S.A ("Lloyd's Brussels"), for an Order:

- i. under section 111 of the Act sanctioning an insurance business transfer scheme for the transfer to Lloyd's Brussels of certain insurance business written by the Members and related assets and liabilities (the "Transferring Business") in accordance with the Order and without any further act or instrument (the "Scheme"); and
- ii. making ancillary provision in connection with the Scheme pursuant to sections 112 and 112A of the Act.

Further information about the Scheme, including:

- a copy of the report on the terms of the Scheme (the "IE Report"), prepared in accordance with section 109 of the Act by the independent expert, Mr Carmine Papa of PKF Littlejohn LLP, whose appointment has been approved by the

Prudential Regulation Authority, in consultation with the Financial Conduct Authority;

- the full terms of the Scheme; and
- a summary of the IE Report and a summary of the terms of the Scheme,

is available free of charge and can be downloaded from www.lloyds.com/brexittransfer or by calling or writing to us at the address below.

The Application is due to be heard before a Judge of the Court at 7 Rolls Building, Fetter Lane, London, EC4A 1NL, United Kingdom on 1 October 2020 (the "Hearing"). If approved by the Court, it is currently proposed that the Scheme will take effect on 29 October 2020.

Any person who thinks that they would be adversely affected by the carrying out of the Scheme may make representations about the Scheme at the Hearing either in person or by a representative, or by telephone or in writing using the contact details below.

Any person who intends to appear at the Hearing or make representations by telephone or in writing is requested to notify his or her objections as soon as possible and by 23 September 2020, setting out why they believe they would be adversely affected.

Lloyd's contact information:

To speak to a representative of Lloyd's about the proposals, or to object, please contact us on the Information Line: **0044 190 494 7001**

Lloyd's representatives can answer enquiries in English, Dutch, French, German, Italian and Spanish.

The helpline will be open from 9.00a.m. to 5.00p.m. on Monday to Friday UK time (excluding bank holidays) until the Scheme takes effect on 29 October 2020.

Alternatively, please contact us in writing in any language by email:

enquiries@lloydsbrexittransfer.com

Or by post: Lloyd's Brexit Transfer, PO Box 274, BANGOR, BT19 7WZ, United Kingdom.

For all enquiries unrelated to the transfer, please contact your normal market representative, Managing Agent, Broker or Coverholder.

Lloyd's appointed Solicitors: Freshfields Bruckhaus Deringer LLP.

Ref: 053895:0542/GHFS

July 2020

New and used aircraft

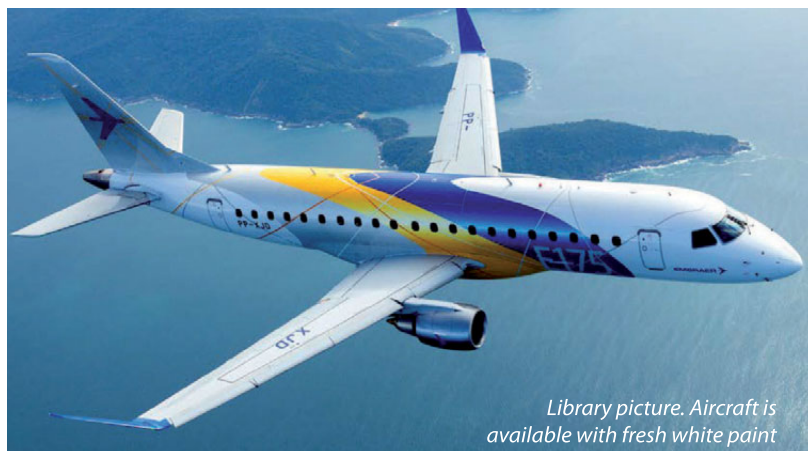
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Request for proposal (RFP) Reference No. and Date
 Ref PROC/101/20/GM 07th July 2020

Closing date and time
 11th August 2020 at 16:00 hrs local MRU time

Availability of Tender documents
 Interested parties should send an email to the following address:
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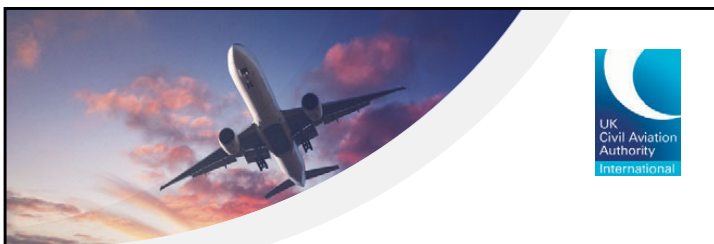
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WORK EXPERIENCE SPENCER HOGGARTH

The mechanics of how to fix aircraft

With a background in engineering, Spencer Hoggarth now oversees training at MRO firm Flying Colours. Having just opened its largest hangar so far, the business sees developing new recruits as vital to growth

How did you get involved in aviation?

My father was an aircraft mechanic, so you could say it runs in my family. From a young age, there was always a fascination with the aerospace industry. I attended the Southern Alberta Institute of Technology in Calgary and completed the aircraft maintenance engineering course. After receiving my aircraft maintenance engineer (AME) licence and gaining the US Federal Aviation Administration airframe and powerplant licence, I moved to Peterborough to accept a position as an AME with Flying Colours.

What does an aircraft technical trainer do?

It is a new role, so to some extent I'm still shaping it. Flying Colours recently added online learning to its training offering and I'm responsible for developing and establishing this as a viable method of sharing skills and knowledge across the company.

How does your typical working week look?

As administrator of the online Learning Management System, there's a multitude of weekly tasks. Typically, this involves creating relevant online modules, classroom teaching, distributing online course material and on-the-job training. The online courses are very effective in providing maintenance training using a variety of materials and visual aids. As a new project I'm also evaluating its effectiveness to establish what works and what doesn't, as the plan is to



Keeping abreast of evolving procedures is a challenge, says Hoggarth

streamline this as a means of training across our facilities in Peterborough, Ontario; St. Louis, Missouri; and Singapore. We're growing rapidly. This helps to keep the team current without having to waste time travelling. It's clear that this is where we need to move in order to keep training accessible to all employees as the company evolves.

When are you happiest?

I enjoy seeing the progress made by the technicians during training. Not only in terms of skill development, but also their dedication and patience. A well-structured, clear path really helps the training succeed. It makes the educational journey much more enjoyable for everyone and achieves their goals faster. Having a background in maintenance allowed me to work on many

different aircraft types. That variety is now replicated, but the variety is represented by the different divisions. I liaise with colleagues from avionics, cabin refurbishments, completions, maintenance, modifications and paint divisions, so there is always something new to learn.

What is the most difficult part?

Keeping up with the constant changes of a growing business is always challenging, but in a good way. For example, I'll put together a new lesson, then a week later that lesson needs to be updated because of a procedural change. In addition, the industry is changing so quickly – a few years ago, avionics and connectivity were not at the forefront of aviation, but now if the connectivity system isn't working, the aircraft won't fly. This means I need to

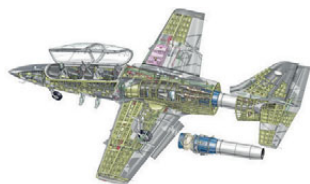
stay on top of all the different sector developments. Selecting the right teaching methods for each trainee is a challenge as some work better than others, but the investment in teaching tools such as the online ones has definitely made that process easier.

How is growing aircraft complexity affecting your work?

Every new type of aircraft has become better at "self-diagnosis". The large array of onboard sensors helps the aircraft "tell" the technician what might be wrong, which is great, but it in no way replaces an experienced technician. The technician must have a solid understanding of how the system should operate before a diagnosis is made. There will always be a practical side of maintenance, at least until robots exceed humans in dexterity. The flip side of this is that the advanced aircraft also give us many new components to learn about. With every advancement in technology, technicians have to stay up to date, so the online learning is vital. Dealing with new aircraft is always interesting, although you can't underestimate the knowledge needed to deal with older machines. ■

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