

MRO^{360°}

**TO OWN,
OR NOT TO OWN,
THAT IS THE QUESTION...**

Spare engine management

AVIONIC REPAIRS

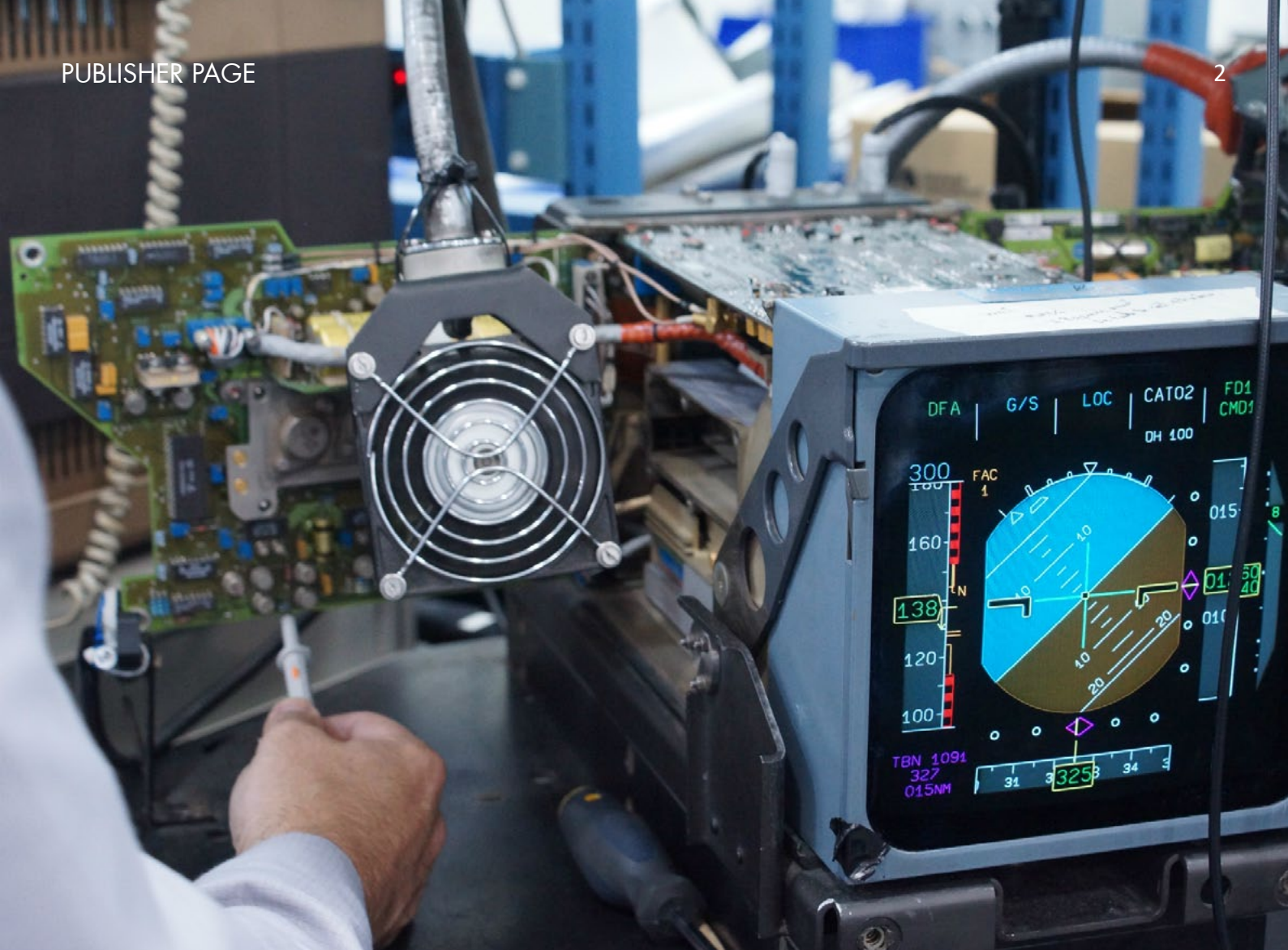
Technology, talent and the
turnaround challenge

MYTHBUSTERS

Composite damage is
always visible

FIRE & ICE

Aircraft maintenance
in extreme environments



Dear Industry Colleagues,

This month we are taking an in-depth look at the challenging task of "Spare Engine Management", made even more so with continued supply chain problems. It has been interesting to learn about the various ways those involved in that specific side of the MRO sector have coped with so many varying demands.

Our second feature article focuses on "Avionic Repairs" where, once again, supply chain problems exist, while component obsolescence, skills' shortages and the demand for even faster turnaround times place enormous and constant pressure on specialist providers.

We also thought it would be interesting and revealing to explore the world of aircraft maintenance in extreme environments, and how the maintenance of two identical aircraft can differ so greatly if operated in different locations. From the sand and dust of North Africa to the bitter cold of sub-zero Arctic temperatures, with the salty and humid atmosphere of coastal airports in between, the degradation of aircraft parts can appear in so many different forms and over varying periods of time.

Finally, for our monthly 'Mythbusters' series, we look at the misconception that "Composite Damage Is Always Visible".

As always, we hope you enjoy the edition.

Torsten Tamm
Publisher

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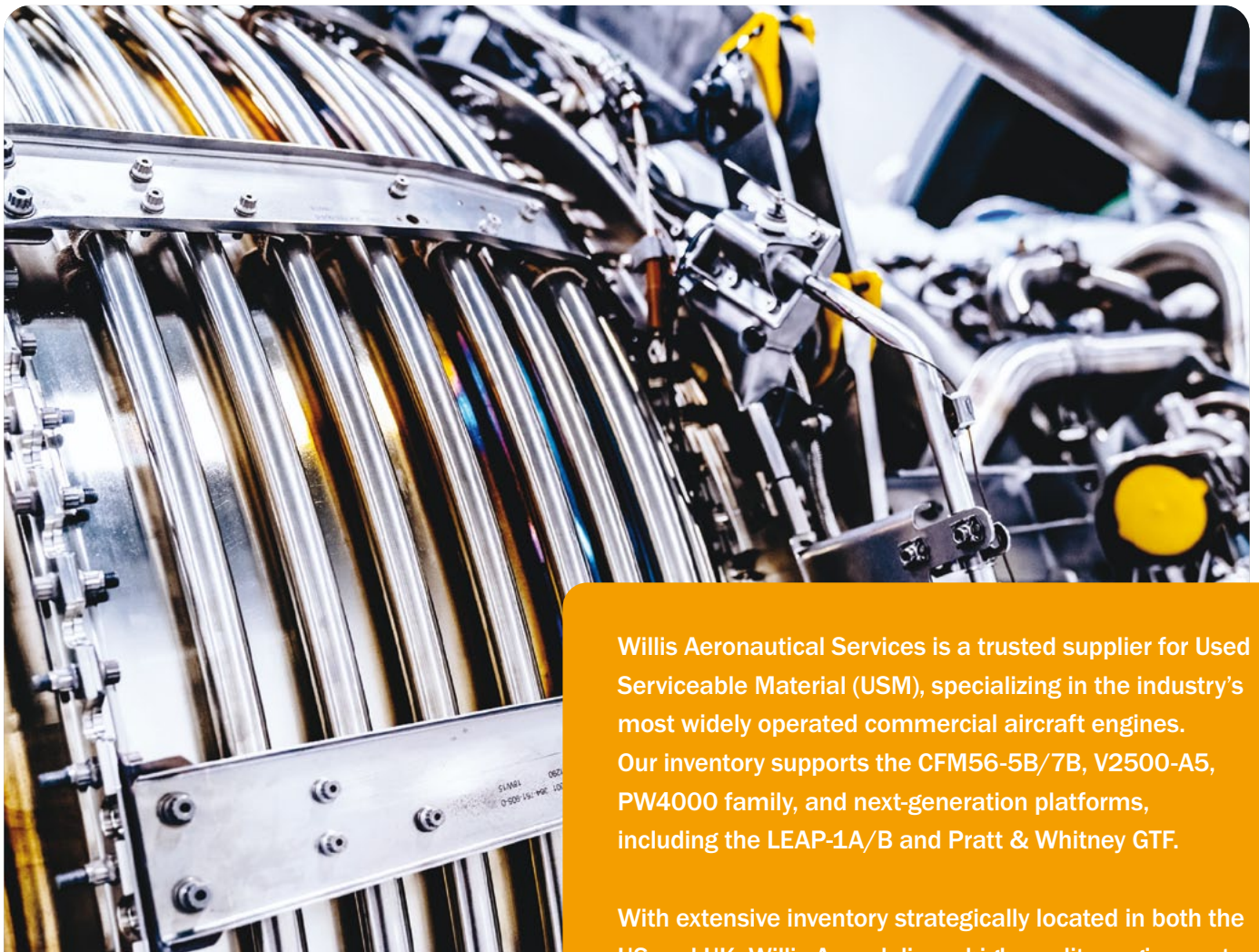




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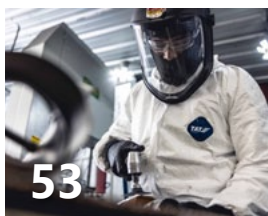
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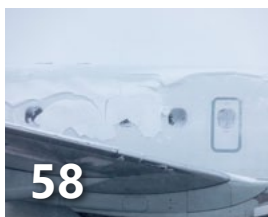
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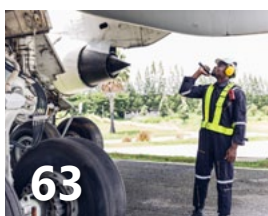
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Vietjet, Thales sign aircraft maintenance deal

Vietnamese airline Vietjet and French technology group Thales have signed a maintenance, repair and overhaul contract covering components for Vietjet's Airbus A320 and A330 fleets, the companies said. Under the Repair-By-The-Hour agreement, Thales will provide component maintenance services aimed at improving aircraft availability, reducing operating lifecycle costs and speeding up repairs, they said. The deal comes as aviation forms part of the Comprehensive Strategic Partnership between France and Vietnam, established in October 2024, and will draw on Thales' global maintenance network as Vietjet modernises its fleet. The companies also signed a memorandum of understanding covering digital aviation, avionics, cybersecurity and artificial intelligence. The agreement will explore technologies for optimising flight operations, data-driven maintenance and Thales' connected aircraft services. The cooperation will also examine the use of AI and cybersecurity to protect Vietjet's critical aviation systems through cloud-based security solutions, predictive analytics and decision-support tools, the companies said. Thales said it has more than 800 AI specialists and combines aviation expertise with technology capabilities in areas including cybersecurity and artificial intelligence.



Vietjet and Thales have signed an MRO contract covering components for the carrier's A320 and A330 fleets
© AirTeamImages

Project NEWBORN achieves hydrogen-electric propulsion milestone for aircraft



NEWBORN develops and demonstrates the TRL 4 ground demonstrator of the overall propulsion system using fuel cells technology for electricity generation
© NEWBORN

Honeywell Aerospace said its engineering team in Brno, the Czech Republic, has successfully integrated the main subsystems of a hydrogen fuel-cell power source capable of generating and supplying electricity for an aircraft, marking progress in a European project aimed at developing low-emission aviation technology. The work is part of Project NEWBORN, launched in 2023 and funded by the European Union through the Clean Aviation Joint Undertaking. The project brings together 18 companies and research organisations from ten European countries to develop an aerospace-qualified hydrogen fuel cell propulsion system capable of delivering power in the megawatt class. The

completed integration brings together fuel cells and other electrical and supporting systems into a functional hydrogen power source. The next stage will be a ground demonstration of the complete propulsion system, in which hydrogen fuel cells and batteries will provide electricity to a megawatt-class electric motor driving an aircraft propeller. Honeywell has developed a dedicated test platform to replicate a range of aircraft functions and assess the hydrogen power source under controlled conditions. The platform is installed at the research and engineering facility operated by ÚJV Řež near Prague and includes power generation, fluid distribution, electrical

and control systems, safety equipment and heat-rejection systems. Engineers have tested the integrated system for electrical functionality, leak tightness, fluid operating parameters, interaction between subsystems, control algorithms and protection mechanisms. Further testing will focus on increasing the system's power range and improving its stability and resilience, Honeywell said. The project involves multiple teams working on hardware, software, modelling, simulations and integration. Companies and research institutions including PowerCell, Fraunhofer, Test-Fuchs, Siemens Industry Software, KU Leuven, Friedrich-Alexander-Universität Erlangen-Nürnberg and CIRA have contributed to different elements of the programme. The hydrogen power source will now be transferred to Gorizia, Italy, where the next phase of testing will take place. There, it will be connected to battery systems supplied by Pipistrel and a megawatt-class electric propulsion system jointly developed by the University of Nottingham, Honeywell Aerospace and Pipistrel. The project is intended to bring together technologies developed across Europe and demonstrate their operation as an integrated hydrogen-electric propulsion system, a step towards the use of hydrogen fuel cells in future aircraft.

Boeing completes first American Airlines 737 MAX landing gear exchange



An American Airlines 737 MAX on take-off

© Boeing

Boeing and American Airlines have completed the first landing gear exchange on a 737 MAX, a milestone that extends Boeing's long-standing Landing Gear Exchange Program to its latest generation of single-aisle aircraft. The exchange demonstrates Boeing's ability to provide fully overhauled and certified main and nose landing gear assemblies ready for installation, potentially reducing aircraft downtime and the need for airlines to hold costly spare gear. Under the programme, Boeing overhauls and certifies landing gear assemblies before delivering them with the required installation kits. For the American Airlines exchange, the assemblies were supplied with

installation kits, excluding wheels, tires and brakes. Boeing said the completed swap validated the process from technical overhaul and documentation through delivery, demonstrating that the exchange model can be applied to the 737 MAX fleet. The programme offers airlines an alternative to purchasing and storing expensive spare landing gear, while providing access to replacement assemblies when required. Boeing is also expanding its global overhaul capacity and working with certified maintenance, repair and overhaul (MRO) partners to increase geographic coverage and reduce lead times. The company's near-term priorities include expanding its inventory of 737 MAX-capable exchange assemblies, adding forward-exchange capacity closer to customer operations and tracking downtime and cost data as the programme scales.

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Xiamen Air picks Altitude for Heathrow 787 maintenance



Xiamen Air aircraft at London Heathrow Airport

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Dublin-based aircraft maintenance provider Altitude Engineering (Altitude) has signed a long-term agreement with

Xiamen Air to provide scheduled line maintenance services for the carrier's Boeing 787 Dreamliner operations at

London Heathrow Airport. The contract covers scheduled flight operations beginning in September 2026. Under the agreement, Altitude will carry out routine line maintenance checks and defect rectification for Xiamen Air's 787 fleet as the carrier launches a new route between London and Xiamen. Altitude has expanded its presence as an independent line maintenance provider in Europe, operating at major airports and supporting international passenger and cargo carriers with maintenance services for wide-body and narrow-body aircraft. Its Heathrow operation has also grown in recent years, supported by demand from short- and long-haul operators seeking technical support at the international hub.

Iberia wins unrestricted approval for A350 heavy maintenance

Iberia has secured approval from Spain's aviation safety authority to carry out heavy maintenance on its entire Airbus A350 fleet, the airline said. The Spanish Aviation Safety and Security Agency (AESA) granted Iberia's Heavy Maintenance division the authorisation without operational limitations, giving the company full maintenance capabilities for the A350 for the first time. The approval follows two years of work involving more than 150 actions covering training, engineering, production, materials, equipment, infrastructure, documentation, organisation, quality and IT systems, Iberia said. Iberia said the unrestricted approval from the outset reflected the confidence of Spanish aviation authorities in its maintenance capabilities. The authorisation strengthens Iberia Maintenance's position in the aircraft maintenance market and is expected to create new opportunities for the expansion of its maintenance business, the airline said.



Iberia obtains authorisation to carry out comprehensive maintenance on A350 aircraft

© Iberia

TAT Technologies joins Beyond Aero hydrogen aircraft

TAT Technologies has partnered with French aerospace company Beyond Aero to help define the thermal management architecture for its hydrogen-electric business aircraft programme, the companies said. Beyond Aero is developing the ONE, a clean-sheet aircraft designed around hydrogen-electric propulsion that aims to carry six passengers up to 800 nautical miles (1,500 km), about five times farther than comparable battery-powered aircraft. The Toulouse- and Paris-based company, which also operates in Los Angeles, was

founded in 2020 and focuses on fuel-cell propulsion, gaseous hydrogen storage and advanced thermal management. It has more than 80 aerospace engineers, it said. As part of the collaboration, Beyond Aero is integrating TAT Technologies' Universal Cooling System (UCS) into the ONE design. The scalable thermal management system is designed to provide cooling across a range of operating conditions while meeting the size, weight and performance requirements of electric and hydrogen-electric aircraft.

EPCOR and cargo airline mas sign five-year A330 APU support deal

EPCOR, part of Air France Industries KLM Engineering & Maintenance (AFI KLM E&M), has signed a five-year agreement with Mexican cargo airline mas to provide long-term support for its Airbus A330 auxiliary power unit (APU) fleet. The agreement covers five A330s equipped with GTCP331-350 APUs and marks the first contract between EPCOR and mas. As mas expands its international cargo operations and fleet, the agreement is designed to provide predictable APU support and help maximise fleet availability and operational continuity. Under the deal, EPCOR will provide APU shop-visit maintenance, replacement APU leasing, engineering support and Prognos® for APU, its predictive maintenance solution aimed at improving maintenance planning and predictability. The support package has been tailored to mas' operational requirements, while access to replacement APUs through EPCOR's lease pool will provide additional flexibility as the airline manages its APU needs. The combination



EPCOR and mas have signed a long-term APU support agreement for mas' A330 fleet

© AirTeamImages

of maintenance, asset management, engineering and predictive services is intended to give mas greater control over APU requirements while supporting the reliability and operational performance of its A330 fleet. The agreement combines EPCOR's specialised APU capabilities with the broader operational perspective and MRO expertise of AFI KLM E&M. EPCOR provides APU maintenance for a wide range of commercial aircraft, including the Airbus

A330 and A350, and offers complementary asset management solutions, including APU leasing and exchanges, as well as Prognos® for APU for predictive maintenance support. As mas continues to develop its international cargo operations, the airline currently operates five Airbus A330 aircraft and is looking to further expand its fleet, with additional A330 aircraft and potential future fleet development including the Airbus A350 and Boeing 777F.



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Condor goes live with digital aircraft tech log AMOSeTL



A320 tailfin

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German airline Condor has moved its entire fleet to AMOSeTL, an electronic technical log solution integrated with maintenance software provider Swiss-AS's AMOS platform, Swiss-AS said. The airline completed the rollout in July 2026 following a preparation and testing phase, covering about 60 aircraft, including Airbus A330neos and A320-family aircraft. Condor is using AMOSeTL's pilot, cabin and maintenance modes, creating a digital workflow for cockpit and cabin crews as well as internal and external maintenance teams. The system connects directly with AMOS, allowing technical log entries and reported defects to be transferred to the airline's maintenance system. This gives maintenance control and maintenance teams timely access to aircraft-related information and is intended to reduce handovers in the technical log process, Swiss-AS said.

Mint Turbines gains Pratt & Whitney Canada overhaul designation

Mint Turbines has been named a Pratt & Whitney Canada Designated Overhaul Facility, expanding the independent maintenance provider's portfolio of original equipment manufacturer authorisations, the company said. The designation allows Mint Turbines to perform Pratt & Whitney Canada-approved overhaul services for PT6A and PT6T series engines, subject to the manufacturer's requirements for quality systems, technical capability and regulatory compliance. The company said the authorisation will give operators access

to OEM-approved overhaul services alongside its 24-hour customer support and field service capabilities. The Pratt & Whitney Canada designation adds to Mint Turbines' existing OEM authorisations, including those from General Electric and Ozark Aeroworks, as well as Rolls-Royce through its sister company Airborne Engines in Canada. Mint Turbines said the authorisations broaden its ability to provide certified engine support to government, commercial and specialist aviation operators.

JCB Aero achieves Boeing Part 145 certification

JCB Aero, part of the AMAC Aerospace Group, has expanded its MRO capabilities after securing a new Part 145 approval covering Boeing aircraft. Based in Auch, near Toulouse, France, JCB Aero began its MRO operations in October 2024 and has since completed numerous maintenance projects on Airbus aircraft. Following this new approval, the company can now extend these services to Boeing operators, covering Base and Line Maintenance on Boeing B737 aircraft, including the B737-600, B737-700, B737-800 and B737-900 variants. JCB Aero has already begun issuing quotations and expects to welcome several Boeing aircraft to its hangar in the coming months. Sébastien Kubler, Chief Operating Officer at JCB Aero, commented on the company's achievement: "Receiving

this Boeing approval marks an important milestone in the development of JCB Aero's MRO activities. Adding the Boeing 737 family to our existing Airbus capabilities enables us to serve a wider range of customers and further strengthens our position as a flexible and responsive MRO partner. This achievement is also a great recognition of the commitment and expertise of our teams." This milestone follows AMAC Aerospace's recent announcement of strong demand for Bombardier maintenance services at its Basel facility, where the company has completed a wide range of inspections, repairs and component replacements across the manufacturer's long-range business jet portfolio.

Neuberger launches aerospace finance platform

Neuberger Specialty Finance (NBSF) has agreed with a group of aerospace finance professionals to launch New Bridge AeroFinance, an aerospace financing platform that will originate and acquire loans and other debt instruments across the sector. The platform, which will be led by Richard Moody alongside co-founders and principals Debbie Frew and William Glaister, initially aims to build a portfolio worth more than US\$2 billion. New Bridge Aero will target asset-based investments designed to provide downside protection and durable cash flows, NBSF said. Moody most recently served as global head of aviation finance at Hamburg Commercial Bank and previously led transportation finance globally at Deutsche Bank. Frew has held senior aviation finance roles at Hamburg Commercial Bank and Deutsche Bank, while Glaister previously served as global head of asset finance at law firm Clifford Chance. NBSF is the asset-based finance arm of Neuberger, a private, independent and employee-owned investment manager with US\$613 billion in assets across equities, fixed income, private equity, real estate and hedge funds. Since launching its strategy in 2018, NBSF has managed more than US\$5 billion across more than 50 portfolio companies and investment vehicles. The group, led by Peter Sterling, has invested more than US\$16 billion through 80 global origination partners, including commercial banks and fintech firms, across thousands of underlying loans.



NBSF launches aerospace finance platform 'New Bridge AeroFinance'

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EGYPTAIR expands Boeing health management deal

EGYPTAIR Maintenance & Engineering has expanded an agreement with Boeing to deploy its Airplane Health Management (AHM) solution across EGYPTAIR's growing Boeing 737 MAX fleet, the companies announced at the 2026 El-Alamein International Airshow. The agreement was signed by Mohamed Samy, Chairman and Chief Executive of EGYPTAIR Maintenance & Engineering, and Dave McKenna, Boeing Global Services' Regional Managing Director of Sales for the Middle East and Africa. It was witnessed by Ahmed Adel, Chairman and Chief Executive of EGYPTAIR Holding. The AHM system provides continuous, real-time monitoring of aircraft conditions and predictive data aimed at reducing unscheduled delays, improving parts planning and streamlining maintenance, repair and overhaul (MRO) operations. The deployment builds on EGYPTAIR's existing use of AHM across its Boeing 787 and 777 fleets as the airline expands its 737-8 fleet to 18 aircraft.



The expanded agreement was signed by both parties at the 2026 El-Alamein International Airshow
© EGYPTAIR Maintenance and Engineering

AeroSHARK "shark skin" set for Airbus A330



Applying AeroSHARK 'shark skin' on the A330 aircraft

© Lufthansa Technik

Lufthansa Technik is moving closer to bringing its drag-reducing AeroSHARK "shark skin" technology to Airbus A330 aircraft, with a Discover Airlines A330-200 set to become the first Airbus jet worldwide to undergo installation and flight testing. The company entered the final phase of the Supplemental Type Certification (STC) process for the A330-200 and A330-300 at the end of August. The Discover Airlines aircraft will be modified at Elbe Flugzeugwerke in Dresden and undergo several weeks of test flights before and after the installation. Developed by Lufthansa Technik and Surventis, formerly BASF Coatings, AeroSHARK uses a riblet-textured surface film modeled on shark skin. The technology is designed to reduce aerodynamic drag, cutting fuel consumption and associated CO₂ emissions. AeroSHARK is currently certified for commercial use on the Boeing 777F, 777-300ER and 777-200ER. The A330 certification programme expands the technology to one of the world's most widely delivered long-haul aircraft types, many of which are expected to remain in service for years. Lufthansa Technik is conducting the A330 certification programme with the European Union Aviation Safety Agency (EASA). It includes technical documentation, ground and flight testing, followed by in-service validation. If approved, the certification would pave the way for AeroSHARK to be deployed more widely across the global A330 fleet.

GKN Aerospace starts US\$16 million North Charlestown expansion

GKN Aerospace has begun construction on a US\$16 million expansion of its North Charlestown facility in Indiana, increasing capacity for aero-engine components and supporting growth across its engine components business, the company said. The project will add about 57,000 ft² to the site, bringing its total footprint to nearly 97,000 ft². The expanded facility will add manufacturing capabilities including turning, surface finishing and non-destructive testing, allowing more production processes to be carried out on site and helping to improve efficiency and reduce lead times, GKN Aerospace said. The investment, announced earlier this year, will also provide space for additional employees and support a broader range of manufacturing activities as demand grows. "This expansion gives us the space to grow our team, increase



GKN Aerospace breaks ground on North Charlestown expansion

© GKN Aerospace

production capacity and broaden our capabilities," Tomas Lindsta, Senior Vice President of OE Product Solutions at GKN Aerospace, said. "By bringing more manufacturing processes in-

house, we can further develop our employees' skills, gain greater flexibility and respond more effectively to our customers' evolving needs as our business continues to grow," he said.

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GE Aerospace to buy precision casting specialist CPP

GE Aerospace has agreed to acquire Consolidated Precision Products (CPP), a major manufacturer of highly engineered castings, from private investment firms Warburg Pincus and Berkshire Partners. Headquartered in Cleveland, Ohio, CPP supplies precision castings and sub-assemblies primarily to the commercial aerospace and defence sectors. Founded in 1991, the company is one of the world's largest producers of investment and precision sand castings. CPP manufactures complex castings from superalloys, titanium, aluminium, magnesium and steel for commercial and military aircraft, weapon systems, business and regional jets, helicopters and industrial gas turbines. The company employs around 6,600 people across more than 20 facilities worldwide. GE Aerospace has been a CPP customer for more than 15 years. GE Aerospace Chairman and CEO H. Lawrence Culp Jr said the acquisition would help the company expand critical casting capacity amid strong demand across commercial engines, aftermarket services and defence. "By combining GE Aerospace's technology capabilities and FLIGHT DECK with CPP's manufacturing experience, we expect to



CPP is one of the industry's most capable titanium casting suppliers

© CPP

expand capacity, improve performance and accelerate new engine technologies for the current fleet and next-generation platforms," Culp said. GE Aerospace said it plans to use its FLIGHT DECK technology to improve manufacturing processes and quality, increase output and better integrate design and production. Culp said

the improvements would also support the deployment of enhanced airfoil technology and help ensure manufacturing readiness as the company increases production. "Investing in mission-critical casting capacity is needed to support the strong simultaneous demand across commercial engines, aftermarket and defence," he said.

BCT extends C Check capability to 84 months



BCT Aviation Maintenance extends C Check capability to 84 months for A320 and B737 aircraft

© BCT

BCT Aviation Maintenance (BCT) has secured approval from the UK Civil Aviation Authority (CAA) to extend its Part-145 base maintenance C Check capability to 84 months for Airbus A320-family and Boeing 737 classic and next-generation aircraft. The approval marks a strategic enhancement of BCT's heavy base maintenance capability, allowing the company to perform extended-interval C Checks on two of the world's most widely operated narrow-body aircraft families. With Airbus A320 and Boeing 737 fleets continuing to dominate short- and medium-haul operations globally, demand for efficient, flexible and cost-effective maintenance solutions remains high. BCT's enhanced capability is designed to support operators managing high-cycle aircraft, where maintenance optimisation is critical to balancing cost efficiency

with operational reliability. The approval also confirms BCT's continued compliance with stringent Part-145 regulatory requirements, alongside its demonstrated expertise in structural maintenance, engineering oversight and fleet maintenance planning. The extension further reflects the organisation's investment in skilled personnel, advanced tooling and robust reliability management processes.

US\$25 million boost for P&W's Polish engine operation



Pratt & Whitney's Niepołomice, Poland, facility

© RTX

Pratt & Whitney is investing US\$25 million (PLN 95 million) to expand its Polish manufacturing facility in Niepołomice, increasing production capacity for complex tubular assemblies used in commercial and military engines. The expansion is expected to be operational in 2028 and will create more than 120 jobs as Pratt & Whitney responds to rising demand for aircraft engines. The Niepołomice site currently manufactures

precision components for several engine programmes, including Pratt & Whitney's GTF engine for commercial aircraft, the PW800 for business jets and the F135, which powers all variants of the F-35 Lightning II fighter. "Poland plays a vital role as a key hub in Pratt & Whitney's global engine production, a commitment further strengthened by our US\$125 million investment in facilities this year," said Dariusz Stopa, general manager of

Pratt & Whitney in Niepołomice. "Our employees in Niepołomice manufacture high-precision engine components that support commercial and military aircraft around the world. Growing this team will increase our ability to meet global demand for advanced aircraft engines." The investment is supported by the Polish government through its Polish Investment Zone Programme. It follows a recently announced US\$100 million investment in Pratt & Whitney facilities in Rzeszów, Poland, aimed at increasing production capacity and adding advanced capabilities for processing isothermally forged parts for the GTF, F135 and F100 engines. Poland is RTX's largest investment and employee base outside the US, with more than 9,500 employees across its Collins Aerospace, Pratt & Whitney and Raytheon businesses in the country. Pratt & Whitney's Polish operations provide advanced manufacturing and technology development capabilities for commercial and military engines, turboprops and auxiliary power units. Products manufactured in the country include the GTF fan drive gear system, F100 static structures and critical F135 components.

Ontic acquires SIRS Navigation

Ontic has acquired SIRS Navigation, a Kent, UK-based specialist in the design and manufacture of precision standby magnetic compasses for the global aviation industry. SIRS Navigation has been designing, manufacturing and supporting aviation magnetic compasses for more than 60 years. Its products are installed across major commercial and business aviation platforms, including fixed-wing aircraft and rotorcraft, with tens of thousands of units in service worldwide. The company supplies compasses to aircraft manufacturers for installation on production lines, while also providing replacement units to operators and distributors through the aftermarket. It operates a 24/7 global support network covering logistical and technical assistance. SIRS Navigation's compass designs, originally acquired from GE Aerospace, have been continuously developed in-house. The company



Ontic is expanding its portfolio with the acquisition of SIRS Navigation

© SIRS Navigation

also provides customised designs to meet specific customer and aircraft requirements. Ontic said the acquisition underlines its strategy of investing in specialist aerospace businesses with established intellectual property and long-standing positions across aircraft platforms. JC Gallagher, Ontic's new CEO,

said SIRS Navigation had built a "market-leading position" and a strong reputation across the aviation industry over more than five decades. "This acquisition is about providing continuity and long-term commitment to its customers, while giving the business a home where it can continue to thrive," Gallagher said.

Vietjet, CFM assess Vietnam LEAP engine MRO

CFM International and Vietnam's Vietjet have signed a letter of intent to assess the feasibility of developing local maintenance, repair and overhaul (MRO) capabilities for LEAP engines in Vietnam, the companies said during Vietnamese General Secretary and President To Lam's official visit to France. Under the agreement, CFM would propose a consulting arrangement to advise Vietjet on engine MRO requirements, capabilities, infrastructure, workforce needs and other industry considerations linked to a potential local maintenance operation. The initiative comes



The MRO was signed during Vietnamese General Secretary and President To Lam's official visit to France

© CFM International

as Vietjet expands its next-generation fleet and could support the airline's long-term operations while helping Vietnam develop high-value aerospace services, train internationally qualified engineers and deepen its role in the global aviation supply chain. CFM has powered Vietjet's growth since the airline took delivery of its first CFM56-powered Airbus A320ceo in 2014. Vietjet now operates 50 CFM56-powered A320ceo and A321ceo aircraft. The relationship is set to enter a new phase following Vietjet's recent order for 200 Boeing 737-8 aircraft, including 737-8 and 737-8-200 models powered by CFM LEAP-1B engines.

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Safran and Ramco streamline engine data integration

Ramco Systems has signed a Memorandum of Understanding (MoU) with Safran Helicopter Engines, to integrate Safran engine data with Ramco Aviation Software. Under the agreement, engine information generated following shop visits will flow directly from Safran into Ramco Aviation Software's Maintenance Information System, reducing manual data entry and enabling helicopter operators to focus on keeping aircraft in service. The collaboration is expected to result in Ramco receiving Safran Helicopter Engines' EngineLife® Connect label, which recognises connectivity solutions compatible with Safran's products and services. Under the MoU, Ramco Systems and Safran Helicopter Engines will work to integrate engine configuration, usage and maintenance data directly into Ramco Aviation Software. The partnership will establish a reliable two-way data exchange, supported by compatible formats and operational processes. For operators, the integration is expected to reduce the time and effort required to enter engine data into the Maintenance Information System, while improving the accuracy, quality and consistency



Ramco and Safran Helicopter Engines partner on engine data integration

© Ramco Systems

of information used for airworthiness management and maintenance planning. Sam Jacob, Executive Vice President & SBU Head – Aviation, Aerospace and Defense, Ramco Systems, commented on the new partnership: "With several of the world's largest helicopter operators on our platform, Ramco sits at a unique intersection of the aviation MRO ecosystem — connecting OEMs and operators through a single digital backbone. We're delighted

to partner with a leader like Safran Helicopter Engines to enable this seamless digital exchange: Safran gains richer engine maintenance data to strengthen reliability, while operators receive OEM information directly into their systems, cutting manual work and improving productivity. Powered by AI and agentic automation, Ramco Aviation Software is built to make exactly this kind of connected, intelligent ecosystem possible."

Avianca secures US\$300m engine maintenance financing



CFM56 engine

© CFMI

Avianca has secured up to US\$300 million in financing to support MRO services for its CFM56 engines at GE Aerospace's Celma facility in Brazil. The agreement, announced by Avianca, GE Aerospace and the Brazilian Agency for Management of Guarantee Funds and Guarantees (ABGF), was arranged through Citibank and backed by export

credit insurance provided by ABGF. The financing supports the export of high-value Brazilian services and marks the first time a non-Brazilian airline has secured funding under the framework for aircraft engine maintenance services. Avianca, part of the Abra Group alongside Gol and Wamos, said the agreement would provide greater

flexibility in executing its engine maintenance plans while supporting the reliability and resilience of its fleet. "This innovative financing solution, a first-of-its-kind with ABGF, provides Avianca with access to world-class maintenance and overhaul services at our Celma facility in Brazil," said Mahendra Nair, Group Vice-President of Global Commercial Sales at GE Aerospace. The agreement further strengthens Brazil's position as a regional hub for specialised aerospace services, supported by skilled personnel, internationally certified facilities and advanced technical capabilities. GE Aerospace's Celma operation is the company's main aircraft engine overhaul facility in Latin America. Nearly 25% of GE Aerospace's internal engine maintenance work worldwide is carried out by its Brazilian operations across five sites in Petrópolis, Rio de Janeiro and Três Rios.

StandardAero opens Winnipeg facility expansion



StandardAero expands Winnipeg facilities

© StandardAero

StandardAero has opened a 70,000 ft² extension to its Winnipeg facility, increasing MRO and component repair capacity for airline and military operators worldwide. The expanded site supports GE Aerospace CF34-3/8 and CFM International CFM56 engines, which power a range of regional, business, commercial and military aircraft, including the Embraer E-Jets, MHIRJ CRJ family, Bombardier Challenger, Boeing 737NG, Airbus A320ceo and P-8A

Poseidon. The investment underlines StandardAero's continued commitment to CF34 and CFM56 customers worldwide while building on its 115-year history in Winnipeg. The company employs 1,500 highly skilled people across eight facilities in the city, supporting commercial, military and business aviation operators globally and contributing to the local economy. "Opening this facility in the city where our company was founded underscores

both our deep roots in Winnipeg and our confidence in the future," said Russell Ford, Chairman and CEO of StandardAero. "By increasing our capacity to support CF34 and CFM56 operators, we are investing in the long-term success of our customers and reinforcing Winnipeg's role as a key hub within our global network. We are grateful to both the Manitoba provincial government and our other partners for their support as we continue to provide reliable, high-quality engine services for customers around the globe." "Demand for high-quality CF34 and CFM56 support continues to grow, and we believe that this expansion will ensure that we can meet our customers' evolving needs for years to come," added Peter Wheatley, Vice President and General Manager – CF34/CFM56 at StandardAero. "By combining additional capacity with world-class equipment, talent and processes, we are delivering on our commitment to deliver operational excellence. Backed by a highly skilled workforce and a strong foundation of long-term customer commitments, this facility positions us to deliver even greater value, responsiveness and reliability."

AnimaWings selects SAMCO for Airbus A220 maintenance

AnimaWings has selected SAMCO Aircraft Maintenance (SAMCO), as the base maintenance provider for its Airbus A220 fleet. The newly signed agreement further strengthens the companies' existing relationship and builds on the close cooperation and strong support already established between them, providing a solid foundation for the continued operation of AnimaWings' A220 aircraft. Under the agreement, SAMCO will provide tailored base maintenance services designed to support the safety, reliability and operational availability of AnimaWings' growing Airbus A220 fleet. Each maintenance input will be carefully planned and managed in close collaboration with the airline, ensuring that work is completed efficiently and aircraft are returned to service on schedule. SAMCO's experienced engineering and maintenance teams will draw on their in-depth knowledge of the A220 platform to deliver consistently



AnimaWings Airbus A220

© Samco Aircraft Maintenance

high standards of workmanship and customer support. Its flexible approach enables the company to respond to individual operational requirements while minimising aircraft downtime and maintaining full transparency throughout every stage of the maintenance process. The partnership also reflects SAMCO's continued commitment to strengthening its position as a trusted maintenance provider for A220 operators across Europe and beyond. By combining

technical capability with responsive service and close customer cooperation, SAMCO aims to provide long-term support throughout the aircraft lifecycle. SAMCO looks forward to welcoming AnimaWings' A220 aircraft to its facilities and developing the partnership further in the years ahead. The agreement represents another important milestone for both companies and reinforces their shared focus on safety, quality, efficiency and dependable fleet operations.

Japan Airlines launches autonomous drone inspection project

Japan Airlines (JAL) and French aircraft-maintenance drone maker Donecle have launched a joint project using fully autonomous drones for exterior aircraft inspections at JAL hangars, the companies said. The project is the first in Japan to use autonomous drones approved in aircraft manufacturers' maintenance manuals for such inspections. It aims to improve the safety and efficiency of maintenance operations by reducing inspection times and limiting the need for mechanics to carry out manual visual checks at height. Under the project, drones will capture high-resolution images of aircraft exteriors for mechanics to review. JAL expects the time saved through the technology to be redirected towards predictive maintenance, helping to improve aircraft quality. Since the end of June 2026, JAL has been comparing conventional visual inspections with images captured by drones to assess the technology's effectiveness. The project uses Donecle's



Drones capture high-resolution images of aircraft exteriors for mechanics to review

© JAL

Iris GVI drones, which are approved for use in aircraft manufacturers' maintenance manuals. The drones use obstacle-detection technology to fly autonomously without touching the aircraft, allowing inspections to be

carried out consistently regardless of operator skill. The system also uses image-analysis technology to map and measure aircraft defects, enabling maintenance teams to identify and assess problem areas more precisely.

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AFI KLM E&M signs Air Corsica LEAP-1A engine deal

Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) and Air Corsica have signed a new multi-year agreement to support the airline's fleet of LEAP-1A engines. Covering nine engines that power Air Corsica's Airbus A320neo aircraft, the agreement marks a significant milestone in a partnership spanning several decades. AFI KLM E&M, which already provides CFM56-5B engine maintenance and component support for Air Corsica's Airbus A320ceo and A320neo fleet, will now extend its services to the airline's new-generation LEAP-1A engines. The

agreement underlines Air Corsica's continued confidence in AFI KLM E&M's engine MRO expertise and strengthens the Group's position in the rapidly growing LEAP engine support market. By combining extensive operational expertise with high-quality maintenance solutions, AFI KLM E&M will help Air Corsica maximise engine reliability, fleet availability and operational performance throughout the agreement. Martijn de Vries, Senior Vice-President Commercial at AFI KLM E&M, praises the extended partnership, saying the new LEAP-1A engine support agreement further

strengthens the company's long-standing relationship with Air Corsica. "For decades, AFI KLM E&M has been a trusted partner, supporting the reliability of our operations as our fleet has evolved. As we continue modernising with the Airbus A320neo, extending our collaboration to include LEAP-1A engine support is a logical progression of that long-standing relationship. Having a partner that understands our operational requirements gives us confidence that we can continue delivering the high levels of reliability and service our passengers expect."

Bombardier agrees to acquire MHI Canada Aerospace assets

Bombardier and Mitsubishi Heavy Industries (MHI) have agreed that Bombardier will acquire the assets of MHI Canada Aerospace (MHICA) in Mississauga, Ontario. Subject to regulatory approval and customary closing conditions, the transaction is expected to be completed later this year. Through the acquisition, Bombardier will add MHICA's aerostructure manufacturing expertise and approximately 750 employees to support its aircraft programmes. The transaction will also strengthen Bombardier's in-house aerostructures capabilities, resilience and operational independence. MHI will work closely with Bombardier to ensure a smooth transition, maintain

continuity and minimise disruption to aircraft programmes. Following completion of the transaction, MHI will provide support during an interim period to help transfer operations and ensure continuity for MHICA's employees and Mississauga activities. "This agreement represents a key step in Bombardier's long-term growth strategy, strengthening critical capabilities, enhancing operational resilience and supporting the company's flexibility to meet growing customer demand," commented David Murray, Executive Vice President, Manufacturing, Supply Chain Execution and Bombardier Operational Excellence (BOE) System, Bombardier. "MHI Canada Aerospace has built a highly respected operation with

a talented and experienced team. With this acquisition, we are deepening our core manufacturing expertise as well as our commitment to proactively develop the local workforce through multiple streams in component manufacturing and whole aircraft assembly." Hiroyuki Koguchi, Executive Vice-President and Head of Commercial Aviation Systems at MHI, praised MHICA's employees for their achievements and the important contribution they have made: "Together, we have built one of Canada's aerostructures manufacturers, and this agreement ensures a bright future for our employees, whose skill, dedication and expertise have been central to MHICA's success."

QOCO broadens data service supporting Rolls-Royce Trent fleet

QOCO Systems and Rolls-Royce are expanding QOCO's intelligent data service, which provides real-time airline operator data to Rolls-Royce systems to support engine reliability and maintenance operations. Delivered through QOCO's Aviadex platform, the service now covers tens of additional operators, with the aim of supporting the entire in-service modern Trent fleet and extending coverage to legacy engine types. The Rolls-Royce Trent family is a leading long-haul engine franchise, powering Airbus A350 and A330neo aircraft and a substantial share of Boeing 787s worldwide. The service

forms part of Rolls-Royce's strategy to expand the use of digital technology across its aftermarket operations. By combining automated data exchange with its analytics and optimisation capabilities, Rolls-Royce can improve engine reliability, troubleshooting and overhaul turnaround times, while developing additional digital services for customers. QOCO's service currently supports the majority of Rolls-Royce's operational modern Trent fleet, measured by both the number of operators onboarded and engine volume. More than 40 operators are live on the platform, with further operators

in the pipeline. The solution consolidates reliable, accurate and timely data from multiple sources across the airline operator network. QOCO also provides the data management capabilities required for the critical processes that depend on this information. QOCO has been Rolls-Royce's digitalisation partner since 2018, when it began supporting the company's 'Blue Data Thread' digitalisation programme and its 'Intelligent Engine' vision. By automating and standardising data exchange, QOCO helps reduce integration effort and improve transparency for airlines.

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Akzonobel Aerospace Coatings opens new Thailand facility

AkzoNobel Aerospace Coatings has officially opened a new colour blending and distribution facility in Chonburi, Thailand, strengthening its support for commercial aviation operators, MRO providers, OEMs and industry partners across the Asia-Pacific region. The opening ceremony took place on August 25, 2026, giving guests the opportunity to tour the production floor, quality control laboratory and distribution facilities, as well as meet members of AkzoNobel's local and regional teams. The new aerospace facility will provide locally blended and stocked coating solutions tailored to customers' individual requirements, improving product availability and supporting regional growth. AkzoNobel's Chonburi site, located 90 minutes from Bangkok International Airport and east of Pattaya, will blend aerospace topcoats locally and provide streamlined access to primers, thinners and curing solutions, helping to reduce lead times, improve product availability and strengthen technical and commercial support for customers across the region's growing aviation industry. Marius Vasiliu, Regional Sales Director, AkzoNobel Aerospace



Chonburi, Thailand facility

© Akzonobel Aerospace Coatings

Coatings Asia Pacific, commented on the new Asia-Pacific facility expansion: "The new opening of our Chonburi facility is an important milestone as we look to support commercial aviation operators, MROs, OEMs, and industry partners across the region. Customers can expect fast access to the products they need, backed by technical expertise and increased

responsiveness for locally blended and stocked coatings solutions at the highest quality." He continued: "From this site we will be able to offer increased distribution capabilities, reducing lead times for local blending of topcoats alongside streamlined access to primers, thinners and curing solutions."

Lufthansa Technik and Emirates renew A380 maintenance deal



Emirates renews A380 Maintenance Deal

© Lufthansa Technik Philippines

Lufthansa Technik and Emirates have reinforced their long-standing A380 base maintenance agreement. Under the new multi-year contract, Lufthansa Technik Philippines, the global MRO provider's Asian centre of excellence for wide-body base maintenance, will continue carrying out heavy checks on Emirates' A380s until 2030. The programme is already under way at Lufthansa Technik

Philippines' existing maintenance facility in Manila, where two base maintenance lines are dedicated to Emirates. The airline will also serve as the launch customer for the company's new facility at Clark International Airport once it becomes operational. The agreement is among the largest by value in Lufthansa Technik Philippines' history, underlining the strength and longevity of the

relationship between the two companies. Emirates, the world's largest Airbus A380 operator, has drawn on Lufthansa Technik's extensive heavy maintenance expertise for its flagship double-deck aircraft since 2023. Lufthansa Technik Philippines has completed more than 30 A380 checks for the airline to date. Kai Roepke, Vice-President Corporate Sales Europe, Middle East and Africa at Lufthansa Technik, thanked Emirates for its continued trust and confidence in the company. "This agreement reflects the success of our partnership and the high quality consistently delivered by our teams. As the world's leading provider of MRO services, we are proud to support the operation of the world's largest passenger aircraft and to further strengthen our collaboration with Emirates. We look forward to continuing to offer reliable, high-quality maintenance support for the airline's impressive A380 fleet in the years ahead."

JetZero raises US\$100 million to advance Z4 Programme



Jet1 aircraft

© JetZero

JetZero has completed a senior secured term loan facility worth up to US\$100 million, building on recent milestones for its all-wing aircraft programme. Designed for the mid-market segment, the aircraft will carry around 250 passengers over distances of up to 5,000 nautical miles and is expected to reduce fuel consumption and emissions by up to 50% compared with conventional tube-and-wing aircraft of a similar capacity. The funding will support

technology development, manufacture of the Demonstrator Jet1 aircraft, expansion of JetZero's US manufacturing and testing facilities in Greensboro, North Carolina, and working capital for its US operations. Tom O'Leary, JetZero CEO and co-founder commented: "Through this facility, we will fund tooling and production facilities in North Carolina, advancing aerospace innovation and reindustrialising America. Not only has the time come to reshape

aviation, but the Z4 will lead the way." The Z4 is expected to enter service in the early 2030s. The group of lenders includes Pinegrove Credit Partners, backed by Brookfield and HRTG Partners, alongside Silicon Valley Bank, a division of First-Citizens Bank. "JetZero is moving from demonstration to production, and that transition is where capital structure matters most," added Craig Caukin, Partner at Pinegrove. "We structured this facility around the programme's real milestones. Together with our limited partners, we will be looking to expand the capacity of this facility when the opportunity presents itself." JetZero is continuing to build Jet1, its full-scale demonstrator aircraft, in partnership with Scaled Composites, a Northrop Grumman company. Construction was 40% complete as of June 2026, with the maiden flight planned for the fourth quarter of 2027. In June 2026, JetZero broke ground on Factory1, its Z4 production facility in North Carolina, where it plans to create more than 14,000 jobs over the next decade.

AMAC Aerospace reports strong Bombardier demand

AMAC Aerospace has completed a wide range of scheduled inspections across the Challenger and Global families at their Basel facility, reflecting continued activity among operators seeking specialist maintenance support. Recent projects have included a 36-month inspection on a Bombardier Challenger 604, as well as a 12-month inspection combined with a change of aircraft registry on another Challenger 604. The Basel team also carried out a 12-month inspection on a Challenger 605. Demand has been particularly strong for Bombardier Global aircraft. AMAC Aerospace completed a 30-month inspection on a Global 6000 and combined 15-month and 2,250-flight-hour checks on a Global 6000 XRS. A further Global 6000 underwent both 1,500- and 500-flight-hour inspections, while the company also performed a 1,000-flight-hour inspection on a Global 5000. AMAC Aerospace has also welcomed several Bombardier aircraft to its Basel facility for defect rectification. Recent work has



© AMAC Aerospace

included an engine repair on a Global Express XRS, replacement of a bleed-air controller on a Global 5000 and a flap-actuator change on a Challenger 604. The team also completed a tail-cone repair and tyre replacement on a Global 7500. The variety of completed projects highlights the Basel facility's ability to manage maintenance requirements based on both calendar intervals and aircraft utilisation. It also demonstrates the breadth of AMAC Aerospace's experience across Bombardier's long-range business

jet portfolio. With several substantial inspections recently completed, the company's Basel operation continues to serve as an important maintenance centre for Bombardier operators. Alexis Ott, Director of Sales and Key Account Management, said the company is once again handling a busy summer programme of Bombardier projects, adding that AMAC Aerospace is attracting a growing number of new clients seeking an alternative maintenance, repair and overhaul provider.

MTU Maintenance lands first North African LEAP contracts



LEAP-1A engine

MTU Maintenance has signed its first maintenance contracts for CFM

International LEAP-1A engines in North Africa, securing agreements

© MTU Maintenance

with regional airlines including Air Cairo as it expands its presence in the market. The Air Cairo agreement covers 42 LEAP-1A engines powering 19 Airbus A320neo aircraft, MTU said. The contracts mark MTU's entry into a North African market it has targeted for several years. The region's strategic location between Europe, the Middle East and sub-Saharan Africa, along with rising tourism, passenger demand and fleet modernisation, is driving growth in narrow-body aircraft operations. The support agreement will be delivered jointly by MTU Maintenance Hannover in Germany and MTU Maintenance Zhuhai in China. Zhuhai serves as the MTU network's specialist for narrow-body aircraft engines and has extensive experience maintaining LEAP engines. MTU said established relationships with airlines in North Africa helped underpin the expansion and strengthen its position as a maintenance provider in the region.

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TP Aerospace strengthens partnership with Parata Air

TP Aerospace has expanded its partnership with Parata Air, providing a comprehensive wheels and brakes support programme to support the South Korean carrier's rapid fleet growth. Established in 2025, the partnership has developed alongside the airline's expansion from two aircraft to its current fleet of five, covering both Airbus A320 and A330 operations. Since the partnership began, TP Aerospace has supported Parata Air through its Land For Less (LFL) programme, providing Airbus A320 wheels and brakes and Airbus A330 brakes. The service includes component exchanges, access to pooled inventory, on-site stock support and 24-hour aircraft-on-ground assistance. Backed by TP Aerospace's Asia-Pacific team and global supply network, the programme has grown alongside Parata Air's fleet, helping to maintain reliable operations, control maintenance costs and simplify component management. Parata Air currently operates two Airbus A320s and three Airbus A330s across an expanding network of key regional destinations. As the airline continues to grow, it requires scalable support solutions capable of covering both narrowbody and widebody aircraft under a single programme. "The



© TP Aerospace

partnership reflects our ability to deliver scalable wheels and brakes support across both narrow-body and wide-body Airbus platforms while providing the reliability, flexibility and responsiveness required by growing airlines. As Parata Air pursues its planned expansion to the US West Coast, our workshop in Las Vegas positions us to provide local support while leveraging our global supply chain, ensuring the same high level of operational reliability as the airline expands across regions," commented Philip Broskov Hansen, Vice President, Global Program Sales at TP

Aerospace. "As important as expanding our fleet is, it is equally important to ensure that we have the maintenance and parts support infrastructure in place to operate our growing fleet safely and reliably," stated Lee Kang-hyun, Head of Maintenance at Parata Air. "Through partnerships with global industry specialists like TP Aerospace, we will continue to proactively prepare for the expansion of our fleet and route network while further strengthening the foundation for safe and stable operations."

VSE Corporation acquires Atech Turbine Components

VSE Corporation (VSE) has disclosed the acquisition of Atech Turbine Components (Atech), a specialist maintenance, repair and overhaul (MRO) provider focused on complex hot-section components for aircraft turbine engines. Founded in 1990 and based in Auburn, Massachusetts, Atech specialises in proprietary engine component repairs, primarily for Pratt & Whitney Canada platforms. Its approvals cover more than 300 part numbers, and it is the sole-source provider for many flight-critical repairs across several engine families and the PW901 auxiliary power unit. Its approximately 40 employees deliver highly technical repairs for hot-section and structural engine components supporting business, commercial, military, rotorcraft and special-mission aviation. The acquisition adds more than 300 specialised, proprietary and OEM-approved repairs to VSE Aviation's

engine aftermarket platform, expanding its capabilities beyond parts distribution and accessory MRO into differentiated engine component repair. Atech's long-standing relationship with Pratt & Whitney Canada also strengthens VSE's alignment with a key OEM partner and broadens its aftermarket support across critical engine platforms. VSE plans to expand Atech's capacity and capabilities, accelerate the development of new proprietary repairs and support future organic growth. "This acquisition represents another important step in the expansion of VSE Aviation's engine aftermarket capabilities," commented John Cuomo, President and CEO of VSE Corporation. "Atech brings a differentiated portfolio of proprietary repairs, highly technical capabilities and a deep relationship with Pratt & Whitney Canada across some of the most important engine platforms in the

aviation aftermarket. By adding Atech to VSE, we are expanding the breadth of solutions we provide to our OEM partners and customers while creating another attractive platform for long-term organic growth." Rita Kapur, President of Atech Turbine Components praised the company for their achievements: "Our people, our reputation, and the trust we have earned from our customers are what defines us. This partnership with VSE Aviation allows us to build on that foundation while creating even greater opportunities for growth. VSE shares our commitment to technical excellence, exceptional customer service, and investment in our people. Together, we will have greater resources and capabilities to expand our specialized repair portfolio, deepen our customer relationships, and continue delivering the quality and service that have defined Atech Turbine Components for decades."

SIAEC acquires 30% stake in Arport AME



© SIAEC

SIA Engineering Company Limited (SIAEC) has completed its acquisition of a 30% stake in Arport Aircraft Maintenance & Engineering (Fujian), also called Arport AME. The transaction was completed on August 26, 2026, after all conditions were met. This follows SIAEC's announcement on March 17, 2026, that it and its wholly owned subsidiary, SIAEC Global Private Limited, had signed agreements with Arport AME, Xiamen Iport Group and Arport AME's direct shareholders to complete the transaction

and establish an MRO joint venture in Fujian, China. Following completion, Arport AME has become an associated company of SIAEC. Arport (Xiamen) International Airport Co., and Arport (Fuzhou) International Airport Co., Ltd. hold the remaining 38.5% and 31.5% stakes, respectively. The transaction is not expected to have a material effect on the SIAEC Group's consolidated net tangible assets per share or earnings per share for the financial year ending March 31, 2027. None of SIAEC's directors or

controlling shareholders has any direct or indirect interest in the transaction, other than through any shares they may hold in SIAEC. The joint venture expands SIAEC's presence in China's aircraft maintenance, repair and overhaul market while bringing together its engineering expertise and IPORT Group's regional airport network. Through Arport AME, the partners will be positioned to support airline customers in Fujian and respond to growing demand for regional aviation maintenance services.

ADE revenue rises 29% as MRO demand strengthens

Asia Digital Engineering (ADE), the MRO subsidiary of Capital A Berhad, reported a strong second-quarter performance, with revenue rising 29% year on year to RM284 million for the three months ended June 30, 2026. The growth was driven by higher-value base maintenance checks and increased workshop orders, supported by greater demand for component repair and refurbishment as the company took on more intensive maintenance work. EBITDA increased to RM69 million, with a margin of 22%, while profit after tax (PAT) stood at a 14% margin. Profitability was supported by strategic debt refinancing, which helped offset higher depreciation following the acquisition of new tools. For the first half of 2026, ADE generated more than RM500 million in revenue, up 19% year on year. EBITDA rose 16% to RM112 million, while net operating profit (NOP) increased 52% to RM62 million. ADE's performance also contributed to Capital A's broader growth. Together with logistics arm Teleport, ADE accounted for more than 70% of the group's total revenue in the first half of 2026, highlighting the contribution of its core businesses following the disposal of its airline operations and exit from PN17. (RM1 = US\$0.24862 at time of publication).



© ADE

Together with logistics arm Teleport, ADE accounted for more than 70% of the group's total revenue in the first half of 2026, highlighting the contribution of its core businesses following the disposal of its airline operations and exit from PN17. (RM1 = US\$0.24862 at time of publication).

Nayak Aircraft Services takes over LAS Maintenance

Nayak Aircraft Services has acquired a controlling stake in Portugal's LAS Group, which comprises LAS Maintenance, LAS Training and SLOT-Human Resources. Founder João Louro will retain a shareholding and continue to lead LAS Maintenance as Chief Executive Officer. The acquisition expands Nayak's European network and strengthens its ability to provide high-quality, customer-focused aviation services. The integration strengthens Nayak's presence in Southern Europe while maintaining LAS Group's existing management, operations and brand. Airline customers will benefit from continued high-quality maintenance support, backed by the resources of a larger international group. Marco Smit, CEO of Nayak Aircraft Services commented on the acquisition: "What makes this acquisition particularly powerful is the cultural alignment between our organizations," He continued: "LAS Group brings not only strong technical capabilities but also a mindset



Nayak Aircraft Services takes over LAS Maintenance

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that perfectly matches our approach: pragmatic, customer-focused, and collaborative." "We strongly believe in empowering local teams while providing the structure and support of a larger group," added João Louro, CEO and Founder of LAS Maintenance. "Maintaining our management structure and leadership

ensures that our clients will continue to receive the exact same quality and service levels they have always trusted, while gaining access to the benefits of a larger European platform. Together, we will continue to grow in a sustainable way, driven by quality, safety, and customer satisfaction."

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Ornge goes paperless with Ramco maintenance platform

Ramco Systems Canada Inc., has announced that long-standing customer Ornge has gone live with Ramco's Digital Task Card with eSign-off and Mechanic Anywhere mobile application across all its maintenance bases. The rollout moves Ornge's maintenance operations from paper-based task cards to a mobile-enabled, paperless workflow covering its AW139 and PC-12 fleets. Ramco's eSign-off solution is designed to meet Transport Canada



Ornge has achieved paperless maintenance operations with Ramco's Digital Task Card and mobile apps

© Ornge

sign-off compliance requirements, allowing technicians to execute and digitally sign off maintenance tasks in real time. As part of the implementation, Ornge's existing task cards were migrated to an eSign-off-ready format, while Work Summary Reports were introduced to support audit and regulatory compliance. Through Mechanic Anywhere, technicians can access documentation, carry out maintenance tasks and complete digital signoffs from wherever they are working. The system also gives Ornge's maintenance and quality teams near-real-time visibility of work progress, sign-off status and task completion. The move is expected to improve efficiency by reducing the delays associated with paper-based processes while supporting more consistent, standardised work-step execution and compliance. Robert Zwanenburg, Technical Services Manager at Ornge, said the technology would support both the organisation's paperless ambitions and efforts to improve maintenance turnaround times. "Ramco's Digital Task Card and Mechanic Anywhere app is well positioned to help us in our efforts to ensure timely maintenance turnaround times," Zwanenburg said. "We are working as a team to ensure our front-line maintenance crews (AMEs) have the tools they need wherever they're working."

Willis Lease to establish Willis Engine Repair Center in Malaysia



WLFC will expand global maintenance services with a new Willis Engine Repair Center® (WERC®) in Malaysia
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Willis Lease Finance Corporation (WLFC) is expanding its global maintenance operations with plans for a new Willis Engine Repair Center® (WERC®) in Johor, Malaysia. The company has acquired land for the facility, which will become its third WERC®, alongside existing centres in Coconut Creek, Florida, and Bridgend, Wales. Construction is expected to be completed in the first quarter of 2027. WERC® facilities provide maintenance, repair and storage services for Willis Lease's owned engine portfolio as well as third-party assets, supporting the company's integrated aviation services platform. The Malaysia facility will extend Willis Lease's established engine repair centre model into Asia and strengthen its ability to provide integrated services across the Asia-Pacific region. The company said Malaysia's strategic location, skilled aerospace workforce, established aviation ecosystem and logistics infrastructure make it well suited to the new operation. Willis Lease has partnered with South Alliance Sdn. Bhd. on the land acquisition and development of WERC® Malaysia.

Rolls-Royce completes US\$1bn Indiana manufacturing investment

Rolls-Royce has completed a decade-long, US\$1 billion investment in its manufacturing, assembly and testing facilities in Indiana, strengthening its role in the US defence industrial base. The investment, the largest Rolls-Royce has made in the US, has modernised advanced manufacturing capabilities at its Indianapolis campus and expanded engine testing capacity. This includes new ground-test facilities and an altitude test facility in West Lafayette. The Indiana operations build and test engines for a range of defence and commercial platforms, including future engines for the US Air Force's B-52 strategic bomber and the US Army's MV-75 Cheyenne. The facilities also support current programmes including the V-22 Osprey, the US Navy's MQ-25A Stingray and the C-130J. Rolls-Royce employs around 3,500 people in Indianapolis, including members of the United Auto Workers (UAW), and supports thousands of additional jobs through its Indiana supply chain.



Rolls-Royce has completed its US\$1billion investment in Indiana

© Rolls-Royce

RECARO unveils next-gen R4 premium seat



RECARO's new R4 premium seat

© RECARO

RECARO Aircraft Seating (RECARO) has introduced the R4, its next-generation premium-class aircraft seat, designed to combine improved ergonomics and passenger comfort with greater flexibility for airlines. The R4 succeeds the PL3530, which entered service in 2015. The new seat is ETSO-certified for the Boeing 787, with additional certifications in progress. Deliveries began in June 2026, with entry into service expected later this year. Building on RECARO's expertise in lightweight seating, the R4 features a 16-inch monitor, a six-way adjustable headrest with integrated neck support, side ambient lighting and privacy wings with integrated reading lights. A range of power options is also available to support passenger connectivity throughout the flight. The seat

is designed to combine passenger comfort with operational flexibility. Its side console includes dedicated access for passengers with reduced mobility (PRM), while a newly developed extra-wide single-plate tray table features a soft open-and-close mechanism and an integrated holder for smartphones and tablets. Airlines can also customise the R4's colours, trim and finishes, allowing them to create a premium-class cabin aligned with their individual brand identity.

Veryon adds Polaris Aero to aviation software portfolio

Veryon, a provider of aviation software solutions, has acquired Polaris Aero, a company specialising in aviation safety management software. Founded in 2007, the company provides safety management solutions to aircraft operators and maintenance, repair and overhaul (MRO) providers worldwide. The acquisition adds more than 200 customers to Veryon's portfolio and strengthens its position in the aviation maintenance software market. Polaris Aero's VOCUS SMS, FlightRisk and GroundRisk products help corporate flight departments, charter operators and MRO providers manage compliance, assess risk and improve operational safety. The deal also combines Polaris Aero's extensive safety



VOCUS SMS Software

© Polaris Aero

information with Veryon's dataset of more than 100 million maintenance events. The expanded data will enhance the accuracy and reach of Veryon AIRE, its AI-powered intelligence platform, giving operators more precise insights into safety risks and maintenance requirements. Veryon Chief Executive Officer, Bethany Little, welcomed the addition of Polaris Aero's proven safety solutions to the company's software suite. She stated: "It's a pivotal step towards a better alignment between aviation safety and maintenance, enabling smarter and safer decisions across every phase of customers' operations."

"Joining forces with Veryon is an exciting next chapter for Polaris Aero," added Chris Connor, Chief Executive Officer of Polaris Aero. "Our mission has always been to help operators manage risk and streamline compliance through smarter safety programmes. With Veryon, we can scale that mission even further, integrating safety and maintenance in ways that deliver more value, more efficiency, and ultimately, safer operations for our customers."

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Second A320 acquisition in August boosts Werner Aero's parts drive



Werner Aero adds another A320 to parts pipeline

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Werner Aero has acquired an Airbus A320-200 airframe, MSN 2964, which is currently located at the eCube facility in St Athan, Wales, where it will be dismantled for spare parts. The acquisition marks Werner Aero's second A320-200 purchase in August alone, further expanding its A320-family portfolio and strengthening its ability to supply airlines, lessors, MRO providers and other aviation customers with aircraft components and aftermarket solutions. MSN 2964 will be dismantled to recover serviceable components and materials, supporting continued global demand for A320-family parts across the aviation aftermarket. Werner Aero, a wholly owned subsidiary of Sumitomo Corporation Group, provides aircraft asset management and logistics solutions to airlines worldwide. The company has offices across the globe and specialises in the A320, Boeing 737NG, E-Jet and CRJ families. Werner Aero is ISO 9001-certified and an FAA AC 0056B-approved supplier.

BAT secures approval to service South Korean-registered aircraft

Batam Aero Technic (BAT) has officially received maintenance facility approval from South Korea's Ministry of Land, Infrastructure and Transport (MOLIT), marking another milestone in the company's international expansion. The approval follows a rigorous and comprehensive audit and authorises BAT to provide maintenance services for aircraft registered under South Korean MOLIT regulations. The certification further strengthens BAT's position as a growing MRO provider in Southeast Asia and international markets. Established to support Lion Group's aircraft maintenance requirements, BAT is designed to serve high-frequency narrow-body operations, delivering efficient, consistent and reliable maintenance services. BAT's capabilities are also supported by Lion Group's broader aviation ecosystem. The group brings together airlines, cargo and logistics operations, travel services, aviation support businesses and training institutions, creating an integrated



Batam Aero Technic has expanded its international MRO capabilities with approval to service South Korean-registered aircraft

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network that supports efficient aircraft operations. Through this ecosystem, BAT combines dedicated MRO expertise with the operational experience and resources of a diversified aviation

group—providing customers with reliable maintenance solutions while continuing to expand its presence in the global aviation market.



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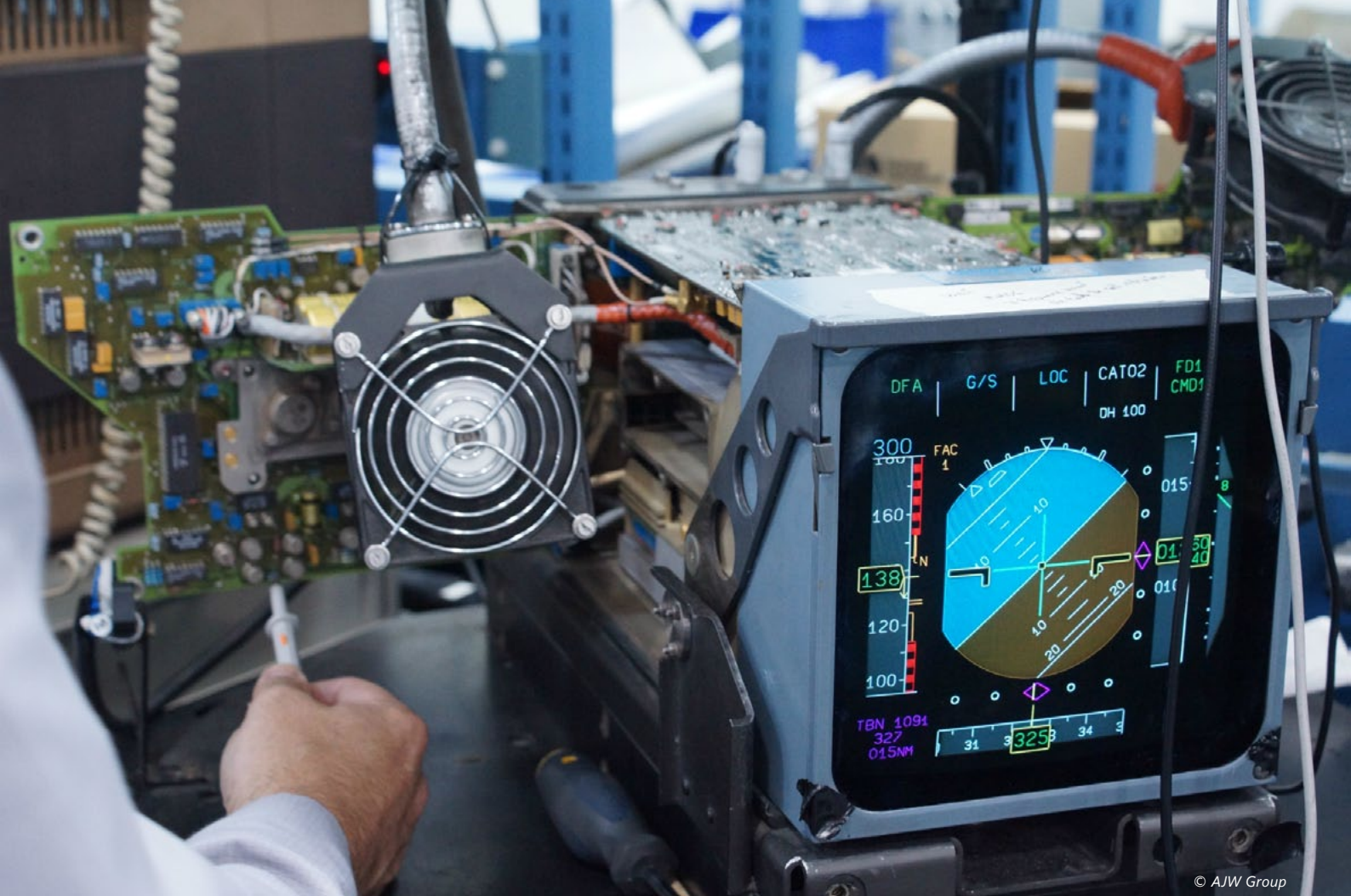
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Avionic Repairs

Technology, talent and the turnaround challenge

By David Dundas

Commercial aircraft avionics have become increasingly sophisticated but keeping those systems serviceable presents MROs and repair specialists with a growing range of challenges. From supply chain disruption and component obsolescence to skills shortages and demands for ever-faster turnaround times, avionics repair providers are under constant pressure to return reliable equipment to operators while minimising costly aircraft downtime. Technology is also changing the way that work is carried out. Advanced diagnostic tools, automation and increasingly sophisticated analysis of repair histories and aircraft data are helping technicians identify faults more quickly and, in some cases, anticipate problems before a component fails in service. Yet technology alone cannot provide all the answers. Modern digital flight decks require highly skilled personnel, while older aircraft present a very different challenge as repair providers work to support equipment containing components that may no longer

be manufactured. Against this background, those responsible for avionic repairs must balance speed, cost and availability without compromising the exacting standards demanded by commercial aviation. For this article, we spoke with three industry specialists to examine how the field of avionic repairs is evolving, how companies are responding to the pressures facing today's aftermarket, and where new technologies, working practices and expertise can deliver improvements in repair capability and turnaround times.

Supply Chain Hurdles: How do you handle sudden parts shortages or long delays from original equipment makers without hurting delivery times?

It is fair to say that supply chain resilience increasingly depends on anticipating problems rather than reacting once a shortage has already affected a repair. Dave Mayne, Director MRO

Europe & Asia at Ontic Engineering & Manufacturing UK Limited reveals that where Ontic is concerned, the entire business model revolves around keeping fleets flying – though for him, sometimes, it feels like - against all the odds! He further explains: "Therefore, each time we acquire a new license, we take a proactive approach from the outset to identifying risks across the product lines we support, reviewing technologies, materials, bills of material and sources of supply to understand where future constraints or obsolescence may emerge. In other words, we manage outcomes from the start and plan never to be in a situation where 'sudden' parts shortages will ever be a problem. Where necessary, we can qualify alternative sources, reinvigorate supply chains that are no longer suited to lower-volume aerospace requirements, or invest directly in engineering and manufacturing solutions. In some cases, that can mean redesigning a component using current technology to replicate the performance of the original or bringing

capability in-house when the external supply chain can no longer support it economically. The objective is to address supply constraints as early as possible, so they don't ultimately become a delivery problem for the customer." For Louis Philippe Mallette, Chief Executive Officer at AJW Technique, having access to reliable resources and historical data are important. "We have access to a global supply chain network, extensive inventory, and strong relationships with OEMs, which gives us multiple avenues when a part becomes difficult to source," he says, adding that: "We also use historical repair and demand data to anticipate requirements and position inventory before shortages become critical. Where obsolescence or OEM lead times become a challenge, we work directly with manufacturers to identify approved alternatives and, where appropriate, rely on serviceable material sourced through our teardown programmes. The key is being proactive rather than waiting for a shortage to impact a customer's turnaround time."

Tom Eskola, Vice President, Panasonic Technical Services at Panasonic Avionics is very clear in his opinion that supply chain resilience is built before the shortage, not during it, and that it comes from having several options ready before a constraint ever reaches the customer. "Panasonic Technical Services (PTS) benefits from being part of the wider Panasonic organization, which gives us access to a global supply network that we have been able to draw on when the availability of particular components becomes constrained. We complement

that with our own material management capabilities and global maintenance and repair footprint, positioning inventory closer to the airlines and regions where it is most likely to be needed," he explains. He then informs: "During some of the more acute supply chain constraints, we also looked beyond traditional sourcing routes. We have used market buybacks to acquire line replaceable units and supplement inventory where we knew repair cycles could be extended, while our wider spares model includes loans, exchanges and refurbished or hard-to-find parts. The aim is to create enough flexibility that a delay affecting one component does not automatically translate into a missed turnaround commitment. Supply chain conditions have stabilized considerably compared with the immediate post-pandemic period, but aviation remains highly interconnected and disruption elsewhere in the supply base can still have an impact. The lesson for us is simple: resilience is not a bigger warehouse. It is anticipating demand, knowing where the risk sits before it arrives, and always having more than one way to respond rather than relying on a single source or location." Where David Kidwell, Director of Repairs at KP Aviation is concerned, the goal is to preserve options before the shortage becomes the emergency. "Once something becomes an AOG situation, the choices usually get fewer, faster, and more expensive," he says. "The first thing we try not to do is treat every shortage like the same emergency. When everything is hot, nothing is hot. We look at the actual demand first. What do we have on the shelf? What repairable units are already in the pipeline? What can the vendor realistically support? Are certification requirements limiting our options? Is there another approved repair source? Is there available USM? Can we reposition material or prioritize a repair that has real demand behind it? That is where the decisions get made. Another status request does not move material. If the OEM is late, I want my team thinking about what other levers

we can pull and which one makes the most sense commercially and operationally," he adds.

Smart Technology: Which new diagnostic tools or automation software do you use to find hidden avionics faults faster?

Here, Louis Philippe Mallette is keen to point out that: "The biggest advances have come from automated test equipment and the software that sits behind it. Modern avionics units contain far more processing power and complexity than they did twenty years ago, so testing has become significantly more detailed." He expands further from the company's point of view: "AJW's ATEC automated test systems perform comprehensive functional testing and can identify failures down to specific areas of a unit. Once a fault has been narrowed down, our technicians combine those automated results with manual troubleshooting techniques, including circuit card analysis and oscilloscope testing, to pinpoint the root cause. We also use environmental stress testing, introducing temperature variation and vibration during testing, which helps reveal intermittent faults such as cold solder joints that don't always appear under normal bench conditions." For Tom Eskola, he is of a like mind to Dave Mayne in that to him a proactive as opposed to reactive approach is also the order of the day. He sheds greater light on this by explaining that: "The most valuable diagnostic tool we have is data that reaches the technician before the aircraft does. PTS is increasingly using connected monitoring and digital maintenance tools to give technicians greater visibility into system performance and faster access to the information they need. Panasonic Avionics' newest in-flight engagement (IFE) systems are set to include a proprietary aircraft health monitoring capability that feeds continuous system data through Converix, our new onboard computing and application-hosting platform. This shifts the conversation from



Dave Mayne, Director MRO Europe & Asia, Ontic Engineering & Manufacturing UK Limited

“The objective is to address supply constraints as early as possible, so they don't ultimately become a delivery problem for the customer.”

Dave Mayne, Director MRO Europe & Asia, Ontic Engineering & Manufacturing UK Limited

finding faults to anticipating them, allowing maintenance teams to identify emerging issues before a passenger ever notices.” He then informs us that: “We also use digital maintenance platforms to give technicians direct access to the information they need at the point of work rather than relying on paper-based processes and manuals. The objective is to bring system information, technical documentation and maintenance execution closer together so that qualified technicians have all the information they need when investigating and resolving a fault. Behind the aircraft, we are deploying AMPS (Aircraft Maintenance Planning and Scheduling), our AI-based maintenance planning platform, which uses fleet data to prioritize work and position the right people and material ahead of demand. Combined with over-the-air software loading, this allows us to manage a growing installed base remotely rather than dispatching a technician for every task. As Panasonic Avionics delivers new IFE systems to hundreds of aircraft a year, our strategy is to absorb that growth with smarter tools rather than simply adding headcount.”

“The bench-level diagnostic tools sit with our repair station partners, so my team is not the one performing the actual fault isolation,” David Kidwell shares with us. He then reveals more about the company’s attitude to technology. “Where technology matters to us is everything surrounding the repair. I want to know what stopped moving, how long it has been sitting, and why. If a quote is late, an approval has stalled, a vendor has exceeded expected turnaround time, or a unit keeps coming back with the same issue, I do not want somebody finding that by accident while digging through emails. That is where ERP data, alerts, exception reporting, repair history, and workflow automation can make a real difference. I am not interested in technology just because it gives us another dashboard. It needs to help somebody make a better decision or take action sooner. If it shortens the time between seeing the problem and doing something about it, then it is doing its job.”

Predictive Data: How do you use past repair data and flight logs to stop avionics units from failing before they happen?

Repair data becomes particularly valuable when it is considered over the life of a product rather than looking at each shop visit in isolation, from Dave Mayne’s perspective. He then goes on to tell us that: “At Ontic, our engineering teams analyse repair history and recurring failure modes to identify trends that may indicate an underlying reliability issue. Where a pattern emerges, the aim is to understand the root cause and determine whether action can be taken to prevent future failures. That might lead to a change in maintenance recommendations, the introduction of preventative maintenance, a service bulletin or, where appropriate, an engineering improvement to the product itself. We’ve seen this deliver tangible improvements across a number of product lines. For example, analysis of recurring faults within a fuel system identified ageing solder joints as a common issue. By proactively reflowing those joints during maintenance, we were able to significantly improve time on wing. Similarly, within one of our radar systems, repair data helped identify a harness as a recurring source of faults, leading us to introduce proactive inspection and, where necessary, repair or replacement to improve reliability and time on wing. As the OEM for the products we support, we can connect what is happening in the repair shop directly with the engineering knowledge behind the component. That feedback loop helps us move from simply repairing faults as they occur towards addressing their underlying causes, improving reliability and ultimately keeping planes flying for longer.”

David Kidwell is keen to show us a slightly different approach taken by KP Aviation, explaining that: “We do not analyse aircraft flight logs directly, so I would not describe what we do as predictive maintenance in the operator sense. What we do have is repair history,

and that can tell you a lot if you are paying attention. If we start seeing repeat removals, recurring shop findings, higher BER rates, repeated warranty activity, longer turnaround times, or the same part number coming through more often than expected, I want to know why. Is it the unit? The repair source? The application? The repair scope? Are we sending the same problem back through the same process and expecting a different result? That information can change where we route the next unit, how much inventory we want available, or whether we need to challenge the repair strategy altogether. But none of that works if the data is bad. If removal reasons, dates, findings, or repair history are incomplete, you can build a great-looking dashboard that still tells you the wrong story. Clean data first. Otherwise, we are just making assumptions faster.”

Additionally, Louis Philippe Mallette notes that predictive maintenance is becoming increasingly important in avionics repair. “We analyse historical repair data and reliability trends to understand which components are likely to require intervention and when demand for specific repairs is likely to increase,” he informs us, before confirming that: “This data supports both maintenance planning and inventory management. By identifying recurring failure patterns and anticipating component demand, we can ensure that spare parts, consumables and repair capability are available before a component reaches a critical stage. While avionics faults can still be difficult to predict with complete accuracy, data analytics allows us to move from reactive repairs towards earlier intervention and more efficient



Louis Philippe Mallette, Chief Executive Officer, AJW Technique

“By identifying recurring failure patterns and anticipating component demand, we can ensure that spare parts, consumables and repair capability are available before a component reaches a critical stage.”

Louis Philippe Mallette, Chief Executive Officer, AJW Technique

maintenance planning.” Tom Eskola is very shrewd in his approach to this situation. “Every removal tells a story, and our job is to read it before the next one happens. We use historical repair records alongside flight-generated fault and system data to understand how components perform over time. By correlating repair findings, removals, flight hours, BITE faults, software versions, and recurring in-service issues, our engineering teams can identify emerging reliability trends and focus investigations or maintenance actions where they are most likely to prevent disruption. This data foundation, together with AMPS, our AI-based maintenance planning platform, is what allows us to move from reacting to failures to planning around them,” he reveals. He ends with total clarity: “The ambition is straightforward: we want an airline to hear about a problem from us before they hear about it from a passenger.”

Skills Gap: What steps do you take to train and keep skilled workers who understand modern, complex digital flight decks?

Avionics sits at an interesting point in the industry because technicians need to understand both legacy analogue systems and today's highly digital architectures. That requires continuous development. Louis Philippe Mallette at AJW Technique is keen to make it clear that “We invest heavily in training, both through OEM resources and in-house programmes, but some of the most valuable learning still comes from hands-on experience. Our



Tom Eskola, Vice President, Panasonic Technical Services at Panasonic Avionics

senior technicians have built up decades of knowledge troubleshooting complex faults, and a key focus for us is transferring that expertise to the next generation through mentoring and on-the-job coaching. Retaining those skills is just as important as developing them. By giving technicians exposure to a broad range of technologies and challenging repairs, we're able to build a highly engaged workforce while preserving critical knowledge for the future.”

At Panasonic Technical Services Tom Eskola has some very wise words to share as he tells us that: “You cannot hire your way out of the skills gap by competing for the same shrinking pool of experienced technicians. We need to create a stronger pipeline of people entering aviation and give them the practical experience and technical knowledge they need to build long-term careers.” He goes on to say that: “PTS takes a number of approaches, including working with colleges and training centres, providing structured development for junior mechanics, and recruiting internationally where particular markets face acute skills shortages. We also invest in apprenticeship programs that combine classroom learning with hands-on aircraft maintenance experience. At the same time, the required skill sets themselves are changing. As aircraft systems become more connected and software-driven, technicians increasingly need to combine traditional engineering expertise with stronger digital skills. Data literacy, familiarity with connected diagnostic platforms, software configurations, networks and cybersecurity are all becoming more important alongside traditional electrical and avionics knowledge. Training cannot therefore be treated as a one-time event. The technician we hire today will be maintaining systems that have not been designed yet, so retaining skilled people means giving them the opportunity to keep developing

throughout their careers.”

The aerospace skills challenge is particularly significant in MRO because the capability required isn't limited to understanding the latest technology. Technicians and engineers may need to work across multiple generations of avionics, supporting increasingly sophisticated digital systems while also maintaining products designed decades earlier, where specialist knowledge and experience can be increasingly difficult to replace. Dave Mayne is keen to further point out that: “At Ontic, we address that challenge by combining the development of new talent with the deliberate transfer and retention of existing technical expertise. Our apprenticeship and early careers programmes help us build long-term capability around the specialist products and technologies we support, with technical and functional development taking place alongside experienced colleagues within the business. That connection between experienced specialists and developing talent is particularly important. Learning in an aerospace environment isn't achieved through formal training alone; a significant amount of valuable knowledge comes from practical experience, understanding product history, solving complex problems and knowing how a product behaves throughout its lifecycle. Creating opportunities for that expertise to be shared through on-the-job development, mentoring and knowledge transfer helps us retain capability within the organisation rather than allowing it to disappear when individuals move on or retire retaining that operational memory.”

To conclude this section, David Kidwell gives us great insight not his role at KP Aviation. He commences by telling us that: “The technicians working directly on modern avionics and digital flight decks are trained and qualified through the repair stations we work with. My responsibility is different.” He then goes on to advise that:

“You cannot hire your way out of the skills gap by competing for the same shrinking pool of experienced technicians. We need to create a stronger pipeline of people entering aviation and give them the practical experience and technical knowledge they need to build long-term careers.”

Tom Eskola, Vice President, Panasonic Technical Services at Panasonic Avionics

"A big part of my job is getting my team to think differently about Repairs. Processing a repair order is the easy part. I want them to understand what the shop finding means, whether the quote makes sense, whether there is a warranty opportunity, whether the vendor is the right fit, what the real demand is, and what happens if we do nothing. I do not want order takers. I want people who are comfortable asking why, challenging assumptions, and making decisions based on the bigger picture. That takes time. You give people ownership, expose them to the decisions, let them make some calls, coach the misses, and keep raising the expectation. The goal is not just to make someone better at processing repairs. It is to build people who can think through the repair before it becomes someone else's problem."

Old Parts (Obsolescence): How do you manage repairs when an airplane model uses older parts that factories stopped making?

Obsolescence is one of the biggest long-term challenges in avionics repair. Many aircraft remain in service much longer than originally anticipated, while some of the electronic components used to support them are no longer being manufactured. To deal with these problems, Louis Philippe Mallette explains what happens at AJW. "Our approach combines engineering expertise, strong OEM relationships, and strategic inventory management. AJW Group maintains an extensive inventory supporting both legacy and new-generation aircraft platforms, which gives us greater flexibility when sourcing components and helps minimise repair delays. While newer fleets bring their own technology requirements, operators of mature aircraft often rely on support for components that may have been out of production for many years, making access to inventory and repair capability equally important. We work closely with manufacturers to identify approved replacement parts and repair solutions whenever possible. In addition, we make extensive use of serviceable material recovered through aircraft teardown programmes, helping extend support for mature platforms where traditional supply chains have become increasingly limited. Maintaining capability on older avionics systems requires a combination of technical knowledge, proactive inventory management, and creative supply chain



AJW HQ, Slinfold, United Kingdom

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solutions." It is abundantly clear that asking questions is a key element of mitigating the problems associated with obsolescence, based on David Kidwell's response. "When support starts disappearing, I want to know what options are still on the table. Can another approved repair source support it? Is there USM available? Are piece-parts becoming difficult to source? Is the repair still economically viable? Are we seeing more BER decisions or longer turnaround times?" Having advised that these are the warning signs, he carries on to say that: "At some point, continuing to put money into an older component stops being just a repair decision. It becomes an inventory and economic decision. That is where I think people can get trapped. Just because something can still be repaired does not always mean it should be. I want my team thinking about that before availability forces the decision for us. If the market is telling you support is drying up, listen to it while you still have choices." He concludes by warning us that "The worst time to build an obsolescence strategy is when somebody needs the part tomorrow."

Dave Mayne at Ontic encapsulates the downside of obsolescence in one short sentence when he tells us that it "... is only truly disruptive when it arrives unexpectedly." He then describes what happens to avoid such a situation. "Our approach is therefore to identify potential issues early, rather than waiting until a component becomes unavailable and an aircraft or repair is affected. When Ontic takes responsibility for a product line, we review its bill of materials, technologies and supply base to identify potential vulnerabilities. From there, the solution might involve qualifying a new supplier,

securing material through lifetime buys, developing an alternative source, redesigning an obsolete component using current technology or, where appropriate, bringing manufacturing capability in-house. The key is that we have the engineering capability and design knowledge to solve these problems while maintaining the required performance and certification standards. In some cases, relatively targeted investment in an individual component can prevent customers from facing a much larger system redesign or requalification programme. Ultimately, our focus is on keeping products supportable for as long as our customers need them."

Tom Eskola has a very similar outlook to Louis Philippe Mallette as he feels obsolescence is becoming a more significant consideration because aircraft are simply outliving the technology installed on them. He goes on to say: "Many fleets are remaining in service for longer than the systems and support plans were originally designed around. For an MRO provider, that means understanding an airline's long-term fleet plans early enough to anticipate where parts availability may become constrained, rather than waiting until an obsolete component is already affecting operations." He then shares with us that: "We use a combination of approaches depending on the IFE system and the expected remaining lifespan of the fleet. That can include building inventory of critical spares, making last-time buys where appropriate, and using buybacks to recover serviceable components from aircraft that are retiring. PTS also provides new and used parts, including refurbished, certified and hard-to-find discontinued components, and offers loans and exchanges, giving us several ways of

sustaining installed equipment. There can eventually come a point where continuing to support legacy hardware is no longer the most practical or economic answer. In those circumstances, our aim is always to give airlines a manageable migration path rather than force a rip-and-replace they did not plan for. eXNeo, Panasonic Avionics' new-generation seatback monitor retrofit solution, is an example of this philosophy. eXNeo has been designed as a drop-in replacement for legacy Panasonic X Series seatback monitors, allowing airlines to modernize older cabins while retaining much of their existing IFE infrastructure. Ultimately, obsolescence management is about balancing the useful life of the aircraft with the useful life of the technology onboard it, and planning early enough that the two do not become disconnected."

Turnaround Speed: What is your biggest bottleneck in the repair shop, and how do you change your workflow to fix it?

Material availability remains one of the biggest potential constraints on repair turnaround times across the MRO industry. A repair can be diagnosed quickly, but if a required component has a long lead time or has become difficult to source, that can ultimately determine when the unit is returned to the customer. David Mayne then talks further about the solution to the problem at Ontic. "For us, the answer is increasingly about planning material requirements before the repair reaches that point. We use our SIOP processes alongside historical demand and repair requirements to anticipate material usage and provision inventory ahead of expected demand. We also look beyond inventory management itself. Where material availability repeatedly creates a constraint, our supply chain and engineering teams can investigate the underlying cause, which might mean developing another source, addressing obsolescence or finding a longer-term engineering solution. The goal is to move

the bottleneck upstream: identifying and addressing material risks before they have the opportunity to affect the customer's turnaround time." On the other hand, David Kidwell is keen to look elsewhere other than the repair bench for problems. "Some of the biggest turnaround problems never happen on the repair bench. They happen in the handoffs. A unit can sit waiting for evaluation, a quote, approval, material, technical information, certification requirements, shipping, or simply because nobody is clear on who owns the next move. Then everybody looks at the repair station and asks why the TAT is bad. That is too easy. Before I blame the shop, I want to know where the time was actually lost. Did the vendor sit on it? Did we sit on the quote? Did an approval stall? Was material unavailable? Did nobody recognize that the unit was tied to real demand? Our focus is separating true priorities from normal workflow, identifying exceptions, and making ownership clear. A presold unit with immediate demand should not disappear into the same queue as stock material with no current requirement." He rounds things off succinctly as follows: "For me, turnaround comes down to four questions: Where did it stop? How long has it been there? Why did it stop? Who owns the next decision? If we cannot answer those four questions, that is probably part of the problem."

For Louis Philippe Mallette "For most avionics repair organisations, the greatest challenge isn't testing, it's what happens after testing identifies a fault. The real bottleneck is often sourcing material quickly enough to complete the repair." He then expands on how they deal with the challenges. "We've addressed this through detailed planning, inventory forecasting, and close coordination between engineering, repair, and supply chain teams. By using predictive analytics to forecast repair volumes and likely material requirements, we can minimise unexpected material holds and keep units moving through the workshop. At the same time, continued investment in automated

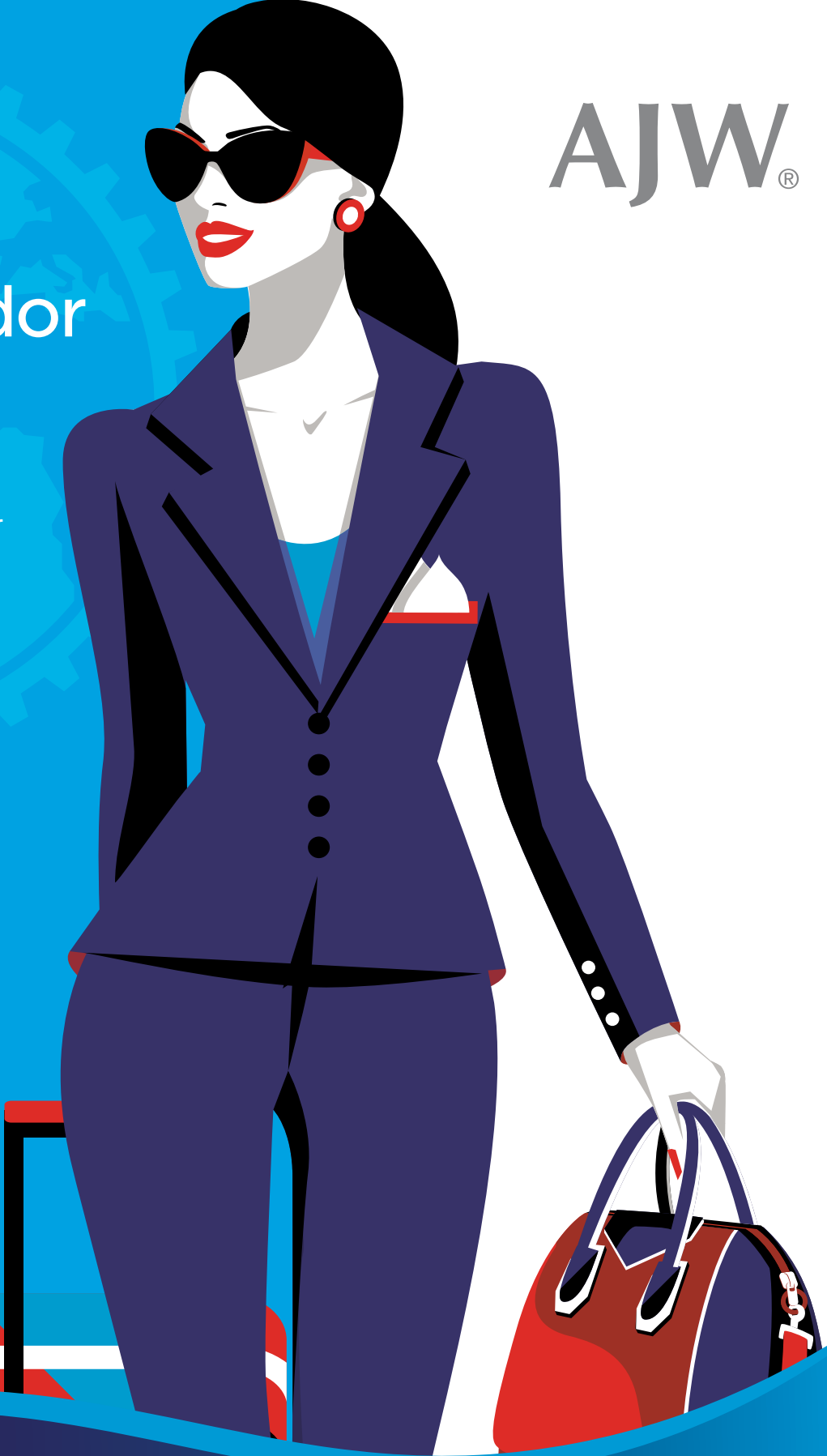
test systems allows us to perform more detailed testing without increasing overall test times, helping us maintain efficient throughput while still meeting strict quality and reliability standards." To conclude this article, Tom Eskola takes a slightly different view to holdups and how to improve the TAT situation. "The honest answer is that the repair bench is rarely the bottleneck. The biggest opportunity to improve turnaround lies not in making the repair itself faster, but in eliminating the non-productive time around it. A unit can lose time while information is being located, a diagnosis is being confirmed, material is being sourced or work is moving between different stages of the maintenance process. Improving turnaround therefore requires looking at the complete workflow rather than only the time spent at the repair bench. Increasingly, the same principle applies further upstream. Better fleet monitoring, AI-assisted planning and predictive insight can help identify likely maintenance requirements earlier, giving us more opportunity to have the right material, people and technical information available before the maintenance event occurs. Our global repair and line maintenance footprint also allows us to position capability and inventory closer to our customers. Ultimately, even if the repair is completed quickly, delays before or after the work can still extend the overall turnaround time from the airline's perspective. The objective is therefore to make the entire process more predictable, from fault identification through repair and return to service. A fast repair is good. A predictable one is what an airline can plan around," he tells us.



David Kidwell, Director of Repairs, KP Aviation

“For me, turnaround comes down to four questions: Where did it stop? How long has it been there? Why did it stop? Who owns the next decision? If we cannot answer those four questions, that is probably part of the problem.”

David Kidwell, Director of Repairs, KP Aviation

A stylized illustration of a woman with dark hair in a ponytail, wearing large black sunglasses, a red circular earring, and a dark blue business suit with a red pocket square. She is holding a red and blue duffel bag. The background features a large blue gear and a stylized globe.

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THE EVOLUTION OF WILLIS LEASE FINANCE CORPORATION

PART TWO

Proving the Model

How WLFC Turned Engine Leasing into a Global Aviation Platform

The 1996 IPO marked a transition for Willis Lease Finance Corporation (WLFC). The entrepreneurial idea had worked.

The next challenge was building the capital base, engine portfolio and technical capabilities required to turn it into a global business.

For an engine lessor, access to capital effectively determines access to inventory.

Financing allows the company to acquire engines. A broader portfolio creates more options for customers. And more available assets improve the ability to respond when an airline has a planned—or unexpected—engine requirement.

WLFC followed its IPO with additional financing initiatives, including its first WEST asset-backed securitization in 2005.

But as the portfolio grew, something else became increasingly clear.

Owning more engines meant understanding much more about maintenance.

Where Finance Meets MRO

Two engines of the same type and similar age can have very different values depending on their maintenance condition.

One may have significant life remaining

before its next major shop visit. Another may be approaching an expensive maintenance event with life-limited parts nearing replacement.

For WLFC, that made engineering condition inseparable from investment strategy.

Should the engine receive another shop visit?

How much should be invested in the work scope?

How much additional lease life will that investment create?

Could the asset be redeployed instead?

At what point is the engine worth more through its modules and material than through another overhaul?

These were MRO decisions.

They were also capital-allocation decisions.

And the larger WLFC became, the more closely those disciplines were connected.

Flexibility Through Aviation Cycles

The business model would be tested repeatedly.

The disruption following September 11 and subsequent aviation cycles reinforced a fundamental benefit of leasing: when operators face uncertainty, owning every asset required for every contingency becomes less attractive.

A leased engine provides another option.

WLFC could also move returned engines

between operators and regions, matching assets with changing demand.

That mobility gave the company flexibility through aviation cycles, but it also reinforced an important lesson.

An engine could not simply be financially available.

It had to be technically available.

That requirement brought leasing ever closer to maintenance, technical management and material.

Moving Deeper into the Aftermarket

In 2013, WLFC expanded more directly into engine parts and aftermarket material through Willis Aeronautical Services, Inc.

The strategic logic followed the asset.

An engine reaching the end of its flying life is not necessarily at the end of its economic life. Modules, components and serviceable material can continue supporting other engines for years.

For WLFC, material created another way to manage value throughout the lifecycle while also moving the company closer to the MRO supply chain.

If WLFC understood when another expensive shop visit no longer made economic sense, it could also understand the value that might be recovered through disassembly and material.

The engine lessor was becoming an aftermarket participant.

From Engine Owner to Asset Manager

Another significant step followed in 2016.

Through Willis Asset Management Limited, WLFC acquired the business and assets of Total Engine Support Limited, the engine-management and consulting operation of TES Aviation Group.

WLFC could now apply expertise developed through decades of owning engines to assets owned by other parties.

That was an important strategic transition.

The company was moving beyond the traditional role of lessor.

It was becoming an asset manager, technical adviser and increasingly broad participant in the aftermarket.

The more WLFC understood about the technical and economic life of an engine, the more opportunities it saw beyond the lease itself.

The expansion into direct engine MRO followed soon afterward. WLFC launched Willis Engine Repair Centre in Bridgend, Wales, in 2018 and Willis Engine Repair Center® in the United States in 2019, establishing Part 145 engine-maintenance capability in both the UK and U.S. The move added another critical piece of the engine lifecycle inside the Willis Platform®: the ability not only to own and manage engines, but to perform maintenance on both WLFC-owned and third-party assets.

The Beginnings of the Willis Flywheel

Seen individually, leasing, asset management and material might appear to be separate businesses.

For WLFC, their greater value increasingly came from how they worked together.

Leasing generated knowledge



Charlie and Austin Willis at Closing Bell Ringing Ceremony at Nasdaq July 2026

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about engine utilization, maintenance requirements and customer demand.

Asset management extended that technical expertise to third-party fleets.

Material capabilities created additional options during maintenance and at the end of an asset's operating life.

And each activity generated relationships, information and opportunities that could support the others.

The beginnings of what WLFC would later describe through its integrated "One Willis" strategy were taking shape.

Instead of looking at the engine lease as a single transaction, the company was increasingly looking at the entire life of the asset.

Finance it.

Lease it.

Manage it.

Maintain its value.

Supply material.

Redeploy it.

And ultimately determine the best economic outcome at end of life.

The engine remained the common thread.

From Leasing Engines to Solving Customer Problems

That evolution changed the strategic question.

It was no longer simply:

Does the customer need to lease an engine?

It became:

What does the customer need to keep the aircraft flying—and which combination of WLFC capabilities can provide it?

The distinction is important.

An airline may approach a maintenance event thinking it needs a shop visit.

What it ultimately needs is a serviceable aircraft.

A lessor with access to engines, technical expertise, material and lifecycle knowledge can potentially approach that requirement differently.

For WLFC, the original engine-leasing model was evolving into something broader: a platform built around the economic and technical life of the asset.

The next step would be to connect those capabilities more directly with maintenance itself.

NEXT: PART THREE — FROM LEASING ENGINES TO DELIVERING THRUST

How ConstantThrust®, MRO, material, asset management and WLFC's expanding maintenance footprint are coming together in a fully integrated model—and why the company believes those capabilities can create a flywheel across the Willis Platform®.

Read in the October edition of *AviTrader MRO 360°* magazine.



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Spare Engine Management

To own, or not to own, that is the question...

By David Dundas

For airlines, spare engine management has always involved balancing cost against operational security. In today's ultra-challenging operating environment, however, achieving that balance has become considerably more difficult. Extended engine shop visit turnaround times, constrained MRO capacity, supply chain disruption and pressure on engine availability mean that achieving the right spare engine coverage

can be critical to maintaining fleet reliability and avoiding costly aircraft downtime. At the same time, the substantial capital tied up in spare engines has upped the temperature on the debate as to whether outright ownership remains the most effective solution. Leasing, pooling and other flexible access models can offer attractive alternatives, while the differing support requirements of mature and new-generation engine programmes add another layer of complexity to long-term planning. Consequently, there is no simple formula for determining how many spare engines an airline needs, how they should be sourced, or when they should be available. Cost, fleet size and utilisation, maintenance schedules, engine reliability, shop capacity and acceptable levels of operational risk all

have a part to play. We asked ten industry specialists to share their perspectives on these challenges so we could get a better feel for what ideal spare engine solutions look like today.

What are the biggest challenges airlines currently face in managing their spare engine requirements?

Spare engine planning is no longer simply a matter of maintaining a predetermined spare ratio. Airlines are now operating in an environment characterised by extended and often unpredictable shop turnaround times, engine durability concerns, material shortages, constrained MRO capacity and rising costs for serviceable engines.



Demetrios Bradshaw, Chief Executive Officer, Aeras Aviation

“The commercial challenge is balancing operational resilience with capital efficiency. Excess spare capacity can tie up significant capital, while insufficient coverage can result in aircraft groundings, schedule disruptions and lost revenue.”

Demetrios Bradshaw, Chief Executive Officer, Aeras Aviation

Demetrios Bradshaw, Chief Executive Officer at Aeras Aviation explains further: "From a technical perspective, an available engine is not necessarily a usable engine. The correct model, build standard, thrust rating, LLP status, configuration, QEC requirements and remaining life must all align with the operator's fleet and mission profile. Equally important are complete records, traceability and regulatory compliance. The commercial challenge is balancing operational resilience with capital efficiency. Excess spare capacity can tie up significant capital, while insufficient coverage can result in aircraft groundings, schedule disruptions and lost revenue. At Aeras, we view spare engine planning as a dynamic process that combines removal forecasts, shop turnaround times, fleet utilisation, reliability trends, maintenance schedules and market availability. The goal is not simply to minimise inventory, but to optimise the total cost of engine availability while maintaining operational reliability. Anca Mihalache, Managing Director at AERO CARE has identified three key areas. "The main challenges are shop-visit turnaround times, MRO slot availability and parts availability. Currently, there are shortages and delays in delivery of almost everything, from expendables and consumables to LLPs. Airlines, lessors and even engine shops are all facing delays in sourcing parts for mature engines. As a result, shop visits are longer and slot availability is scarcer." She then adds: "With engines being delayed in the shops, aircraft may remain on the ground awaiting return of their engines, and there are not enough spares available to cover the need for fast replacements. In my opinion, this is currently the biggest

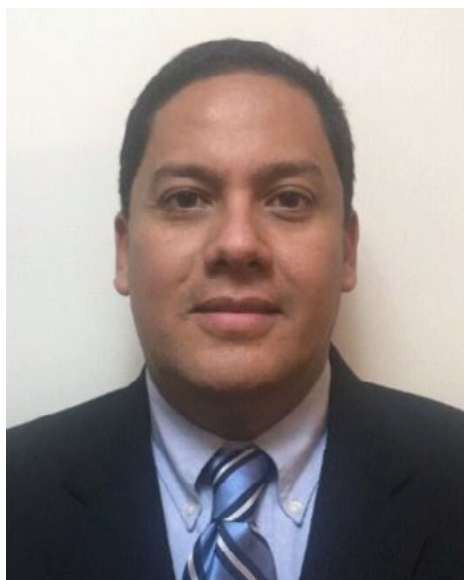
issue for operators. On top of this, there is the cost. In some cases, due to the lack of parts, the cost of a shop visit can exceed the catalogue list price (CLP), making it difficult for both operators and lessors to build a viable business case."

For Mark Satran, Partner at Aero Engine Leasing, an affiliate of Aero Engine Solutions, the main challenge is uncertainty. "Airlines need enough spares to protect the operation against unexpected removals and longer-than-planned shop visits, but they do not want to tie up substantial capital in assets that may sit on the ground for extended periods. This is particularly relevant where we invest—in the one-generation-old narrowbody market, where CFM56-5B and -7B engines continue to support large A320ceo and 737NG fleets. Those fleets are remaining in service longer than originally anticipated, creating continued demand for reliable engine availability even as the industry transitions to newer-generation aircraft. For mature fleets, there is also a question of asset quality. Not all spare engines are equal. Remaining life, configuration, LLP status, maintenance history, records quality, and the timing and cost of the next shop visit can have a major impact on the true value of an engine," he tells us. At Aero Norway, Jim Wylie, Director CFM56 T&M, believes that the biggest challenge is managing the cost and understanding the spare versus fleet size ratio. He goes on to suggest that: "As a fleet ages, the need for spare quantity can increase, and this will directly impact the budget. However, the challenge can be knowing when exactly the allocation needs to be baked in the annual budget. This is something that can be hard to see. The key piece of the puzzle is dependent on how well engineering and maintenance planning communicate. Having talented engineering staff is key to understanding how the fleet historically behaves. This knowledge, combined with a robust 'end of life' fleet plan, can help with the decision to own spares versus leasing spares."

"There are currently many challenges facing airlines when managing their spare

engine requirements," says Walter Trujillo in the Engine Technical Department at APOC Aviation. "Engine repair shops are constrained by limited intake capacity, while shop visit TATs are also being extended by parts shortages and long lead times from specialist vendors. At the same time, OEM production rates for new spare engines are also being impacted by the same parts shortages, as well as the need to balance production with demand for replacement parts from engine shops," he adds. Where Konrad Walter, Chairman, TMS Aero is concerned, operators for the most part all face challenges in managing spare engine requirements due to several factors. He goes on to detail some of these challenges: "Supply chain shortages of engine parts, as well as engine maintenance and repair services backlog, are the most critical problems we have today. We have seen for quite some time airlines operating older aircraft longer than expected due to "new gen" engine and aircraft issues whereas the engines are not staying on wing as long and other factors like aircraft deliveries being delayed as well. Therefore, many must revert to not only operating older aircraft but also leasing engines to hold them over."

Oliver Smith, Origination & Trading Manager – Americas, EirTrade Aviation has also identified three key issues, though differing from those of Anca Mihalache. He states that: "Delays in new aircraft deliveries and the ongoing LEAP and GTF engine challenges have created a tight spare engine market. Fleet-wide engine maintenance campaigns have created simultaneous demand for spare engines across multiple airlines and strained availability. Airlines are subsequently extending the operational life of existing fleets, while longer MRO turnaround times and limited maintenance capacity are reducing the availability of serviceable spare engines. As a result, airlines face three key challenges: securing sufficient spare engine coverage, managing maintenance schedules around extended shop visit timelines, and controlling the increased costs associated with engine support."



Walter Trujillo, Engine Technical Department, APOC Aviation

“Engine repair shops are constrained by limited intake capacity, while shop visit TATs are also being extended by parts shortages and long lead times from specialist vendors.”

Walter Trujillo, Engine Technical Department, APOC Aviation



StandardAero CFM56-7B line Bld 2 DFW 20250605-01

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How do longer engine shop visit turnaround times affect airlines' spare engine strategies?

Airlines are less inclined to keep as many owned spare engines as they used to, mainly because of the significant investment involved in assets that generate very little return. As a result, they have started planning their engine shop visits more carefully to avoid the need for spare engines or short-term leases, which can also come with operational risks. Anca Mihalache expands further on this: "However, delays in the shop, sometimes much longer than expected, can derail an operator's plans. When this happens, operators often turn to short-term or green-time engine leasing," she says. "Currently, the TAT for an engine shop visit is around 180–200 days, which is two to three months longer than it was a few years ago. Larger engine shops can mitigate this problem by offering a lease engine from the beginning of the shop visit. Another issue is that engine shops have now shifted part of their repair capability towards newer-generation engines, meaning there is increasing competition to secure slots at MROs with capacity and capability for legacy

engine types," she concludes.

Mark Satran feels that longer turnaround times effectively increase the number of spare engines an airline needs to support the same fleet. He goes on to tell us that: "As shop times have become materially longer, the airline has to cover the additional time somehow. The knock-on effect is the need for additional spares, leasing engines, or accepting greater operational risk. The issue is particularly relevant for CFM56-5B and -7B operators because A320ceo and 737NG aircraft are remaining in service longer. The continued utilisation of these aircraft, alongside the challenges of transitioning to newer-generation fleets, means airlines need to maintain access to sufficient engine capacity. Longer shop visits also make forecasting more difficult. An airline may plan around a particular engine returning by a certain date, only to find that material availability, work-scope changes, or MRO capacity push that date out. Having access to a leased spare can therefore be considerably more valuable than simply owning an additional engine, because it provides flexibility when the airline actually needs one."

Turnaround time is a key factor for many where Jim Wylie is concerned. "Next to price and warranty, shop visit TAT is one of the most important contract conditions negotiated by an airline, lessor, or asset owner with an MRO. Planned engine removals for the purpose of booking maintenance are done far in advance, sometimes months or years. The primary reason it remains a focal point is because when an aircraft commercial or freighter is scheduled out of service, revenue from that aircraft cannot be achieved. The head of maintenance at the planning department must communicate the aircraft out of service schedules to senior leadership to understand quarterly and / or annual budget impacts. For engine off wing maintenance one of the alternate means of minimising revenue impact is to have spare engines that can be swapped on and off. In the case of a CFM56 this can happen as quickly as overnight. Spare engines can be carrier owned assets or leased from asset brokers. Owned versus leased is weighted by convenience or budget. When TAT unexpectedly slips, the engine that was installed now needs to stay on wing longer than planned. Therefore, if the asset is owned, the cost for that owned spare engine for the installed time frame is minimal. Compare this with the scenario whereby the engine installed is under a lease agreement. In this situation, the lease now needs to be extended which can be as much US\$2K a day," he warns.

"Extended shop visit TATs put airlines at a higher failure risk as operators may be pushed to run installed engines closer to maximum removal thresholds, increasing exposure to technical disruption. For example, even if an airline keeps one spare



Mark Satran, Partner, Aero Engine Leasing

“Longer shop visits also make forecasting more difficult. An airline may plan around a particular engine returning by a certain date, only to find that material availability, work-scope changes, or MRO capacity push that date out.”

Mark Satran, Partner, Aero Engine Leasing

engine available for unexpected events, should this engine be used to compensate for excessive shop TAT's, the risk of daily AOG situations rises significantly," says Walter Trujillo, keen to highlight that there are certain strategies that may appear good in theory, but not in practice. Konrad Walter is also keen to point out how much rides on TATs. He advises that "Longer engine shop visits and reduced on-wing time of these engines make all these challenges and maintenance planning depend on spare engines and leasing thereof, which adds to operating cost. In short, shop visit turnaround times will always impact airlines spare engine strategies, due to maintenance repair, and engine MRO capacities are becoming harder to get slots and delayed by spare parts support... once again the need to lease or have more spares." Oliver Smith makes a valid point that airlines are being forced to engage with outside resources when it comes engine management. "Typically, airlines manage their fleets in line with planned maintenance schedules. However, longer engine shop visit turnaround times, ongoing supply chain constraints, labour shortages, and limited availability of serviceable engines are forcing operators to plan maintenance events further in advance. Airlines are therefore increasingly engaging with OEMs, lessors, and asset managers to develop flexible spare engine strategies, including engine exchanges, short- and medium-term leasing solutions, and engine pooling arrangements," he advises.

Extended shop turnaround times fundamentally change the way airlines must approach spare engine provisioning. Demetrios Bradshaw goes further with this:



Oliver Smith, Origination & Trading Manager - Americas, EirTrade Aviation

"When engines spend longer periods in maintenance due to material shortages, repair bottlenecks, LLP availability challenges, engineering dispositions or limited test cell capacity, spare engines remain in service much longer than originally planned. As multiple shop visits overlap, the available spare pool can quickly become stretched, increasing operational risk and reducing scheduling flexibility. Airlines should also focus on the total time an engine is unavailable rather than the quoted shop turnaround time alone. Removal, transportation, induction delays, scope growth, testing and return logistics all contribute to the actual period an engine is off wing. As a result, airlines increasingly need more sophisticated forecasting models, stronger maintenance planning disciplines and greater flexibility in accessing additional engine capacity when required."

Are airlines increasingly moving away from owning spare engines towards leasing or other flexible access models?

Here we wanted to see if there was any identifiable trend shift in terms of engine ownership as a result of supply chain problems and lack of availability of certain specific and popular engines. Mark Satran certainly believes that there is a greater willingness to use leasing and other flexible access models, although he would not characterise it as airlines abandoning ownership altogether. He explains further: "There are good reasons to own certain spare engines, particularly where an airline has a large, mature fleet and can make efficient use of the asset over many years. Additionally, airlines have fixed capital budgets. Oftentimes, much of this capital is tied up in their fleet enhancement plans. Leasing engines provides access to additional capacity without competing for valuable capital asset dollars. There is also a core-competency argument. Airlines are

in the business of flying passengers, and managing engine assets and overseeing complex shop visits—particularly on older engines that require more frequent maintenance—is not necessarily where they have the greatest expertise. Maintaining that capability internally can also result in higher costs." He rounds off by saying that: "For an engine owner, the value proposition is therefore not simply the engine itself. It is the ability to provide a technically suitable, available engine when it is needed."

Jim Wylie senses that as with any changes in operating methods for airlines, cost is the ultimate driver. "I believe owning or leasing spares is a much-needed scenario for airlines and, in some cases, having a mix of 40% owned and 60% leased is preferable. As the end of life for a given fleet plays out, having a stable full of spare engines can leave an airline with minimal return on investment due to the depreciation of the asset. Whereas, in comparison, a leased asset can be returned with no further financial burden. Where I see the market going is that airlines are moving to module swap as an alternative to longer TAT and lower cost shop visits. Airlines can simply partner with an MRO, such as Aero Norway, and draw up a business plan for module prebuild prior to shop visit and weigh out the financial model. The biproduct of module prebuilds for the purpose of quicker TAT is a shorter lease period. The long term of this type of planning could reduce quarterly or annual maintenance cost," he suggests.

There doesn't seem to be a one-size-first all solution for airlines based on what Walter Trujillo has to say. "There is no single industry view on owning spare engines compared to leasing or other flexible access models. The right approach depends heavily on an airline's fleet size and cash flow capacity. It is also tied into the type of engine support contract in place, be that a flight-hour agreement (FHA) or managing shop visits on a time-and-materials (T&A) basis," he comments, while Konrad Walter

“Airlines are therefore increasingly engaging with OEMs, lessors, and asset managers to develop flexible spare engine strategies, including engine exchanges, short- and medium-term leasing solutions, and engine pooling arrangements.”

Oliver Smith, Origination & Trading Manager - Americas, EirTrade Aviation



Konrad Walter, Chairman, TMS Aero

is more reserved in his opinion. He advises: "I wouldn't go as far as saying airlines are moving away from owning spares... but are leaning towards leasing through the tough times and delays, as the OEMs cannot provide support for spare engines even during warranty repairs due to lack of spares themselves. We also need to take into consideration the costs associated with maintaining a larger inventory of spare engines." Where Oliver Smith is concerned, he feels that "Engine ownership remains an important part of many airlines' fleet strategies; however, modern aircraft engines are high-value, capital-intensive assets that can place significant demands on an airline's balance sheet. Given the current market environment, many operators are increasingly supplementing owned spare engines with leased assets, engine pooling arrangements, and other flexible solutions. Leasing spare engines can reduce upfront capital expenditure and provide greater operational flexibility, particularly during maintenance events or periods of unexpected engine removals. While airlines remain responsible for maintenance costs through lease payments and maintenance reserve contributions, these arrangements can help smooth cash flows and provide access to serviceable engine capacity

“I wouldn't go as far as saying airlines are moving away from owning spares...but are leaning towards leasing through the tough times and delays, as the OEMs cannot provide support for spare engines even during warranty repairs due to lack of spares themselves.”

Konrad Walter, Chairman, TMS Aero

without the need for outright ownership. As a result, many airlines are adopting a hybrid approach, maintaining a core inventory of owned spare engines while utilising leasing and pooling solutions to meet short- and medium-term operational requirements."

It would be fair to say that the industry is certainly moving towards more flexible access solutions, although it would be inaccurate to describe this as a widespread shift away from ownership. Increasingly, the most effective strategy is a hybrid model. Beyond this, Demetrios Bradshaw believes that "For operators with larger and more stable fleets, ownership of a core spare engine portfolio continues to offer significant advantages, including guaranteed availability, greater configuration control and protection from fluctuations in the leasing market. However, acquiring enough engines to cover every potential peak requirement can be highly capital intensive and may lead to underutilised assets during normal operations. Leasing, pooling, exchange programmes and other structured access solutions enable airlines to add flexibility around that core owned fleet. These solutions are particularly valuable during periods of heavy maintenance activity, unexpected removals, OEM campaigns or prolonged shop turnaround times. That said, airlines should evaluate far more than the headline lease rate. Considerations such as lease duration, utilisation charges, LLP exposure, maintenance obligations, return conditions, configuration requirements and logistics costs can materially influence the overall economics of a transaction. Ultimately, the key strategic question is

not whether to own or lease, but which portion of demand is predictable enough to justify ownership, and which should remain flexible." Meanwhile, Anca Mihalache is unequivocal in her opinion. "Yes, I think this is particularly the case for legacy engines. For newer-generation engines, however, I think airlines will still prefer to have spare engines 'ready to go', as there are not many of these newer engine types available to lease in the current market. As fleets evolve and mature engines are increasingly retired, there will still be a need for spare engines that are immediately available, rather than having to wait for a lease agreement to be negotiated and signed. This becomes particularly important in the case of unexpected events such as foreign object damage (FOD) incidents, where immediate engine availability can be more important than whether leasing would theoretically be the more economical option." She then concludes that: "For a large, stable fleet that an airline expects to operate for many years, owning a pool of spare engines can still make very good economic and operational sense. It gives the airline control over availability and avoids complete exposure to the lease market."



Anca Mihalache, Managing Director, AERO CARE

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Anca Mihalache, Managing Director, AERO CARE

What factors should airlines consider when developing a long-term spare engine strategy?

Jim Wylie at Aero Norway highlights three factors to consider for an effective spare engine strategy. He details them as follows. "Utilisation cycles versus hours e.g. LLP cycle burn down: Airlines must have long-term planning to calculate each engine's approximate date for LLP cycles consumed. With this information, they then must stagger each removal with consideration to shop TAT. Engine performance deterioration: Utilising the onboard diagnostic information, aircraft engineers need to assist the maintenance planning teams with calculated performance deterioration approximate dates. These dates can then be used to develop the engine removal stagger plan. Unscheduled engine removals: Unscheduled engine removal historical trend(s) can be gleaned from the airline's past experiences, or via data supplied by engine OEMs. However, it is worth noting that the latter is based on global fleet historical data." He further feels that: "These three factors all drive the need for spare engine management, but the flexibility and commitment from a trusted MRO like Aero Norway will allow for a successful fleet plan with ample spare engine capacity," before he suggests we consider the following scenario: "Ten engines on wing; max LLP 20K cycles; performance deterioration can happen between 15k cycles – 20K Cycles; typical UER rate is three/year, shop visit TAT 120 days. How many spare engines does the airline need?"



Jim Wylie, Director CFM56 T&M, Aero Norway



Aero Norway Engine MRO Shop

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For Walter Trujillo at APOC Aviation, he believes "A key factor airlines should consider when setting their long-term spare engine strategy is dispatch reliability and the ratio of spare engines to fleet size. But it also needs to reflect the airline's cash flow capacity, expected engine shop visit costs and type of contract – and so level of risk transfer – in place to manage shop visits. APOC can support operators with 'green-time' engine lease solutions, particularly when airlines are phasing out older engine types or transitioning from previous-generation technology to newer variants." On the other hand, Konrad Walter at TMS Aero suggests that there could be several factors. He advises further: "While leasing allows airlines to avoid tying up capital for spare engines one would have to consider both having your own spares based on their operation and having lease engines available for short term purposes when engines are going through shop visits. Flexibility is key here while prioritising availability and response to fluctuating operational needs and what could be the burden of owning versus leasing."

As far as Oliver Smith at EirTrade Aviation

is concerned: "Airlines should align their long-term spare engine strategy with their fleet plans, maintenance forecasts, and anticipated engine shop visit requirements. Key considerations include fleet growth, retirement schedules, engine reliability, MRO capacity, turnaround times, and spare engine availability. Given the current supply chain and maintenance constraints, operators must also evaluate market conditions and determine the most effective means of securing spare engine coverage, whether through ownership, leasing, pooling arrangements, or green-time solutions." Meanwhile, Demetrios Bradshaw at Aeras Aviation is very much of the opinion that a successful long term spare engine strategy should be built around the airline's fleet plan and maintenance requirements rather than a fixed target number of spare engines. He goes on to advise that: "Operators should model fleet growth, utilisation levels, engine removal rates, scheduled shop visits, LLP forecasts, reliability trends, expected time on wing and realistic maintenance turnaround times. These assumptions should then be tested against potential disruptions such as unscheduled removals,

“Utilising the onboard diagnostic information, aircraft engineers need to assist the maintenance planning teams with calculated performance deterioration approximate dates. These dates can then be used to develop the engine removal stagger plan.”

Jim Wylie, Director CFM56 T&M, Aero Norway



Virgil D. Pizer, Chief Executive Officer,
Pem-Air Turbine Engine Services

durability issues, regulatory requirements, OEM modification programmes, aircraft delivery delays and material shortages. Technical interchangeability is another critical consideration. Engine model alone does not determine fleet flexibility. Build standard, thrust rating, modification status, LLP life, QEC requirements and installation configuration can all influence whether an engine can be efficiently deployed across the fleet. From a commercial standpoint, airlines should combine ownership, leasing, pooling and exchange capabilities with secured maintenance capacity and a disciplined material strategy, including the selective use of certified used serviceable material where appropriate." He rounds off by suggesting that: "... operators should evaluate the entire economic lifecycle of each asset, including acquisition cost, maintenance exposure, green time, LLP value, leasing potential and residual value. The most effective spare engine strategies bring together engineering, maintenance planning, operations and finance within a single decision-making framework. A spare engine should not be viewed merely as inventory on a balance sheet. It is a strategic asset that protects aircraft availability, supports schedule integrity and safeguards revenue generation."

At AERO CARE, Anca Mihalache believes that predictability is the most important factor. However, she adopts a slightly cautious tone as she explains: "Of course, with newer-generation engines, it is not easy to predict requirements as there is not yet a great deal of historical data. However, as more of these engines enter service, better predictability and good planning will be lifesaving. Then, there is

“Scheduled removals for shop visits, overhauls, and life-limited part replacements can typically be forecast well in advance. However, unexpected engine issues can occur at any time, making it important to have a strategy that addresses both planned and unplanned events.”

Virgil D. Pizer, Chief Executive Officer, Pem-Air Turbine Engine Services

the choice of engine shop to consider. If an operator chooses an engine shop that can also provide short-term leasing options, it may be able to operate with fewer spare engines." To conclude the above question, Mark Satran at Aero Engine Leasing feels that the starting point should be operational requirements rather than simply a target number of spare engines. He believes: "Airlines should consider fleet size and utilisation, expected removal rates, historical reliability, MRO turnaround times, and the level of operational disruption they are willing to tolerate. They should then compare the economics of ownership versus access. An owned spare requires capital and carries costs associated with financing, storage, maintenance, and future shop visits, as well as residual-value risk. Leasing provides greater flexibility and can allow an airline to match engine availability more closely to its actual requirements. The expected life of the fleet is also increasingly important. Airlines need to consider how long they will operate their CFM56-powered A320ceo and 737NG aircraft as fleet transitions continue. A strong strategy is ultimately about having reliable access to the right engines when they are needed."

How can operators balance the cost of holding spare engines against the operational risks of insufficient spare coverage?

There is no avoiding the consequences of delays in the production of new aircraft seeing fleets operating beyond their planned retirement, combined with a shortage of available P&W GTF and CFM LEAP engines, not just for new aircraft, but as standalone spares and replacements for carriers and MROs. So what strategies are proving most effective when dealing with such a challenge?

"Balancing the cost of spare engine ownership against operational risk requires operators to plan for both scheduled maintenance removals and unscheduled

AOG events. While spare engines represent a significant investment, insufficient coverage can quickly lead to aircraft downtime, schedule disruptions, lost revenue, and reduced fleet reliability," says Virgil D. Pizer, Chief Executive Officer, Pem-Air Turbine Engine Services. He goes on to say that: "From an MRO perspective, the first step is understanding an operator's maintenance profile. Scheduled removals for shop visits, overhauls, and life-limited part replacements can typically be forecast well in advance. However, unexpected engine issues can occur at any time, making it important to have a strategy that addresses both planned and unplanned events. This challenge is often more significant for smaller and mid-sized operators. With limited fleet redundancy, the removal of a single engine can have a disproportionate impact on operations. In these cases, owning multiple spare engines may not always be economically practical. This is where strong partnerships with both an MRO provider and a lessor can help relieve some of the pressure. An experienced MRO partner can provide greater visibility into engine health, maintenance forecasts, and upcoming shop visit requirements, allowing operators to plan more effectively and reduce surprises. At the same time, lessors can offer access to spare engine assets or flexible leasing solutions that provide coverage without the capital commitment of outright ownership. By working together, operators, MROs, and lessors can develop a more flexible spare engine strategy that aligns maintenance planning with available engine resources. This collaborative approach helps ensure coverage for both scheduled maintenance and unexpected events while reducing the financial burden of maintaining a large spare engine inventory. Ultimately, the goal is not to eliminate risk but to manage it effectively. For many smaller operators, the right combination of proactive maintenance planning, MRO support, and flexible access to leased or pooled spare engines can provide the operational resilience they need

without tying up excessive capital.”

Robbie Deegan, Senior Manager Contracts and Asset Management, Setna iO sees this very much as a constant battle for operators. He further comments that: “Of course, every fleet is different, as are strategies across regions. Taking the USA, a recent Reuters analysis of U.S. Transportation Department data found that across six large U.S. airline operations, reported spending on engine labour, aircraft-engine repairs and engine materials rose about 68% between 2019 and 2025, while hours flown increased about 10%. Therefore, operators should compare the annual cost of owning or leasing an additional spare engine with the expected cost of insufficient coverage, including AOG losses, aircraft substitution, passenger disruption and emergency short term engine-leasing costs. The optimal strategy is not to hold the maximum possible number of spares, but to maintain enough coverage to keep the probability and financial impact of an engine-related grounding within an acceptable level. Operators could also consider having pre-agreed lease contracts in place with some of the dedicated spare engine lessors and keep in regular contact regarding spare engine availability particularly when supply is tight and demand high for spare engines. For organisations such as us at Setna, providing in stock, ready to go USM ultimately keeps engines flying longer whilst reducing downtime for operators.” Matt Power, Sr. Director Engine Leasing, StandardAero is direct and succinct in his thoughts on the matter. “Options available to operators seeking to minimise the capital outlay associated with spare engines include the use of lease assets (which can also include sale and leaseback deals associated with existing spare engine inventory); the utilisation of engine lease pools (where offered); and partnerships with asset management specialists who may be able to offer cost-effective solutions such as guaranteed access to green-time engines with specific cycles remaining (CR) to meet the airline’s particular requirements,” he tells

us. Cliff Topham, SVP & Head of Engines, Werner Aero LLC is equally concise, while presenting very viable options. He feels that: “Balancing is primarily dependent on the risk acceptable to the operator - however the market has changed over recent years. There are alternative ways to balance that risk as opposed to basically having the spare engine assets owned by the operator. Some of these are long term leasing (financing), operational leasing and pooling, in times of oversupply of green time engines, some operators can feel relatively comfortable having zero committed spare engine coverage and rely on the short-term lease availability.”

Are the challenges of spare engine management different for new-generation engines compared with mature engine programmes?

There clearly are differences, though depending on your relationship with engines, the challenges may well vary considerably. We were keen to discover what these differences might be. Robbie Deegan has more to say on the matter: “Yes, the key difference comes down to uncertainty around new-generation engines. Less long-term operating experience is always going to result in greater unpredictability when it comes to planning engine removals. For example, IATA reported that 648 Pratt & Whitney GTF-powered aircraft were grounded at the peak in March 2025, highlighting the operational impact of engine availability problems. However, as these problems are resolved by the OEM’s, and the engines begin flying over a longer period of time, this will result in a greater ability to plan from an operational perspective in the future.” For Matt Power, one of the most notable changes associated with new-generation spare engine management in recent years has been obtaining cost-effective access to spare engines, at a time when these powerplants have been in high demand

(and limited supply), resulting in extremely high valuations. He goes on to say that: “Aside from this, another obvious challenge associated with new-gen spare engines is the issue of configuration management, at a time in the powerplant’s lifecycle when OEMs may be releasing upgrades to address early service issues. Finally, new-gen engines early in their service life may also experience shorter time-on-wing (TOW) compared to older engines, necessitating more frequent MRO shop visits (which may be longer than anticipated due to MRO induction times and/or parts shortages).”

“Unfortunately, yes in general, the challenges of “new generation” engines have been made more difficult in main due to the lower on-wing life not only to that originally expected lives, but also in comparison to the older generation engines the latest technology engines were due to replace,” comments Cliff Topham. “The outcome of this is that the ratio of spare engine support needed is in general greater than that accepted by the organisation used to operating the older generation engines. The OEMs are doing their best to support these additional requirements but it’s fair to say there is still some work to go in times of durability and life on wing,” he adds. For Virgil D. Pizer the challenges can be quite different, though he feels the underlying objective remains the same: ensuring engines are available when operators need them while minimising operational disruption. He goes on to explain that: “For newer-generation engine programmes, operators are often working within an aftermarket ecosystem that is still evolving. Growing fleet populations, increasing maintenance demand, limited spare engine availability,



Robbie Deegan, Senior Manager Contracts and Asset Management, Setna iO

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and developing repair networks can all place pressure on spare engine planning. In these environments, securing access to spare assets often requires significant advance planning and close coordination among operators, lessors, and maintenance providers. Mature engine programmes present a different set of challenges. While maintenance practices, reliability trends, and shop visit requirements are generally well understood, operators must manage aging assets, parts availability concerns, and long-term lifecycle decisions. The focus often shifts from building maintenance capability to maximising asset value and extending the useful life of engines in a cost-effective manner. From Pem-Air's perspective, one of the key advantages of mature engine programmes is the strength of the support ecosystem that has developed around them. Years of operational and maintenance data, established repair capabilities, available serviceable material, and close collaboration between operators, MROs, and lessors can provide greater flexibility when managing both scheduled maintenance events and unexpected removals. This is particularly important for smaller and mid-sized operators. Rather than relying solely on owned spare engines, many benefit from a collaborative model involving the operator, the MRO, and a lessor. The operator gains visibility into upcoming maintenance requirements, the MRO helps forecast shop visits and maintenance needs, and the lessor can provide access to spare assets when additional coverage is required. Together, this helps reduce uncertainty and improve operational resilience without requiring significant capital investment in spare inventory. Ultimately, regardless of engine

type, successful spare engine management depends on proactive planning and strong partnerships. The more effectively operators can connect maintenance planning with asset availability, the better positioned they are to navigate both scheduled and unexpected maintenance events."

What is the most common mistake airlines make when managing spare engine availability?

Matt Power is quite clear on his choice. "One of the most common mistakes that we see is operators underestimating (or shortcutting) their spare engine ratio. This is an issue which has been particularly exposed with those new-gen engines which have been seeing lower than expected TOW due to early service issues. In a similar vein we have also seen some operators over-estimate their ability to secure lease engines on the open market, which has – as a result – impacted their spare engine strategy," he states. On the other hand, Cliff Topham senses there is more than one mistake that you will find near the top of the list. He lists these as: "Not keeping it in the most favoured condition for rapid engine change usually referred to as full QEC, or EBU'd engines. In certain airplane platforms there are different configurations for Left-Handed engines and Right-Handed engines, which means that the engines should be configured into Max Neutral QEC configuration, i.e., a condition that allows the shortest build and installation time for any aircraft engine position. Not provisioning the correct thrust specification of engine to cover the fleet. In general, if a mixed fleet of aircraft are operated it is important that the highest thrust requirements are provisioned. Not keeping engine stands in usable condition and not having the paperwork ready to install the engine"

Like Cliff Topham, Virgil D. Pizer feels there is more than one mistake to highlight. He begins: "One of the most common mistakes is treating spare engine planning



CFM56 Engine MRO

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as a reactive exercise rather than a long-term strategic process. Many operators understandably focus on unexpected engine removals and AOG events, but the greater challenge is often failing to adequately plan for scheduled maintenance requirements well in advance, especially in today's tight market environment. From an MRO perspective, scheduled shop visits are generally predictable. Engine utilisation, life-limited part cycles, and maintenance requirements provide operators with visibility into future engine removals. However, when maintenance planning, spare engine strategy, and shop capacity planning are not aligned, operators can find themselves competing for limited spare assets or facing longer-than-expected downtime." He then goes on to add that: "Another common challenge is underestimating the cumulative impact of market conditions. Engine availability is influenced not only by an operator's own fleet requirements, but



Matt Power, Sr. Director Engine Leasing, StandardAero

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also by industry-wide factors such as MRO capacity, parts availability, and demand for leased or pooled spare engines. Waiting until a removal is imminent can significantly reduce the number of available options. For smaller and mid-sized operators, this risk is often amplified because there is less fleet redundancy to absorb an unexpected event. A single engine removal, whether planned or unplanned, can have a meaningful impact on operations if adequate coverage has not been arranged. Pem-Air, as an MRO partner, sees the most successful operators taking a proactive approach. They engage early in maintenance planning discussions, maintain visibility into engine health and upcoming shop visits, and work closely with MROs, lessors, and asset providers to ensure spare engine requirements are identified well in advance. Ultimately, spare engine management is most effective when it is integrated into the broader maintenance strategy. The goal is not simply to respond to engine removals, but to anticipate them and ensure the right resources are available before operational disruptions occur."

In your view, what does an ideal spare engine solution look like: ownership, leasing, pooling, or a combination of all three?

Where Robbie Deegan at Setna iO is concerned, this varies depending on fleet size, region and cost of capital, as examples. He then explains that: "If we take large operators, a mixed strategy is likely the best approach for them. The reason for that is that a single strategy can be expensive or have limitations. For example, ownership alone is expensive, and leasing can expose airlines to high prices and limited availability when demand is highest. At Setna, we are leasing and trading engines but also providing them with the required material reduce repair cost and repair time for older generation engines and aircraft, and we envisage this being the same with the new generation of assets in the long term." Over at Standard Aero, Matt Power at Standard Aero has useful insights as he tells us: "The optimal spare engine solution will depend

on an airline's specific preferences (including capital outlay and risk tolerance), with some carriers preferring to assure their access to spare engines via a large owned pool, and others preferring to minimise their sunk capital through the use of leased or pooled assets. The fact that operators are able to choose from these options (and others, including the use of green-time assets and third-party fleet management) does give airlines more flexibility than in years past, and should reduce the risk of unexpected AOG events."

"In general, this very much depends on the size and variety (model thrust standard operated) of the fleet," says Cliff Topham at Werner Aero LLC. He then goes on to tell us that: "The larger the size of the fleet, and the more common fleet operated, the more this is skewed towards ownership of spare engine assets to support the fleet. In today's world there is always a case for reviewing these requirements both from a short-term and a long-term point of view and most likely a mixture of the three types outlined above can provide a better balance of cost versus lack of availability costs. These also change with age of fleet and assets e.g., as aircraft are phased out many airlines are these days looking at keeping engines installed in the to be phased out aircraft to support the remainder of the fleet particularly if they have low book value and good "green time" i.e., remaining useful life."

Virgil D. Pizer at Pem-Air brings this article nicely to a close with a very comprehensive outlook for an ideal spare engine solution. "In our experience, there is rarely a one-size-fits-all solution. The ideal spare engine strategy is typically a combination of ownership, leasing, and pooling arrangements, tailored to an operator's fleet size, utilisation, financial objectives, and operational risk profile. Ownership provides the highest level of control and guaranteed access to an asset when it is needed. For operators with larger fleets or consistently high utilisation, owning spare engines can make strategic sense, particularly when there is a predictable demand for coverage during scheduled maintenance events. Leasing offers greater flexibility and can be an attractive option

for operators looking to preserve capital while maintaining access to spare assets. It is especially useful when covering planned shop visits, temporary capacity shortfalls, fleet growth, or unexpected engine removals without the long-term commitment of ownership. Pooling arrangements can also provide valuable flexibility, particularly for smaller and mid-sized operators that may not have the scale to justify significant spare engine ownership. Shared access to assets can help improve resilience while reducing capital requirements. From an MRO perspective, however, the most effective solution is often not defined by a single asset strategy but by the strength of the partnership supporting it. When operators, MRO providers, and lessors work together, they can create a more proactive and flexible spare engine ecosystem. The operator gains greater visibility into upcoming maintenance requirements, the MRO helps forecast shop visits and maintenance needs, and the lessor can provide access to spare assets when coverage is required. This collaborative model helps reduce uncertainty around both scheduled maintenance events and unexpected removals. Rather than relying solely on owned inventory, operators can leverage a broader network of maintenance expertise, asset availability, and planning support to maintain operational continuity. Ultimately, the best spare engine solution is one that aligns maintenance planning with access to available assets. For many operators, particularly smaller and mid-sized fleets, a combination of owned, leased, and pooled resources supported by strong MRO and lessor partnerships provides the greatest balance of flexibility, cost efficiency, and operational resilience," he concludes.



Cliff Topham, SVP & Head of Engines, Werner Aero LLC

“The larger the size of the fleet, and the more common fleet operated, the more this is skewed towards ownership of spare engine assets to support the fleet.”

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THE POWER OF INTEGRATED MRO

How TAT Technologies is connecting repair, engineering, manufacturing, inventory and asset support to deliver integrated solutions for the increasingly complex business of aircraft maintenance

By David Dundas

For airlines and operators, MRO has never been simply about repairing a component. Behind every removal is a much larger operational challenge: sourcing parts, managing inventory, coordinating suppliers, controlling turnaround times, maintaining asset availability and ultimately keeping aircraft flying. That challenge has become increasingly complex as material availability remains unpredictable, aging fleets require greater repair expertise, and operators manage multiple suppliers across different component categories and geographies. At the same time, expectations for turnaround, reliability and cost control have never been higher.

The result is changing what operators need from their MRO partners. Repair

capability remains fundamental, but increasingly, it is only one piece of the equation. Operators need partners capable of connecting repair with engineering, manufacturing, material availability, inventory, exchange and leasing resources, and responsive customer support. At TAT Technologies, that thinking is behind an increasingly integrated approach to MRO. One designed to bring more of the resources required to support an aircraft component together within a single organization. The objective is straightforward: deliver integrated MRO solutions that reduce complexity, create greater simplicity for the customer and provide more control and predictability throughout the maintenance process.

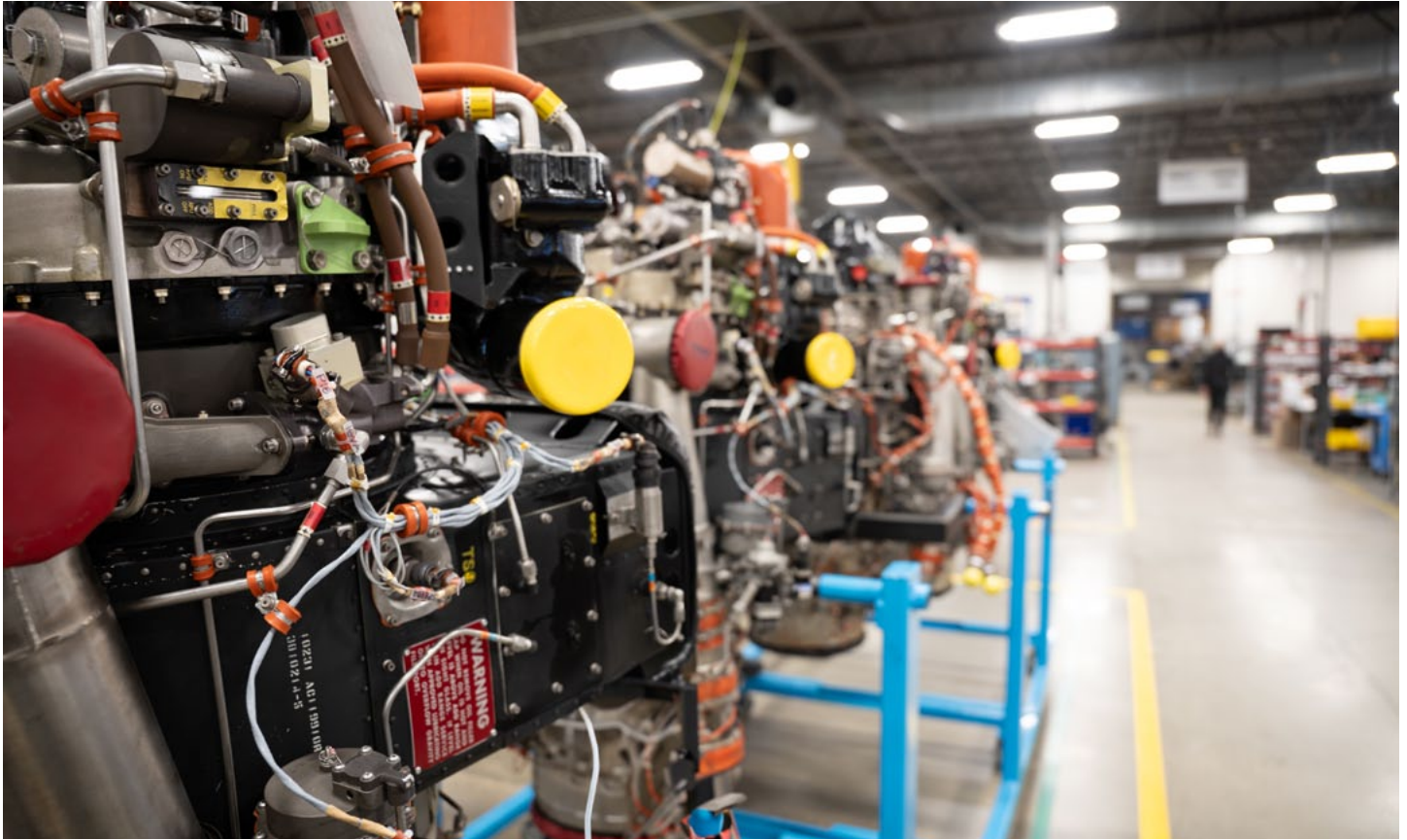
MRO Is More Than the Shop Visit

The traditional repair-and-return model appears simple. A component is removed, shipped to an MRO provider, repaired and returned to service. The reality behind that transaction can be significantly more complicated. Once the



“Customers are looking more and more for their MROs to help remove complexity from their maintenance operations. TAT's integrated approach does exactly that by providing the optimum solution.”

Paul Oliver, VP MRO Business



component enters the shop, the provider may discover that replacement material is unavailable, a specialized repair is required, machining or plating must be outsourced, or a replacement asset is needed to keep the aircraft operating. Each requirement can introduce another supplier, another shipment, another approval and another potential delay. For an operator, those individual steps matter far less than the ultimate outcome: getting a reliable component back into service when it is needed.

That is where an integrated MRO model becomes increasingly important. TAT Technologies supports thermal components, auxiliary power units and landing gear through operations backed by engineering, manufacturing, inventory, exchange and leasing resources. The breadth of those capabilities matters, but integration is not simply about offering more services. It is about connecting those capabilities to create seamless solutions around the customer's requirements, reducing unnecessary handoffs and helping streamline the maintenance process from removal through return to service.

Controlling More of the Process In-House

A central part of TAT's integrated MRO strategy is the continued expansion

of in-house capability. Across its operations, TAT has invested in advanced machining and robotics, plating, welding, engineering, specialized repairs, testing and manufacturing capabilities. These resources allow more work to remain within the organization rather than moving through a network of outside vendors. The impact goes beyond convenience. Every outsourced process creates an additional dependency: parts must be transported, outside capacity must be available, quality requirements must be coordinated, and schedules must align. Bringing more of those processes in-house gives the MRO provider greater visibility and control over the complete repair cycle while creating a more streamlined path through the maintenance process.

Within TAT's APU and landing gear operations, advanced machining, robotics, in-house plating and other specialized processes support repair activity alongside

engineering expertise and licensed and approved capabilities. Investments in automation and advanced equipment are helping improve consistency and efficiency while expanding the range of work that can be performed internally. TAT's thermal operations provide another example of this vertical integration. In addition to MRO capabilities, TAT manufactures heat exchanger cores in-house, providing greater control over material, quality and scheduling while reducing dependence on external suppliers. This combination of OEM manufacturing knowledge and MRO experience creates another advantage: understanding how components are designed and manufactured can inform how they are inspected, repaired and returned to service. Together, these capabilities allow TAT to develop solutions that address more of the maintenance requirement internally and with fewer outside dependencies.

“In-house capability is really about control. When machining, plating, engineering, manufacturing and repair expertise are available within the organization, there are fewer external variables affecting the schedule. That helps create a more consistent and predictable process for the customer.”

Donnie Loflin, Senior Director, APU Operations



Engineering as Part of the MRO Equation

Integration also extends beyond physical repair capabilities. Engineering plays an important role in determining whether components can be repaired efficiently, whether alternative repair solutions can be developed and how recurring maintenance challenges can be addressed over time. Rather than treating engineering as a separate activity, an integrated approach connects engineers directly with technicians, manufacturing resources and customer requirements. That collaboration can help identify repair opportunities, address difficult-to-source material and develop solutions that may otherwise require replacement of a component.

This becomes particularly important as aircraft and components remain in service longer. Aging fleets can create challenges that were not anticipated when the original maintenance programs were established. Parts become more difficult to source, repair histories become more complex and operators need practical solutions that balance reliability, cost and availability. In that environment, connecting engineering expertise with hands-on MRO experience can provide a more seamless path from identifying a maintenance challenge to implementing an effective solution.

Inventory Changes the Turnaround Equation

Even the most capable repair organization cannot deliver consistently

if material is unavailable. For that reason, inventory has become a fundamental part of TAT's integrated MRO strategy. TAT maintains extensive OEM and USM inventory to support ongoing operations and anticipated customer requirements. The distinction is important. In a traditional model, material sourcing may begin after a component arrives and the work scope is determined. When commonly required material is already available, a significant variable can be removed from the turnaround equation.

Inventory also provides flexibility. OEM material, USM, exchange assets and leasing options can provide different solutions

depending on the customer's requirements, economics and operational situation. Rather than treating inventory as a separate commercial activity, **TAT views it as an integral part of MRO execution.** The result is a more streamlined support model built not only around the ability to repair a component, but around having the resources available to keep the process moving.

From Repair-and-Return to Readiness

That same philosophy led to the development of PRO EX™ by TAT Technologies, an exclusive support program designed to move beyond the traditional repair-and-return relationship. PRO EX™ provides participating customers with access to dedicated exchange inventory positioned to support immediate asset availability when required. The program is initially focused on heat exchangers, with the potential to expand the model to additional product categories over time.

The concept addresses a familiar challenge. Under a traditional repair-and-return model, an operator removes a component and waits for that same asset to move through the repair process. Even with a strong turnaround time, the operator must plan around the period in which that asset is unavailable. PRO EX™ changes that equation by positioning dedicated inventory to support the customer. When a covered component is removed, an exchange asset can be made available from the dedicated pool, allowing the



“The goal is to move the conversation beyond ‘How quickly can this component be repaired?’ to ‘How can the customer avoid feeling the impact of the removal in the first place?’ Programs such as PRO EX™ are designed around that broader operational question.”

Kip Edwards, Senior Director, Global Sales

operation to continue while the removed unit enters the repair cycle. The value is not simply speed; it is readiness and simplicity. By aligning inventory with anticipated maintenance demand, PRO EX™ provides a more seamless solution that can help reduce the operational impact of a removal. Instead of responding to each event in isolation, assets and resources can be positioned around the customer's broader operating requirements.

“The goal is to move the conversation beyond ‘How quickly can this component be repaired?’ to ‘How can the customer avoid feeling the impact of the removal in the first place?’ Programs such as PRO EX™ are designed around that broader operational question.” Kip Edwards, Senior Director, Global Sales

Connecting Capabilities Across the Organization

The real value of integrated MRO becomes apparent when these individual capabilities begin working together. A component entering the TAT network can be supported by technicians with deep product experience, engineers capable of addressing repair challenges, in-house manufacturing and specialized processes, inventory positioned to support material requirements, and exchange or leasing assets when immediate availability is necessary. The result is not simply a collection of capabilities, but an integrated solution designed to reduce the number of external touchpoints involved in resolving a maintenance event and create a more seamless experience for the customer.

It also creates opportunities to look beyond an individual shop visit. As the relationship with an operator develops, repair history, material requirements and removal patterns can help inform inventory planning and support strategies. The MRO relationship becomes less transactional and more focused on the overall performance of the customer's maintenance program.

For customers operating globally, that approach is increasingly important. Managing separate providers for individual processes and component categories creates administrative burden as well as operational risk. Connecting more capabilities through an integrated partner can simplify communication, contracting and logistics while helping streamline the overall maintenance operation.

Integration Is Ultimately About Predictability — and Simplicity

The aerospace aftermarket will always involve variables. Components fail unexpectedly, material becomes constrained, fleet plans change and aircraft remain in service longer than originally anticipated. No MRO provider can eliminate every uncertainty, but an integrated provider can control more of the variables within its reach.

In-house machining can reduce reliance on outside capacity. Robotics and automation can support efficiency and consistency. In-house plating and

specialized processes can eliminate external handoffs. Manufacturing capability can provide another source for required material. Engineering can expand repair options. Deep inventory can help address supply constraints. Exchange and leasing assets can protect availability. Programs such as PRO EX™ can position resources before a removal becomes an operational problem. Individually, each capability provides an important solution. Connected through an integrated MRO model, they can create something more valuable: a streamlined maintenance experience built around simplicity, responsiveness and predictability.

For TAT Technologies, that is the power of integrated MRO: not simply putting multiple capabilities under one corporate name, but connecting those capabilities to provide seamless solutions that make aircraft maintenance easier to manage. As operators continue to navigate supply chain pressures, aging fleets, cost constraints and increasing operational demands, the strongest MRO partnerships will be those that can see beyond the repair order, understand the larger operational objective and bring together the right resources to address it.

Ultimately, MRO performance is not measured only by what happens inside a repair facility. It is measured by what happens outside of it: fewer disruptions, greater asset availability, more predictable maintenance schedules and aircraft where they belong — in operation.

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Aircraft Maintenance in Extreme Environments

There can be no one-size-fits-all maintenance solution for two identical aircraft operating in different environments

By David Dundas

Commercial aircraft have been designed to operate in almost every corner of the world, routinely encountering environmental conditions that would challenge most machinery. From the intense heat and airborne sand of desert airports to Arctic cold, tropical humidity and the salt-rich atmosphere of coastal regions, aircraft have to operate safely and reliably time and time again. For MROs, however, these challenging environments present a very complex range of challenges.

For starters, environmental exposure can influence virtually every part of an aircraft. Fine sand and dust, or salt and moisture can infiltrate mechanical systems and accelerate erosion, while extreme cold can alter the behaviour of lubricants, seals and batteries. Frequently, aircraft are forced to deal with several of these conditions during the same operating cycle, creating a complex maintenance challenge where seemingly minor environmental effects can create major problems over time. The consequence is that that flight hours, cycles and calendar-based maintenance intervals can tell only part of the story. Two aircraft of identical age with similar flight hours can experience very different rates and types of

deterioration depending upon where they have been operated.

Having a comprehensive knowledge and understanding of an aircraft's environmental history is thus becoming an increasingly important part of effective maintenance planning. From targeted inspections and cleaning programmes to corrosion prevention, component monitoring and predictive maintenance, engineers within the MRO environment have a constantly growing range of tools with which to respond.

We wanted to look more closely at how extreme operating environments change the maintenance equation—and why knowing what an aircraft has been through should be equally important as knowing how many hours it has flown for.

How sand, cold, salt and humidity change the maintenance equation

Aircraft are designed to operate across an extraordinary range of environmental conditions. A single airframe may spend one week flying through the dry heat of the Middle East, the next operating from a rain-soaked European airport and

later encounter sub-zero temperatures in northern Canada or Scandinavia. From an operational perspective, this versatility is one of aviation's greatest achievements. From a maintenance perspective, however, the environment is anything but neutral.

Salt, sand and dust accelerate erosion and contaminate mechanical systems, while extreme cold changes the behavior of lubricants, seals, batteries and structures. High humidity allows moisture to penetrate electrical connectors, avionics compartments and structural cavities and when these occur in tandem, their effects can be even more damaging and destructive. Thus, for MROs it isn't simply a case of whether or not an aircraft can operate in an extreme environment, but more a case of how repeated exposure changes inspection priorities, servicing requirements and ultimately the overall maintenance programme itself.

The desert: more than just heat

Desert operations are often associated with high temperatures, sand and airborne dust. Fine particles can enter surprisingly small openings and accumulate around hinges, bearings, actuators, landing gear



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assemblies and ventilation systems. So, depending on particle composition and operating conditions, sand and dust can behave as both a contaminant and an abrasive, and for obvious reasons, engines are particularly exposed to this problem.

During taxi, takeoff and landing, aircraft operating from dusty airfields may ingest significant quantities of airborne material. Over time, this can contribute to compressor erosion and deterioration in aerodynamic surface condition. It is also worth noting that engine performance monitoring becomes particularly valuable in environments where contamination or erosion develops gradually. Borescope inspections can provide another important source of information. Instead of waiting for an obvious performance problem, operators can use inspection findings together with trend data to understand how a particular operating environment is affecting the engine.

The same principle applies elsewhere on the aircraft.

Landing gear is located in one of the most exposed and therefore contaminated areas of the airframe. Dust and sand can collect around exposed surfaces, seals, lubrication points and moving components. Frequent cleaning and careful lubrication become important because contamination can accelerate wear. Beyond that, filters also require particular attention. Air-conditioning and ventilation systems may encounter substantially higher particulate loading than they would in cleaner operating environments. Even minor details matter as sand trapped on lubricated surfaces can create an abrasive mixture. Cleaning followed by correct re-lubrication becomes the order of the day than simply topping up the lubricant.

The maintenance response to desert operation tends to become a collection of relatively small changes to normal routines, such as more cleaning, closer monitoring, targeted inspections and greater attention to contamination-sensitive components.

Arctic operations: when materials behave differently

Cold creates a different set of problems. At very low temperatures, materials and fluids do not behave as they do in a warm hangar. Lubricants become more viscous. Elastomeric seals can become less flexible. Battery performance can deteriorate. Water trapped inside systems or cavities can freeze and expand. From the human-side, maintenance personnel also face practical challenges. Tasks that are straightforward under normal conditions may become harder when performed in severe cold. Unfortunately, the wearing of gloves reduces dexterity, while snow and ice can obscure inspection areas. Tools and equipment themselves may also be negatively affected by temperature. You then have one additional problem.

When you move an aircraft between cold outdoor conditions and a heated hangar, condensation can occur. A cold, wet aircraft brought into a warm, humid environment can develop moisture on and inside components. The visible water on the exterior may be obvious; moisture appearing inside connectors, cavities or equipment can be impossible to see. Repeated thermal cycling deserves attention for the same reason. An aircraft operating regularly between very cold cruise or ground environments and warmer conditions experiences repeated expansion and contraction of materials. Maintenance

programmes have to deal not only with the lowest temperature encountered but also the cumulative effects of repeated exposure.

Batteries are another area where temperature can have a significant effect. Electrochemical performance is temperature-dependent and a battery that performs normally under standard operating conditions may deliver substantially reduced capacity in severe cold. Appropriate servicing, condition monitoring and adherence to manufacturer limitations become particularly important for aircraft which operate regularly at low temperatures. Beyond this, hydraulic and lubrication systems present their own challenges. Increased fluid viscosity during cold starts can affect system response and place different demands on pumps and components until operating temperatures rise.

For MROs, understanding the aircraft's thermal history can be as important as knowing the temperature at the time of inspection.

Salt: an invisible passenger

Aircraft based near coastlines or operating frequently over marine environments have to deal with an additional and constant adversary: salt. Salt contamination is particularly troublesome because it promotes corrosion when combined with moisture. Deposits can remain in seams, joints, fastener locations, landing gear bays and other difficult-to-access areas long after the aircraft has left a salt-rich environment. The damage done is never instant. Corrosion is a progressive process. By the time surface evidence becomes clearly visible, deterioration may already have developed beneath coatings or around interfaces between components. This makes prevention doubly important.

Regular washing can remove deposits before they remain on the structure for extended periods. But washing itself must be performed correctly. Introducing water into poorly drained cavities or sensitive electrical areas can solve one problem but create another. It should be noted that protective coatings and corrosion-inhibiting compounds also play an important role, particularly in known corrosion-prone areas. Their condition should be assessed rather than assumed. A protective system only works effectively while it remains intact.

Maintenance personnel need to pay close attention to areas where moisture and contaminants can collect, such as

lap joints, fasteners, drain paths, wheel wells, bilges, control-surface cavities and interfaces between dissimilar materials. The latter is especially relevant because galvanic corrosion can occur when dissimilar conductive materials are electrically connected in the presence of an electrolyte. Salt water provides an effective electrolyte, making correct isolation and protection of material interfaces particularly important.

Today's aircraft have yet to eliminate this problem. Composite structures may themselves be highly resistant to conventional metallic corrosion, but aircraft still contain metallic fasteners, meshes, bonding provisions, fittings and numerous interfaces between different materials. All that has happened is that the corrosion problem has changed; it has not disappeared.

Humidity: moisture finds a way

High-humidity environments introduce another maintenance challenge because moisture can reach locations that are difficult to inspect and here we are talking about the likes of electrical systems which are especially sensitive. Problems faced here include moisture contamination in connectors which can contribute to corrosion, increased resistance and intermittent faults. These problems can be frustrating because the fault observed by the flight crew may disappear by the time the aircraft reaches the hangar. This is because, for example, a connector may test normally when dry and fail again under humid operating conditions.

For troubleshooting personnel, environmental history can therefore provide valuable diagnostic information. A recurring fault that appears after heavy rain, overnight parking in humid conditions or significant temperature transitions should not automatically be treated as coincidence. Beyond this, avionics cooling and ventilation paths also require attention. Blocked drains, degraded seals or contamination around ventilation systems can allow moisture to accumulate where it was never intended to remain. Beyond this, cabin interiors can present another source of moisture. Passengers, catering operations, cleaning processes and normal human respiration all create water vapor. Over thousands of flights, moisture can reach below floor panels and into lower fuselage areas. It is for this reason that corrosion inspections in apparently protected interior locations remain important. To be blunt, the exterior



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environment is not the only source of water inside an aircraft.

When environments combine

In reality, aircraft rarely encounter environmental threats in isolation. A coastal airport in a hot climate may expose an aircraft simultaneously to heat, humidity and salt, while a desert location may combine dust with large temperature changes between day and night. Northern airports may expose aircraft to snow, de-icing chemicals, moisture and repeated freeze-thaw cycles. These combinations can produce maintenance challenges greater than any single environmental factor would suggest.

As an example, consider contamination around landing gear. Moisture, runway contaminants, de-icing chemicals, hydraulic fluid, grease and particulate matter can all accumulate in the same area. The resulting environment can promote corrosion while simultaneously making visual inspection more difficult. This is one reason generic assumptions about "harsh environments" are short sighted. MROs need to better understand the specific exposure profile of their operation.

From fixed intervals to environmental exposure

Traditional maintenance programmes are heavily structured around flight hours, flight cycles and calendar intervals. Those parameters remain fundamental, but environmental exposure adds a further, critical dimension. As we have said, two aircraft of identical age and number of flight

hours may not have experienced equivalent degradation. The reason for this is because one may have spent most of its life operating from relatively dry inland airports. Another may have accumulated similar hours and cycles while operating from humid coastal locations. Their maintenance histories—and potentially their physical condition—can be very different. The result is that this raises an important question for modern maintenance planning:

Should environmental exposure become a more explicit maintenance parameter?

Increasingly sophisticated aircraft health-monitoring systems make that possibility more practical as operators can combine aircraft data with information about routes, airports, temperatures and environmental conditions to identify patterns. This means an operator might discover, for example, that a particular component exhibits a higher removal rate on aircraft assigned predominantly to one geographic region. Another fleet might show increased corrosion findings following certain seasonal operations. Such unique information can support targeted maintenance actions rather than performing identical additional inspections for every aircraft.

The value of maintenance data

It is worth noting that extreme-environment maintenance is closely connected with another major industry trend: predictive maintenance. Here the objective is not necessarily to predict the



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exact moment when a component will fail as, frequently, the more useful goal is to identify changing degradation patterns early enough to intervene efficiently.

Engine performance trends, component removal histories, corrosion findings, fault messages and inspection results can all contribute. Then, environmental data adds context. This, if repeated faults correlate with high humidity, maintenance personnel have an additional troubleshooting clue. If compressor deterioration correlates with operation from particular dusty airports, inspection or cleaning intervals can potentially be adjusted. If corrosion findings cluster around aircraft assigned to marine routes, corrosion-prevention activities can be concentrated accordingly. The overall result is that an aircraft effectively develops an environmental history alongside its conventional maintenance history.

People operate in the same environment

It is easy to concentrate entirely on what extreme environments do to aircraft. However, this somewhat simplifies the problem as they also affect the technicians maintaining them. Working in intense heat increases fatigue and dehydration risks, while severe cold reduces dexterity and can make detailed inspection difficult. Windblown dust affects visibility and cleanliness during maintenance while heavy rain can constrain outdoor work and complicate electrical troubleshooting. Human-factor consideration therefore should become part of environmental maintenance planning.

Organisations may need to change shift patterns, provide additional lighting

or shelter, modify task sequencing, allow equipment to stabilise thermally or move certain work into controlled environments. Thus, the quality of an inspection depends not only on the procedure but also on the conditions under which a technician must perform it.

Cleaning is maintenance

Perhaps one of the most underestimated lessons from extreme-environment operations is the importance of cleaning as a technical maintenance activity. Why? Because washing removes corrosive deposits, compressor cleaning can help address contamination. Cleaning landing gear facilitates proper inspection and reduces the presence of abrasive material, clearing drainage paths prevents trapped moisture, removing contamination from electrical and structural areas can prevent longer-term deterioration. However, it is important not to fall into the trap that more cleaning is automatically beneficial. Use of incorrect chemicals, excessive pressure, poorly controlled water application or inadequate drying can damage finishes, remove protective compounds or introduce moisture into sensitive areas. Cleaning procedures therefore need the same discipline as other maintenance tasks: approved materials, correct processes, appropriate intervals and proper documentation where required.

Building an environmentally aware maintenance program

The most effective approach is not simply to declare an aircraft as operating in a "severe environment." Maintenance planners

should identify the actual degradation mechanisms associated with the operation, which involves asking specific questions such as: where does contamination accumulate? Which components experience accelerated wear? Are corrosion findings increasing? Are particular faults seasonal? Do certain routes or bases correlate with increased component removals? Are filters reaching limits sooner than expected? Are drain paths frequently obstructed? Reliability data can then be used to test those assumptions.

The appropriate maintenance programme can evolve accordingly through appropriate inspections, cleaning schedules, corrosion-prevention measures, servicing requirements and reliability monitoring, while remaining within the applicable approved maintenance and manufacturer requirements. Of course, this approach also avoids unnecessary maintenance, because adding inspections indiscriminately can increase cost and aircraft downtime without necessarily improving reliability. One must not forget that the objective is targeted intervention based on actual exposure and evidence.

The environment leaves a maintenance signature

Aircraft may be designed to fly almost anywhere, but they never forget where they have been. In other words, microscopic erosion on compressor blades, contamination around landing gear, corrosion beneath a coating, moisture inside a connector or reduced battery performance in severe cold can all be signatures of the environments through which an aircraft has operated. Thus, for technicians, engineers and maintenance planners, recognising those signatures is becoming increasingly important.

The future of aircraft maintenance will undoubtedly involve more sensors, more health monitoring and more sophisticated analytics. Yet the underlying principle is much older and simpler: understand the conditions in which the machine operates, understand how those conditions affect its materials and systems, and inspect accordingly.

Flight hours may tell us how long an aircraft has operated while cycles may tell us how often it has taken off and landed. However, environmental exposure tells us something different.

It tells us **what the aircraft has been through.**



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Maintenance Mythbusters: “Composite Damage Is Always Visible”

This month's edition of Maintenance Mythbusters examines why, when it comes to composites, seeing is not necessarily believing.

By David Dundas

The increasing use of composite materials has proven to be one of the most significant developments in modern aircraft design. Offering considerable advantages in terms of weight, strength, corrosion resistance and efficiency, you will now find the use of composites throughout commercial and business aircraft, from fuselage and wing structures to control surfaces, fairings and interior components. Their growing presence, however, has also required MRO and their technicians to re-evaluate certain long-established assumptions about how structural damage can be identified.

One of these particularly persistent assumption is that damage serious enough to affect an aircraft component

will leave some obvious external evidence. With traditional metallic structures, dents, cracks, scratches or deformation can often provide an immediate indication that further investigation is required. The problem here is that composite structures do not always demonstrate the same symptoms or provide the same warning. By this we mean that an apparently undamaged surface can conceal problems within the layers beneath it, making inspection techniques, technician knowledge and adherence to approved maintenance procedures increasingly important. As composite aircraft continue to represent a larger proportion of the global fleet, understanding better how these materials respond to impact, stress and fatigue is becoming an essential maintenance skill.

The Misconception of “No Dent, No Problem”

As composite materials have become increasingly common in modern aircraft structures, maintenance practices have evolved alongside them. Composite fuselage sections, control surfaces, fairings, and interior structural elements now play a major role in both commercial and business aviation fleets. However, despite their widespread use, composites remain one of the most misunderstood materials in maintenance environments. Unfortunately, one of the most persistent misconceptions is the belief that composite damage is always visible. After all, the logic seems simple: if there is no dent, crack, or obvious deformation, the structure must be intact. However,



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in reality, composites behave very differently from traditional metallic structures, and some of the most serious damage can exist beneath the surface, leaving no clues on the surface relating to the trouble that lies beneath.

Composite Materials Fail Differently Than Metals

Traditional aluminium structures typically show visible indicators when damaged as impacts often leave dents, scratches, or permanent deformation that can be identified during inspection. Composite materials, however, respond differently. They are made of layered fibres which have been embedded in resin matrices, designed to distribute loads efficiently. The result of this is that when composites experience impact or stress, the damage may occur internally between layers rather than on the surface, resulting in delamination, matrix cracking, or fibre breakage that is not, externally, immediately apparent.

The result is that a composite panel may look perfectly normal while its internal structural integrity has been compromised. This fundamental difference is at the core of why the myth persists—and why it is particularly dangerous.

The Hidden Threat of Delamination

One of the most common forms of composite damage is delamination, where layers within the composite separate due to impact or fatigue. Delamination can significantly reduce strength and stiffness yet is so difficult to detect as it often produces little or no visible surface evidence. This is especially important in areas such as wing skins, fairings, and fuselage panels where surface appearance may not reflect underlying condition. Ground handling incidents, tool drops, hail strikes, or even minor contact with service equipment can introduce internal

damage that remains undetected unless proper inspection methods are applied. In simple terms, unlike metals, where damage often manifests outwardly, composites can conceal damage in the very layers that carry a structural load. MROs should therefore treat composite inspections with a different mindset: absence of visible damage is not proof of structural health.

Inspection Requires Specialised Techniques

Because composite damage can be hidden from view, visual inspection alone is consequently insufficient for many composite structures. Thus, modern maintenance programmes now rely on non-destructive testing techniques such as ultrasonic inspection, tap testing, thermography, and radiography to detect subsurface defects. These methods allow technicians to effectively identify delamination, voids, and internal



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cracking that would otherwise go unnoticed. Composite inspection is therefore not simply an extension of metallic inspection practices. It requires dedicated training, specialised equipment, and an understanding of composite failure modes.

Repair Complexity and Certification Requirements

Composite repair is also fundamentally different from repairs to metal structures. While metallic repairs often involve cutting, patching, and fastening, composite repairs require controlled material removal, layer rebuilding, curing processes, all performed under strict environmental conditions. Repairs must be performed in accordance with approved structural repair manuals and often require careful control of temperature, humidity, and bonding procedures. To a degree, this complexity reinforces why composite damage cannot be treated casually. A

missed defect can progress over time, and an improper repair can significantly compromise structural performance.

Operational Pressures and the Risk of Underestimating Damage

The myth that composite damage is always visible often persists because maintenance teams operate under operational pressure. In fast turnaround environments, there can be a temptation to rely on quick visual assessments. The truth is that composites demand a more cautious approach as a panel that appears intact after a minor impact will likely still require further evaluation. Underestimating composite damage not only increases safety risk but can also lead to more extensive repairs later if hidden defects grow. In other words, early detection is essential if you want to avoid situations where internal damage has the potential to become a major structural issue.

Conclusion: Composite Airworthiness Is Not Always Visible

The belief that composite damage is always visible is one of the most dangerous oversimplifications in modern aircraft maintenance. For sure composite materials have transformed aviation through weight savings and corrosion resistance, but they also introduce unique inspection and repair challenges. Internal damage such as delamination can exist without obvious surface signs, meaning that visual inspection alone cannot provide full assurance of structural integrity. Maintaining composite airworthiness requires specialised techniques, disciplined procedures, and an understanding that what matters most may lie beneath the surface as, in the world of composites, "looks fine" does not always mean "is fine," and effective maintenance depends on seeing beyond what the eye can detect.

PEOPLE

»»»»→ *on the move*



Jill Albertelli

Jill Albertelli has been named President of Pratt & Whitney, effective January 1, 2027, succeeding **Shane Eddy**, who plans to retire. Albertelli will report to RTX Chairman and CEO **Chris Calio**. She has more than 30 years of experience at Pratt & Whitney across engineering, manufacturing, quality, supply chain, commercial programmes, sales, maintenance and repair

operations, transformation and strategy. She currently leads Pratt & Whitney's Military Engines business, where she secured the company's sole-source propulsion position for the F-35 fighter programme, improved F135 engine delivery and quality performance, and expanded sustainment capacity. Eddy will remain with RTX through March 2027 as a special adviser to support the transition. He became President of Pratt & Whitney in 2022 after a more than 40-year career with the company, which began as a flight-line mechanic. During his tenure, Eddy oversaw a multi-year transformation of Pratt & Whitney and production, and sustainment increases for the Geared Turbofan and F135 engine programmes.



Jilinda Growley

Aviation Capital Group (ACG) has announced that **Jilinda Crowley** is becoming Executive Vice-President and Chief Financial Officer, effective immediately. Based at ACG's headquarters in Newport Beach, California, she will oversee the aircraft lessor's financial strategy and lead its finance team, including treasury, risk, tax, accounting, pricing and financial planning and analysis.

Crowley brings more than 20 years of aviation and aerospace finance experience to ACG. She spent 14 years in senior

finance positions at Rolls-Royce before taking CFO roles at aviation and aerospace companies including Electra Aero, magniX and Skydweller Aero. Crowley succeeds **Jaime Crear**, who had served as interim CFO alongside her role as Chief Administrative Officer. Crear will remain Chief Administrative Officer.



Sylvain Fagot

Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) has appointed **Sylvain Fagot** as Senior Vice President (SVP) Components at Air France Industries, effective October 1, 2026. Fagot succeeds **François Gueguen**, who is leaving AFI KLM E&M to become Executive Vice President Fleet, Engineering & Maintenance at Transavia France. Fagot returns

to Air France Industries after a career spanning more than two decades with the organisation, alongside senior technical and operational roles elsewhere in the Air France-KLM group. Most recently, he was responsible for Fleet, Engineering & Maintenance at Transavia France, overseeing the airline's technical operations. Before joining Transavia France, Fagot served as SVP Engineering & Maintenance at HOP! Air France, where he held responsibility for engineering and maintenance activities and developed broad experience in technical and operational leadership. Earlier in his career, Fagot spent more than 20 years at Air France Industries, taking on a series of management positions across the organisation. His roles gave him extensive experience in aircraft maintenance and engineering, as well as a detailed understanding of MRO operations and the requirements of airline customers. Fagot's career has therefore combined technical expertise with leadership experience on both the MRO and airline sides of the business. In his new role, he will focus on further developing Air France Industries' component capabilities and improving performance and service for customers.

PEOPLE

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Sanjay Sood

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AAR has named **Sanjay Sood** as Senior Vice-President and Chief Digital and Technology Officer, effective immediately. Sood will lead AAR's technology organisation, overseeing enterprise systems, infrastructure, cybersecurity, data and analytics, as well as the company's wider adoption of artificial intelligence and other technologies across its operations. He will report to

John M. Holmes, Chairman, President and Chief Executive Officer. Before joining AAR, Sood was Senior Vice-President and Chief Technology Officer at CDW, a leading multi-brand provider of information technology solutions. In this role, he modernised the company's platforms, data architecture and AI programmes, while managing the technical integration of several acquisitions. He previously held senior technology and product leadership roles at HERE Technologies, where he led global engineering teams and developed emerging products. Earlier in his career, Sood held leadership positions at YP, formerly AT&T Interactive, AllVoices and BuzzLabs.



Brian Rohloff

Textron Inc. has appointed **Brian Rohloff** as President and CEO of its Textron Aviation segment, effective August 31, 2026, as **Ron Draper** retires after more than 27 years with the company. Rohloff brings extensive experience across Textron Aviation, having held leadership roles spanning customer support, sales, supply chain and quality. He most recently served as Senior Vice President of

Customer Support, overseeing the company's global customer support operations. His previous positions include Vice President of Quality, Vice President of Sales, Senior Product

Director for the Citation XLS+ and Citation X, and Director of Paint Operations. Draper is retiring after eight years at the helm of Textron Aviation. His departure follows a more than 27-year career with Textron. Rohloff is a graduate of Wichita State University.



Harald Gloy (left) to succeed Soeren Stark (right) as CEO
© Lufthansa Technik

Harald Gloy will become Chief Executive Officer for Lufthansa Technik as of February 1, 2027, succeeding **Soeren Stark**, who is retiring. The company's Supervisory Board has appointed the engineering graduate to lead the global aircraft maintenance services provider for a five-year term. Gloy has served on LHT's Executive Board as Chief Operating Officer since 2022. He joined the Executive Board of Lufthansa Cargo AG as Chief Operating Officer in January 2019, taking on additional responsibilities as Chief Human Resources Officer and Labour Relations Director in 2021, returning to LHT's Executive Board in 2022 as Chief Operating Officer and Accountable Manager, with responsibility for all operational processes and IT. Gloy also oversaw human resources as Labour Relations Director until 2025.

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