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MRO

Management



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MORE THAN PARTS

There was a time when every discussion about the aerospace supply chain seemed to end with the same assumption: eventually, things would return to normal.

After attending the IATA World Maintenance & Engineering Symposium in Madrid recently, I'm no longer convinced that's how the industry sees it.

That's not to say anyone believes disruption has become acceptable. Far from it. But there does seem to be a growing recognition that waiting for a return to the way things once were is no longer a strategy. Instead, the conversation has shifted towards how organisations become more resilient, more adaptable and ultimately better prepared for whatever comes next.

For MRO providers, airlines and suppliers alike, resilience is no longer just about holding more stock or finding alternative sources. It's about better forecasting, stronger partnerships, improved repair capability, smarter use of data and making decisions earlier rather than later.

Perhaps that's why the supply chain now seems to find its way into almost every corner of our industry. Whether the subject is engine maintenance, hangar expansion, digital transformation, workforce planning or fleet growth, the same underlying question keeps emerging: how do we build operations that can continue to perform when uncertainty remains a constant?



“The challenges haven’t disappeared, but perhaps our expectations have changed”

The encouraging news is that the industry isn't standing still. Investment continues, new facilities are opening, technology is improving and collaboration is becoming more than just a well-used buzzword.

The challenges haven't disappeared, but perhaps our expectations have changed.

Success in MRO may no longer depend on waiting for stability to return. It may depend on learning how to thrive without it.

Craig Waters

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Winner

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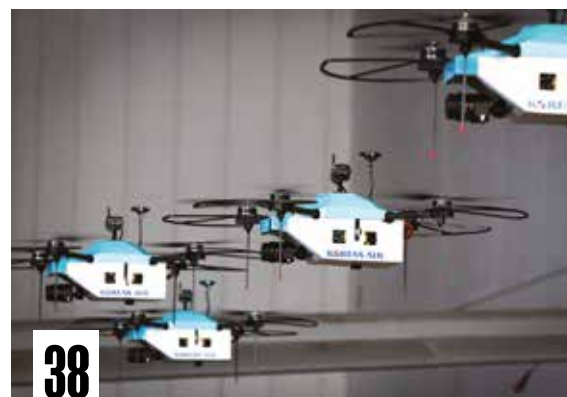
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Hangar Talk.

News from across the industry



Jurekilian/Adobe Stock

COMPONENT SUPPORT

AFI KLM E&M extends LOT component support deal to 2033

Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) and LOT Polish Airlines have signed an extension of their long-standing component support agreement for the airline's Boeing 737 fleet.

The renewed agreement expands coverage to a total of 31 Boeing 737 MAX aircraft and extends the partnership until 2033.

Through its dedicated Boeing 737NG/MAX component pool solution, AFI KLM E&M will continue to support LOT Polish Airlines' fleet

operations with reliable component availability, optimised logistics and high operational performance.

Marcel Kuijn, vice president sales Europe at AFI KLM E&M, said: "The decision to expand the scope of the contract and continue our collaboration until 2033 reflects the trust LOT places in our teams, expertise and component support solutions. We remain fully committed to supporting LOT's operational performance and fleet growth ambitions in the years ahead."

Dorota Dmuchowska, chief operating officer of LOT Polish Airlines, said:

"In an increasingly demanding environment for the aviation industry, strengthening cooperation with a trusted and experienced partner is more important than ever.

"Extending our long-term agreement with KLM enables us to build on a proven cooperation model and secure stable component support for our operations. We believe this collaboration will continue to support the safe, reliable and cost-effective performance of LOT's fleet, while creating a strong foundation for its continued growth."



Lufthansa Technick

HANGARS/FACILITIES

Lufthansa Technick breaks ground on 700-job Portugal facility

Lufthansa Technick has officially broken ground on its new 55,000 sqm maintenance facility in Santa Maria da Feira, south of Porto, as the company continues to expand its global MRO network.

The new site, operated by Lufthansa Technick Portugal, will specialise in the repair of engine parts and aircraft components. Established in 2024, the subsidiary is expected to create up to 700 highly skilled jobs, with operations scheduled to begin in 2028.

The groundbreaking ceremony was attended by Portuguese Prime

Minister Luís Montenegro alongside representatives from government, business and industry.

As part of the event, Lufthansa Technick Portugal and Portugal's trade and investment agency AICEP also signed their final agreement on investment incentives for economic development.

As part of the Lufthansa Group's three-digit million-euro investment in Portugal, the facility will expand Lufthansa Technick's component repair capabilities while strengthening its European MRO footprint.

HEAVY MAINTENANCE

Liebherr signs A320ceo/neo MRO agreement with Loong Air

Liebherr Aerospace and Transportation has announced it has signed a maintenance agreement with Chinese low-cost airline Loong Air to provide major repair and re-coring services for the heat transfer equipment on its A320ceo/neo fleet.

According to Liebherr Aerospace and Transportation, the re-coring, which includes full matrix

replacement, will be carried out at its site in Shanghai, Pudong (China) – its dedicated service centre for Chinese customers that has recently been extended.

In a post on social media, Liebherr Aerospace and Transportation said: "Thank you, Loong Air, for the trust you are placing in us. We look forward to a strong collaboration."



BRIEFS

- SriLankan Engineering has signed a new line maintenance agreement with Beijing Capital Airlines for all its flights to Sri Lanka.

- Base Maintenance Malaysia, part of the SIAEC Group, has completed its first Air India A350 maintenance check.

- EPCOR B.V. has signed a new long-term agreement for the support of Air Canada's GTC131-9A Auxiliary Power Unit (APU) fleet.

- FL Technics has acquired Sensus Aero, a company best known for Sensus MRO, a software platform for MRO organisations focused on base and heavy airframe maintenance operations.

- Global Airtech has signed an agreement to provide component availability support for BBN Airlines Thailand's A320 fleet.

- Liebherr Aerospace & Transportation has signed an agreement for the overhaul of nose landing gear systems on Finnair's Airbus A350 fleet.

- ExecuJet MRO Services Malaysia has announced that all six apprentices in its new aircraft maintenance programme have completed their training and accepted full-time roles at its Kuala Lumpur facility.

IN NUMBERS

55,000

Lufthansa Technik's new MRO Santa Maria da Feira facility will span 55,000 sqm

31

The number of Boeing 737 MAX aircraft supported in a new AFI KLM E&M and LOT Polish Airlines deal

\$360M

A new MRO facility at Van Don International Airport will cost US\$360 million



eric1207/vb/Adobe Stock

ENGINE MRO

MTU re-enters Taiwanese market with EVA Air engine MRO deal

Taiwan's EVA Air has awarded MTU Maintenance a long-term engine MRO contract covering the CFM56-5B engines powering its fleet of 17 Airbus A321-200 aircraft.

The agreement covers all shop visits, which will be carried out at MTU Maintenance Zhuhai, the company's specialist facility for narrowbody aircraft engines.

EVA Air will also have access to the engine lease pool of MTU Maintenance Lease Services if spare engine support is required during shop visits.

MTU Maintenance said the agreement marks its re-entry into the Taiwanese market, following its last contract with a Taiwanese carrier in 2016, and supports its ambition to strengthen its position as a leading engine MRO provider in the region.

The contract also marks the first time EVA Air has selected an independent company for comprehensive engine maintenance on exclusive terms. ●

HANGARS/FACILITIES

HAECO leads US\$360m Vietnam maintenance hub project

HAECO has announced plans to establish a joint venture with Sun Group, Toyota Tsusho and Japan Airlines to develop a new aircraft maintenance facility at Van Don International Airport.

The US\$360 million project forms part of HAECO's long-term growth strategy in Asia and is intended to strengthen maintenance capacity in Vietnam by introducing international standards, established operational systems and industry best practices to support both domestic and international airline customers.

Subject to government and regulatory approvals, the facility – expected to begin operating in late 2028 – will occupy approximately 170,000 sqm, making it one of the largest aircraft maintenance hangars in Vietnam.

The development will be centred on a four-bay widebody hangar, with the flexibility to accommodate narrowbody aircraft in the middle bays.

The facility is expected to create more than 1,000 highly skilled jobs and support the development of local aviation talent through structured training and capability-building programmes.



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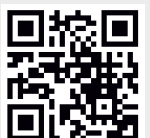
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In the Spotlight.

A snapshot of the latest innovations, partnerships
and people news across the global MRO sector



Boeing



APPROVALS

Airhub Aviation has received Boeing 737 MAX line maintenance approval for both MRO and CAMO operations from the Transport Competence Agency of the Republic of Lithuania. The approval marks the expansion of the company's maintenance organisation certificate and boosts its ability to support operators with 737 MAX fleets.



TRAINING & DEVELOPMENT

Iberia is recruiting EASA Part-66 B1 and B2 licensed certifying staff for its line maintenance teams to support continued fleet growth. Preference will be given to engineers with Airbus A320ceo/neo, A321XLR, A330 or A350 type ratings. Recruits will also receive training, digital tools and professional development opportunities.



DIGITALISATION

Aer Lingus has signed a multi-year agreement with AISmartPlan to implement AI-powered maintenance production planning. The platform automates planning by combining operational data to optimise maintenance schedules, match engineers with aircraft and tasks, and provide visual planning tools that help teams quickly adapt resources and operations. According to the companies, the platform progressed from proof of concept to a functioning operational solution in just three months.



PEOPLE NEWS

HAECO has made a series of senior leadership appointments across its global MRO business, naming Charles de Zoete as chief financial officer, George Edmunds as group director of component and engine services, Peter Murton (pictured above) as chief executive of HAESL, and Tom Bellamy as chief executive of HAECO Hong Kong, as it strengthens its leadership team to support future growth.



TRAINING & DEVELOPMENT

HAECO will work with the School of Mechanical Engineering at Hanoi University of Science and Technology to strengthen aviation education and talent development, supporting Vietnam's growing aviation sector by developing local skills.





Air India

^ **APU SERVICES**

Air India and Lufthansa Technik have concluded a multi-year contract covering MRO services for the auxiliary power units (APUs) on the Indian carrier's Airbus A350 fleet. Under the agreement, Lufthansa Technik will exclusively support 40 Honeywell HGT1700 APUs, with all work carried out at its specialised APU workshops in Hamburg, Germany.

^ **MERGERS & ACQUISITIONS**

Private equity and investment firm Rcapital has completed the acquisition of parts and accessories distributor Adams Aviation from Incora in a corporate carve-out transaction.

The existing management team will continue to lead the business, with Rcapital providing strategic and operational support to support future growth.



Caglan/Adobe Stock



^ **PEOPLE NEWS**

IAG's new engine MRO business, IAG Engine Tech, has appointed Max Schramm (pictured above) as chief executive as it scales its operations and expands its presence in the global MRO market. The appointment forms part of Iberia's Flight Plan 2030 strategy, with the new company created to support the growth of the group's engine maintenance capabilities.



TRENDING STATS

\$102.6 BILLION

The engine MRO market is set to grow from \$70.1 billion in 2026 to \$102.6 billion by 2036 (from Engine MRO feature, p.20)

\$4.84 BILLION

The SEA aircraft MRO market is vibrant, valued at \$4.84 billion in 2026 (from Region Outlook feature, p.28)

20

Korean Air's drone inspections can cut the time for widebody airframe imaging from 60 to 20 minutes (from Korean Air Q&A feature, p.38)

100

Bombardier has a wide network with more than 100 locations worldwide (from Business Jet MRO feature, p.46)

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Facility Map



R4



Are your standard parts acceptable?

Jason Dickstein examines the compliance challenges associated with standard parts

We've been seeing some issues arising around parts that are alleged to be standard parts but may not meet appropriate specifications. There appears to be heightened awareness about standard parts which will lead to greater scrutiny. This article discusses the history of standard parts, how they are defined, and some issues that are arising today about parts that are alleged to be standard parts but that may not be recognised as such under current law.

In aviation, standard parts are parts that are manufactured to a known standard. They represent an exception to the general rule that aircraft parts must be produced according to a government design and production approval; no approval is necessary for a manufacturer to produce standard parts that are intended to be installed on an aircraft.

History of the standard parts definition

In the 1990s, the Federal Aviation Administration (FAA) increased its enforcement of the Parts Manufacturer Approval (PMA) regulations and was requiring parts manufacturers to obtain FAA approval in the form of a PMA. Part of this effort included better defining the exceptions to the PMA regulations, like standard parts. While most aircraft parts needed to be approved using a PMA, TSOA or Production Certificate, standards parts did not need to be subject to FAA production approval.



“
Before installing alleged standard parts, you should be asking some basic questions
”

JASON DICKSTEIN

president, Washington
Aviation Group

A major influence on the FAA's standard parts definition was the pre-existing GSA definitions of standard parts. When the FAA was looking to improve its own definition, I raised this GSA definition as an effective model that would meet the FAA's needs, and it served as the template for the FAA's own published definitions. The purpose of the GSA definition was to permit standard parts to be produced and offered to the US government, so one of the key features was that a 'standard' had to be published and available to anyone as the basis for manufacturing.

In 1996 the FAA published a definition of 'standard' parts in AC 00-56D, but that definition largely tracked with the existing regulatory language concerning standard parts. In 1997, the FAA published an interpretation explaining that standards may include specifications that are limited to detailed performance criteria, complete testing procedures and uniform marking criteria. The example published with this interpretation was discrete electrical and electronic parts, including resistors, capacitors, diodes, transistors and nonprogrammable integrated circuits. If such parts are produced to known published standards, like IEEE standards, then they qualify to be standard parts. On the other hand, application-specific or programmable integrated circuits typically would not be considered standard parts under the 1997 guidance, because of their functional variances.

During the 1990s, Boeing lobbied the FAA to recognise Boeing proprietary standards as 'standards' for purposes of the exception to the PMA requirements. This would have allowed companies producing 'BAC' standards to sell them to the marketplace without a PMA. The FAA rejected this position and required parts made to proprietary standards (like BAC 'standards') to be produced under PMA when they were intended to be made for sale, for installation, on a type-certificated product (aircraft, engine or propeller). During this same time frame, the FAA also published three Technical Standards Orders

(TSOs) that were intended to provide some relief to this community, with new TSOs published for fasteners [TSO C-148], bearings [TSO C-149], and seals [TSO C-150a]. The TSOs did not relieve the manufacturers of the obligation to obtain FAA approval for these proprietary parts, but it provided an alternative path to obtaining FAA approval for such parts.

What is a standard part?

Today, FAA guidance explains that a known standard – one that supports a standard part – is a standard that is published, by the US government or by an industry standard-setting body. The standard must include design requirements, manufacturing requirements and uniform identification requirements. The standard must include all information necessary to produce and conform the part. The specification must be published and publicly available so that any party may manufacture the part.

Various FAA publications cite examples of sources of published standards, including:

- National Aerospace Standards (NAS)
- Air Force/Navy (AN) aeronautical standards
- Society of Automotive Engineers Aerospace Standards (AS)
- Military Standard (MS)
- American Electronics Association
- Joint Electron Device Engineering Council

- American National Standards Institute (ANSI)
- Institute of Electrical and Electronics Engineers (IEEE).

What about standard parts in the EU?

The European Union's (EU) corollary to the FAA is the European Union Aviation Safety Agency (EASA). EASA has a very similar definition of standard



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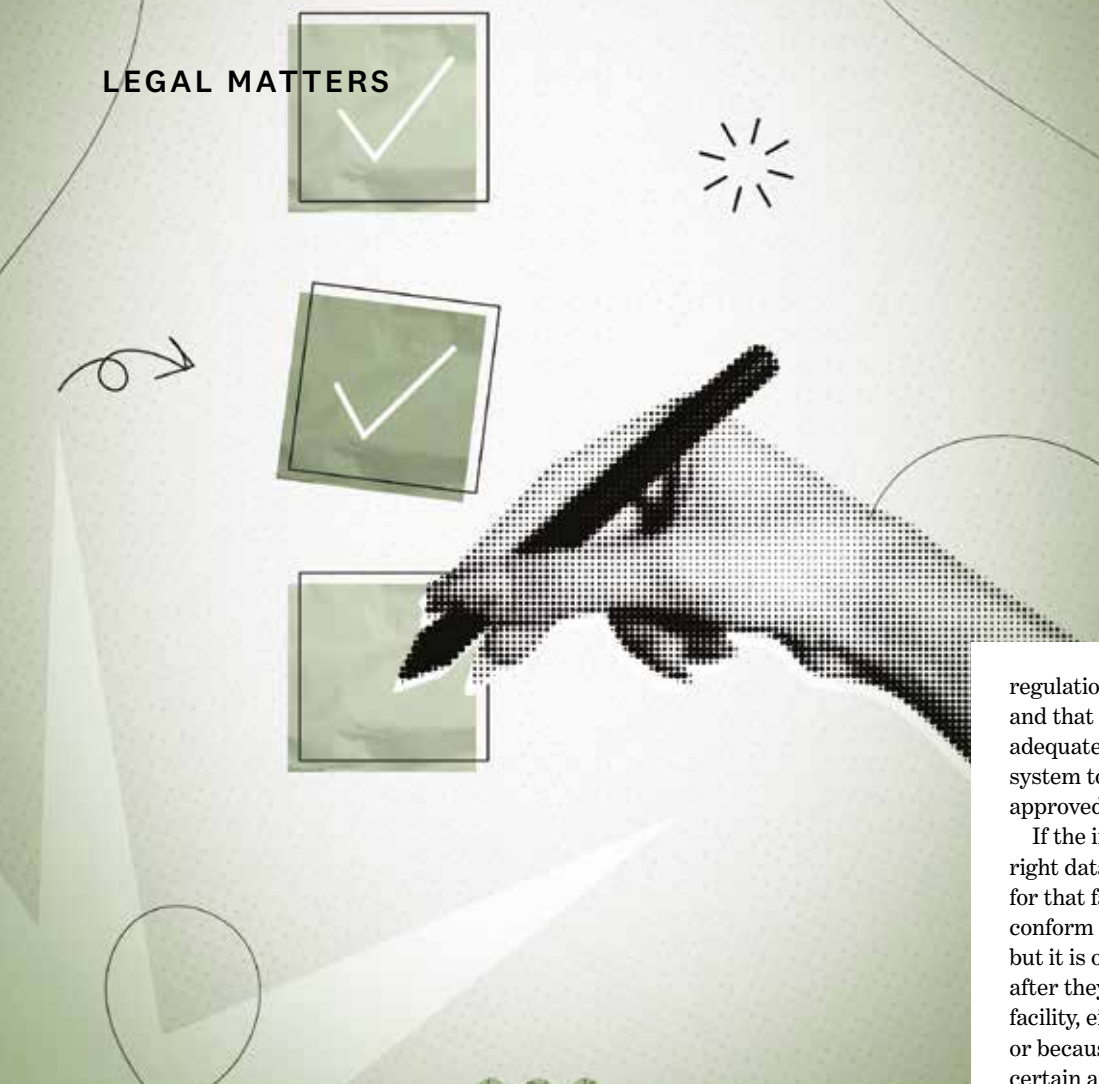
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“It is important for US installers to examine parts that are purported to be standard parts, to ensure that they are made to a recognised standard”

parts, with one small difference: a type certificate holder is permitted to declare its own standards. These standards remain under the complete control of the type certificate holder, and they are not published to the world for anyone to produce.

When called out by the type certificate holder, these EU proprietary parts are permitted for installation on aircraft registered in EU nations.

However, those same parts are only eligible for import into the US system (e.g. for installation on an N-registered aircraft) when they meet the requirements of the FAA-EASA Bilateral Technical Implementation Procedures (TIP). The TIP provisions permit aircraft parts produced by an EU

production organisation approval (POA) holder to enter the US as approved parts as long as they are accompanied by an EASA Form 1.

In practical terms, this means that such parts need to be processed through a POA – like the Airbus POA – or they need to be produced under some other European production authority. Otherwise, they are not recognised as airworthy when imported into the US.

There are some other options. A US manufacturer can rely on the European source as a supplier and then process them through a PMA (or through a TSOA where appropriate). To do this, though, the US manufacturer needs to demonstrate that the design complies with US airworthiness

regulations (to obtain design approval) and that the manufacturer has an adequate production quality assurance system to ensure compliance to the approved design.

If the installing repair station has the right data, then it also may be possible for that facility to inspect the parts to conform them to an approved design, but it is often difficult to do that on parts after they have left the manufacturer's facility, either because of a lack of data or because of the difficulty in assessing certain airworthiness conditions.

Practical advice

It is important for US installers to examine parts that are purported to be standard parts, to ensure that they are made to a recognised standard. Before installing alleged standard parts (and before accepting them in your receiving inspection programme) you should be asking some basic questions:

- Did the parts arrive with an airworthiness approval form (like an EASA Form 1 or an 8130-3 tag) or did the parts arrive with a certificate of conformity (C of C)?
- Does the C of C certify conformance to a standard?
- Does the C of C identify the standard?
- Does the identified standard qualify as a standard?
- Are the parts marked consistent with the standard?

If you are not satisfied with the answers to these questions, then it is possible that you may have parts that do not meet the FAA's standards for parts acceptable for installation on type certificated aircraft (such as standard parts). ●



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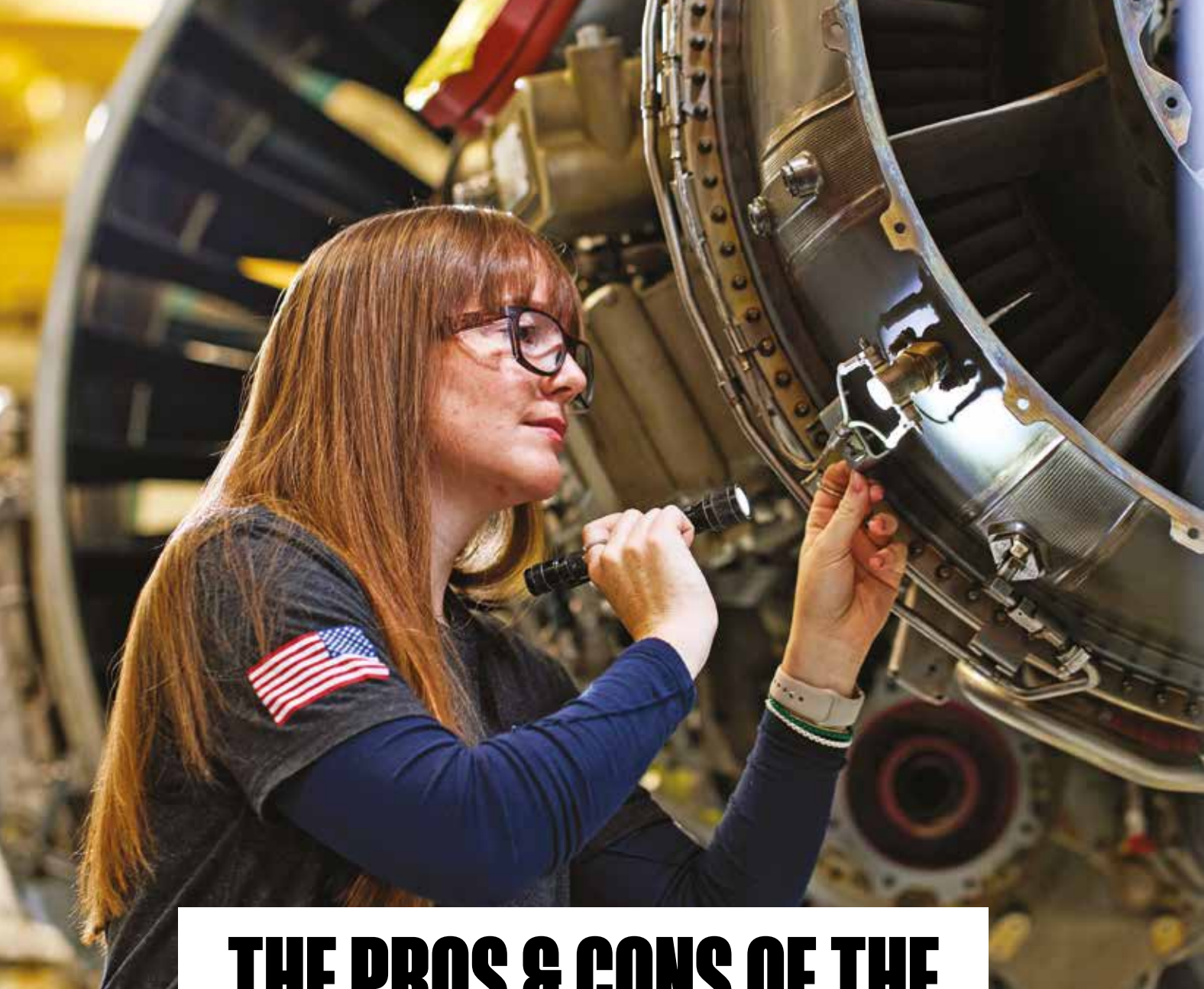
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THE PROS & CONS OF THE ENGINE MRO SUPER-CYCLE

Cyclical events have become structural, requiring more effort in dealing with them. **Kevin Rozario** reports

Choke points are now commonplace in the engine MRO business. According to reports from consultancies Oliver Wyman and Bain & Company, key concerns include severe parts shortages, especially hot-section and life-limited parts (LLPs); turnaround times (TATs) rocketing by 35% to 150%; the reliability of next-gen engines such as LEAP and GTF; a shortage of global shop

capacity; instability of supply chains; and continuing labour shortages.

MRO Management spoke to players in the aftermarket, both large and small, for insights on these pressing issues, and the wider scenario of the 'engine MRO super-cycle' that's requiring the industry to push beyond its design limits.

Many senior executives agree that the global engine MRO sector is suffering from a convergence of factors such

as deferred maintenance, ageing fleets and airlines rethinking their approaches to repair.

This is being described as a structural super-cycle that is reshaping the economics of aviation. What was once a cyclical, capacity-driven business has become a long-term constraint on global fleet availability, with ripple effects across airlines, lessors, OEMs and independent shops.

◀ Checks on a PW1100G-JM Geared Turbofan (GTF) engine by Pratt & Whitney at the company's West Palm Beach engine centre

Engine MRO is the largest segment in the aviation MRO market and is set to grow from \$70.1 billion in 2026 to \$102.6 billion by 2036, according to Oliver Wyman's latest MRO forecast. But industry leaders agree that the system is overloaded, and the pressures will intensify through 2027. A wave of innovation – from predictive maintenance and robotics to teardown-led material strategies and new repair capabilities – are, however, helping to redefine how MROs respond.

Engine volumes the system 'wasn't designed to absorb'

The most consistent message from respondents is that the surge in engine shop visits is not a temporary spike but a more long-term imbalance resulting in a system operating beyond its intended limits.



"ENGINE MRO HAS BECOME ONE OF THE BIGGEST CONSTRAINTS ON FLEET AVAILABILITY"

Simon Bayliss, chief operating officer, AerFin

Simon Bayliss, chief operating officer at AerFin, captures the shift bluntly: "This is no longer a cyclical challenge that will ease over time – it's a structural issue for the industry. Convergent issues have 'created a level of demand that the industry simply wasn't designed to absorb.'"

Bayliss adds: "Engine MRO has become one of the biggest constraints on fleet availability. What was once considered primarily a technical challenge now has a direct commercial impact across the aviation ecosystem, affecting airlines, lessors and operators alike."

This is echoed by MTU Maintenance executive vice president for MRO operations, Jaap Beijer. He tells *MRO Management*: "We would not say supply chains have fully normalised... we are still operating in a constrained environment – particularly when it comes to engines, materials and parts availability."

Pratt & Whitney, with 21 global maintenance facilities, is facing acute next-gen engine pressures and is scaling aggressively to get on top of the issue. Rob Griffiths, senior vice president for commercial engine operations,

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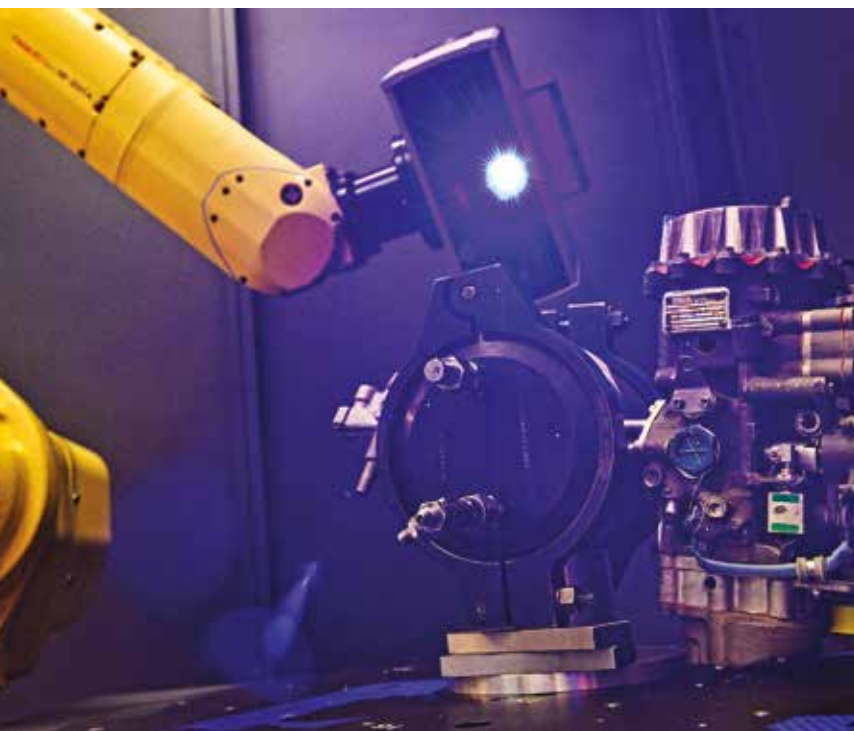
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comments: “GTF MRO output was up 26% in 2025 (vs 2024), and we’re positioned to grow at a similar level in 2026.” In April, the company announced a \$100 million investment across three MRO sites in Texas, Florida and Arkansas to enhance efficiencies.

Supply chains - now permanently tight

One phrase that appears to define supply chain woes is ‘the new normal’, even though it is not particularly welcome. Bayliss says: “I don’t necessarily see the supply chain as either stabilising or deteriorating. This is simply the operating environment we’re working in today.”



“WE ARE STILL OPERATING IN A CONSTRAINED ENVIRONMENT – PARTICULARLY WHEN IT COMES TO ENGINES, MATERIALS AND PARTS AVAILABILITY”

Jaap Beijer, executive vice president for MRO operations, MTU Maintenance

Jelle Menges, head of strategy, innovation and communication at Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) agrees and notes that while conditions have not worsened recently, they are far from healthy. He tells *MRO Management*: “We have not seen any meaningful improvement... and the situation in the Middle East could pose an additional risk, as military demand for raw materials may increasingly compete with civil aviation.” The challenges affect both MRO and airline operations with a focus on repairing rather than replacing.

Magnetic MRO’s supply chain manager, Jana Toompuu, is even more direct: “Uncertainty has become the new normal in the supply chain, so we focus on working with partners who can adapt quickly and on maintaining flexibility in our processes to ensure efficient operations.”

Dag Johnsen, chief operating officer at Aero Norway (an ITP Aero company), sees no easing in sight for supply chains, particularly OEM components. He comments: “This is compounded by difficulties sourcing the right used serviceable material (USM). Some parts, such as 9/10/11,000 cycle core LLPs, are very attractive and the market is competitive. We are proactively aligning

with parts brokers, and teardown shops of primarily CFM56-5b/-7b LLPs to secure supplies. It is essential to be able to identify the right parts and to move quickly.”

The result is a market where engines are queuing, TATs are getting longer, and operators are increasingly forced into life-extension strategies. Mitigations vary considerably: MTU Maintenance is expanding in-house repair capability and harvesting material from phase-out engines – a strategy increasingly common across the sector.

Pratt & Whitney points to massive upstream investment: \$200 million for a seventh isothermal forging press, and \$100 million ploughed into Poland to expand production capacity. These projects, operational by 2028, aim to increase output of critical rotating parts by 30%.

Technology is helping, but not yet transformational

Artificial intelligence (AI), robotics, and digital twins are often touted as the future of MRO, but respondents

are pragmatic: technology is helping, for example by improving planning and executing maintenance, but it does not solve the physical bottlenecks.

MTU Maintenance uses AI-assisted fleet management and engine-trend monitoring to tailor worksopes and avoid unnecessary downtime. Beijer explains: “The real value comes from linking insight to action... whether by adjusting the workscope, planning a shorter shop visit, or supporting operations with a leased spare engine.”

For AFI KLM E&M, its Prognos predictive maintenance platform is now in its tenth year, and that predictability is increasingly valuable. Menges notes: “Prognos helps anticipate and prevent unexpected technical failures before they affect flight operations, thus improving reliability and reducing operational disruption for our customers.”

In robotics, Pratt & Whitney's Singapore facility, Eagle Services Asia, is a standout example. According to Griffiths, robotics assemble high-pressure compressor rotors

1. AFI KLM E&M component APU Amsterdam
2. AFI KLM E&M operates a major MRO network at Paris-Charles de Gaulle (CDG), servicing CFM LEAP-1A and LEAP-1B engines

\$200 million

Pratt & Whitney points to massive upstream investment: \$200 million for a seventh isothermal forging press, and \$100 million ploughed into Poland to expand production capacity

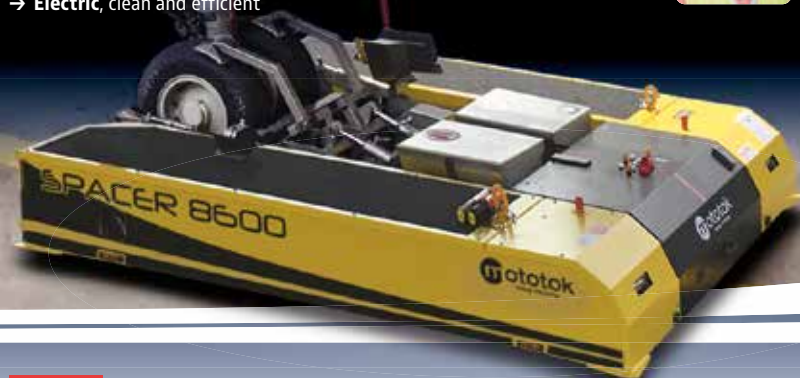
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“delivering 100% first pass yield and reducing assembly time by 50%.” This type of investment has supported an 80% increase in output at the facility over the past two years.

Aero Norway is also researching and investing in robotic technologies in line with OEM requests. This includes NDT procedures, and capabilities such as shot-peening – a task normally undertaken manually by experienced technicians – now requiring ultrasonic robotic arms for consistent precision. On the AI front, Johnsen cautions that regulatory conservatism will slow adoption: “We anticipate that widespread utilisation will take time.”



“THE SITUATION IN THE MIDDLE EAST COULD POSE AN ADDITIONAL RISK, AS MILITARY DEMAND FOR RAW MATERIALS MAY INCREASINGLY COMPETE WITH CIVIL AVIATION”

Jelle Menges, head of strategy, innovation and communication, AFI KLM E&M

At AerFin, Bayliss says: “The direction of travel is undoubtedly positive. Technologies such as AI, predictive maintenance and advanced analytics are delivering meaningful improvements in planning, visibility and asset utilisation. But they cannot create additional repair capacity where that capacity simply doesn’t exist.”

So, while digital tools are making a measurable difference, the consensus is that technology is an enabler, not a saviour – at least not yet.

Solid demand and a shift towards integration

Every respondent expects strong, sustained demand through 2026 and 2027. Further ahead, Oliver Wyman puts engine MRO growth in the decade to 2036 at 3.3%, faster than the wider MRO market. The consultancy states: “The super-cycle is good for MROs, but global market capacity, particularly for engines, is tight and will continue to be constrained over the next few years.” Bayliss confirms this view: “We remain firmly within an MRO super-cycle... demand is likely to continue outpacing available capacity through 2027.”

Beijer at MTU sees similar momentum across GTF, V2500 and CFM56 programmes, with LEAP and

GEnx capabilities expanding rapidly while Aero Norway anticipates a shift from life-extension repairs in 2026 to heavy maintenance in 2027. “Operators have been cutting back on heavy engine maintenance, but that cannot go on forever,” says Johnsen.

Magnetic Group’s commercial director, Laura Roke, highlights the extraordinary load in the CFM56 market: “Industry estimates indicate around 2,300 CFM56 engine shop visits will need to be performed by the end of 2027 (and) up to 10,000 overhauls and major maintenance events are expected to be required by 2030,” she says. Head of Magnetic Engines, Filip Stanisic, adds: “Strong demand for CFM56 family engine quick fixes, hospital repairs, and modular exchanges are expected to continue, driven in part by MRO providers increasingly shifting capacity towards heavier LEAP engine repairs. As a result, operators will seek flexible solutions that minimise downtime and extend the operational life of existing assets.”

In a pressurised market, integration across multiple segments is likely to be a competitive differentiator that offers stability. “Organisations that can operate effectively across trading, MRO and material solutions will be best positioned to create value,” believes Bayliss. MTU’s Beijer adds: “Not every engine event requires the same solution... the most important thing is having options.” That often comes through collaboration. In the current market, Menges describes predictability as “a strategic asset,” while Johnsen and Roke see material scarcity as reshaping market behaviour.

Without doubt, engine MRO is undergoing a major transformation as the old cyclical model disappears. While the pressures of capacity constraints, supply-chain fragility, labour shortages and next-gen engine durability remain, data-driven innovation is helping. And it looks like a more capital-intensive, integrated, and cooperative approach – with a high degree of flexible – will define the winners. ●

1. The MTU Maintenance DAT (Engine Technician) training programme is a 6-week compact course designed to train prospective engine experts and specialists
2. Teamwork at Aero Norway

3.3%

Oliver Wyman puts engine MRO growth in the decade to 2036 at 3.3% – faster than the wider MRO market

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FASTER DATA, BETTER DECISIONS

Avionica's **Edward Gorman** says that the biggest flight data problem isn't collection. It's decision speed

For years, the aviation industry has focused on collecting more flight data. We've invested in better recorders, expanded FOQA programmes and increased aircraft connectivity. Yet one challenge remains surprisingly common: operators still struggle to turn data into timely operational decisions.

The issue is no longer whether airlines have enough information. Most fleets generate an extraordinary amount of data during every flight. The real question is how quickly that information reaches the people who can act on it.

This shift matters because operational value declines rapidly with time. A maintenance trend identified two weeks after a flight may be interesting. The same trend identified before the aircraft's next departure can prevent delays, improve maintenance planning and reduce unnecessary troubleshooting. Speed transforms data from historical reporting into an operational tactical tool.

Too often, discussions around flight data focus on analytics platforms or artificial intelligence (AI). Those technologies have an important role, but

they cannot compensate for inconsistent data capture, delayed retrieval, or disconnected workflows. Sophisticated analytics built on incomplete or outdated information simply produce more sophisticated delays.



“Faster access to reliable flight data supports more accurate maintenance planning”

EDWARD GORMAN

vice president - engineering, Avionica

The operators seeing the greatest value from flight data share a different mindset. They treat data as operational infrastructure rather than an engineering byproduct. That means ensuring information is captured consistently, delivered automatically, validated for quality and integrated into everyday decision-making across maintenance, flight operations, safety and engineering.

The benefits extend well beyond compliance. Faster access to reliable flight data supports more accurate maintenance planning, improves fuel efficiency initiatives, reduces repetitive troubleshooting and enables operational teams to respond before small issues become expensive disruptions. Just as importantly, it creates a common operational picture that helps different departments work from the same facts instead of separate assumptions.

As aircraft become increasingly connected, the conversation should move beyond how much data we collect and toward how effectively we use it. Connectivity alone is not the destination. The competitive advantage comes from reducing the time between an event occurring on the aircraft and an informed decision being made on the ground.

The next generation of high-performing flight data programmes will not be defined by the volume of information they store. They will be defined by how quickly that information drives action.

In an industry where every minute matters, reducing decision latency may prove to be one of the most valuable operational improvements an airline can make. ●



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Emmanouil Nanos, Reliability and Maintenance Programme Engineer, Aegean Airlines



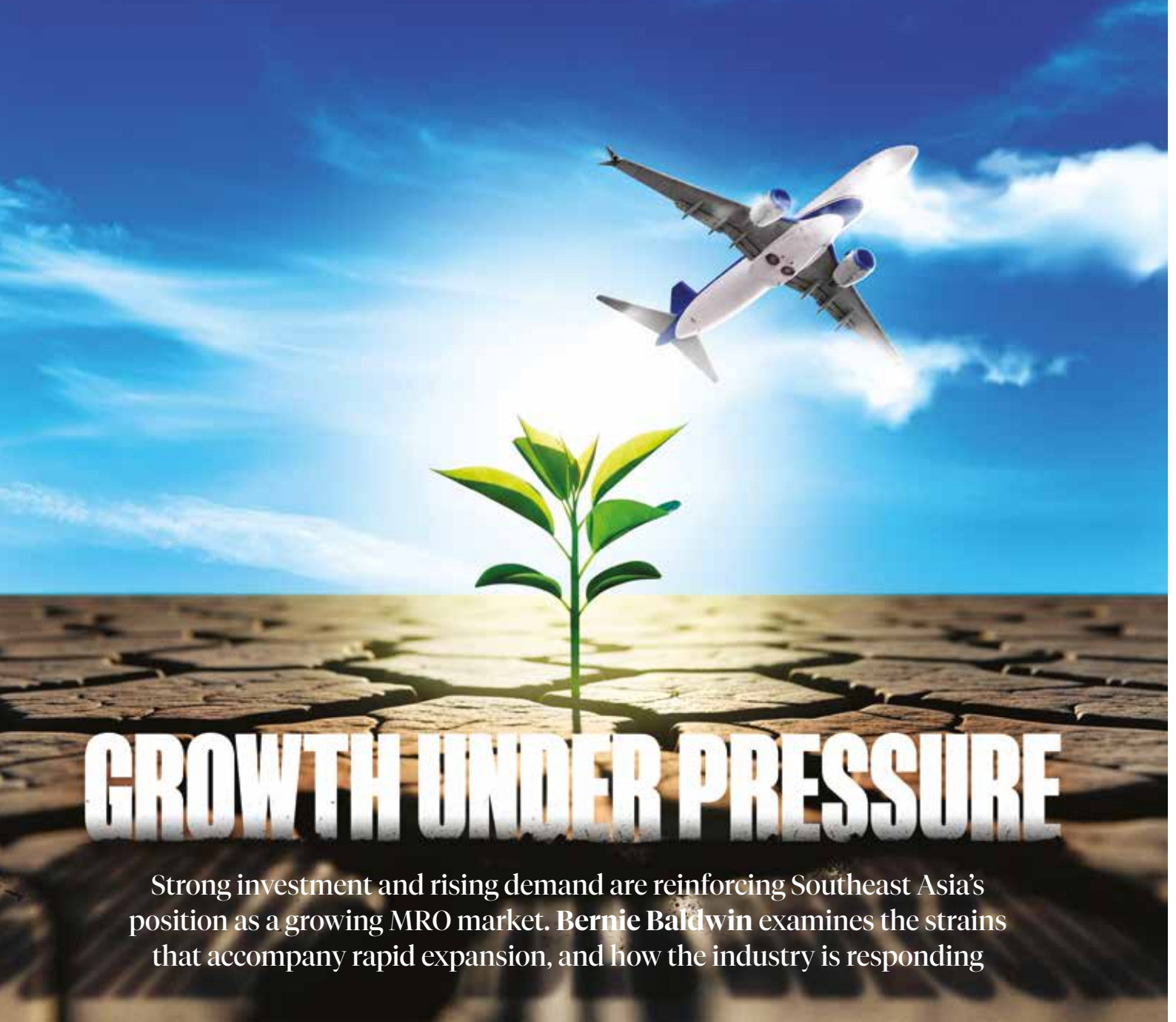
"Thank you to the PAM Europe team for fostering a collaborative environment and insightful exchanges on the digital transformation of our sector. These discussions and case studies highlight just how crucial innovation and teamwork are to advancing predictive technologies in aviation."

Mike Roemer, Director, Digital Fleet Management, United Airlines



"This year's discussions offered a sharp, practical look at the real predictive maintenance journey - not from theory, but directly from the experiences of operators like Ryanair, easyJet, Delta Air Lines, United Airlines, Vueling Airlines, Aer Lingus, British Airways and Condor Flugdienst GmbH."

Amanjot Singh Bhambra, Aircraft Systems Specialist, Wizzair UK



GROWTH UNDER PRESSURE

Strong investment and rising demand are reinforcing Southeast Asia's position as a growing MRO market. Bernie Baldwin examines the strains that accompany rapid expansion, and how the industry is responding

A quick internet search for Southeast Asia (SEA) will explain that the sub-region of the continent of Asia comprises 11 countries – Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Vietnam – and has a population of approximately 676 million people. With increasing disposable income across SEA, its aviation market continues to grow as ever more business and tourism is done across its considerable expanse.

The growing numbers of aircraft based in SEA means a concomitant increase in MRO. Saravanan Rajarajan, assistant vice president and head of consulting – aviation, aerospace and defence at Ramco Systems, has been observing the market, its current status and which MRO segments are predominant.

Vibrant and active

“The SEA aircraft MRO market is exceptionally vibrant, valued at \$4.84 billion in 2026 and growing at an aggressive 10.58% CAGR toward \$8 billion by 2031, according to Mordor Intelligence,” Rajarajan notes. “The region operates with extreme asset utilisation due to surging passenger demand and historical backlogs in new aircraft.”

“The transition from CFM56 and V2500 fleets to LEAP-1A/1B and PW1100G GTF engines is creating a dual-track workload: heavy shop visits on the legacy fleet running in parallel with an emerging LEAP aftermarket that is still building momentum,” he adds. “Component MRO is the fastest-growing segment, driven by avionics complexity and the fact that parts scarcity is pushing operators toward repair-versus-replace decisions they would not previously have made.”

Illustration by Phil Couzens

“Airframe MRO is equally active, driven by aging commercial fleets, with leased variants across the region averaging 18 to 24 years and a structural rise in passenger-to-freighter conversions as e-commerce cargo demand reshapes the Southeast Asian aviation economy,” Rajarajan reports.

With the current scenario assessed, Rajarajan turns to how the market may progress in the near future. “The outlook for the next 12 to 18 months is strong on demand but constrained on capacity,” he explains. “Asia-Pacific airlines posted the fastest international traffic growth of any region in 2025. That sustained utilisation means shop visit intervals are compressing, and line maintenance demand is rising.

“In response, airlines are moving to insulate themselves from third-party vendor delays by expanding captive MRO operations. Singapore continues to anchor the region as its premium aerospace hub, with ST Engineering aggressively expanding LEAP engine capability. At the same time, Indonesia, Malaysia and Thailand are emerging as genuinely cost-competitive alternatives, with significant infrastructure investments and joint ventures narrowing the capability gap with the traditional hub.”

Rajarajan continues: “Vietnam is also entering the frame, with a planned MRO complex at Van Don representing one of the most significant greenfield MRO commitments in the region. For the next 18 months, the market will be defined by whoever can bring qualified capacity online fastest, and the competitive geography of Southeast Asia MRO is shifting as a result.”

Mahesh Kumar, chief executive of Asia Digital Engineering (ADE), says he is seeing airlines increasingly advancing maintenance schedules to ensure fleet readiness amid aircraft delivery delays and ongoing supply chain constraints, thus

driving healthy demand across the MRO sector. “The region has also emerged as a leading MRO hub, combining a skilled workforce, expanding technical capabilities, modern facilities and strategic connectivity,” he comments. “As airlines seek to maximise aircraft availability while managing costs, they are increasingly looking to Southeast Asia for maintenance solutions that offer quality, efficiency, flexibility and competitive turnaround times.”

ADE too is currently focusing on airframe and engine MRO, as well as component workshops. “We are seeing strong demand across these segments as airlines increasingly seek integrated maintenance solutions that improve aircraft availability, reduced turnaround times (TAT) and enhanced operational reliability,” explains Kumar. “This is reflected in our recent US\$100 million financing facility, which will be used to expand our capabilities across airframe maintenance, engine services, component workshops and supporting infrastructure, including the construction of a third hangar at Kuala Lumpur International Airport.”

Like Rajarajan, Kumar believes the outlook remains very positive. “We expect continued growth across base maintenance, line maintenance and specialised repair services, alongside greater investment in digitalisation, predictive maintenance and workforce development to address capacity constraints,” he forecasts.

“MRO providers are also expanding capabilities for next-generation aircraft. At ADE, we are preparing for the Airbus A220 and exploring expansion opportunities beyond Malaysia, reflecting a broader trend of aligning capacity with future fleet growth,” Kumar reveals.

Kevin Chow, president of commercial aerospace for ST Engineering, also sees the



▲ Mahesh Kumar, chief executive, Asia Digital Engineering (ADE)

“AS AIRLINES SEEK TO MAXIMISE AIRCRAFT AVAILABILITY WHILE MANAGING COSTS, THEY ARE INCREASINGLY LOOKING TO SOUTHEAST ASIA FOR MAINTENANCE SOLUTIONS THAT OFFER QUALITY, EFFICIENCY, FLEXIBILITY AND COMPETITIVE TURNAROUND TIMES”

Mahesh Kumar, chief executive, Asia Digital Engineering (ADE)



▲ ST Engineering's visual evaluation technology solution at its MRO facility in Singapore

market as robust and highlights engine MRO as experiencing strong growth. "This is especially so for LEAP engines, where demand is outpacing global repair capacity due to rapid fleet expansion and increasing shop visits," he states, adding that ST Engineering is well-positioned to support LEAP operators in the region and beyond.

Chow adds: "At the same time, airframe MRO demand remains healthy as older aircraft stay in service longer than originally planned. That said, the market outlook should be viewed with some balance. While maintenance demand is expected to stay elevated over the next 12 to 18 months, airlines continue to face pressure from high fuel prices, supply chain constraints and cost inflation, which could affect profitability and fleet planning decisions."

Chow continues: "Overall, however, we expect MRO demand to remain resilient. In anticipation of sustained long-term demand, ST Engineering has been growing its MRO capacity in Asia-Pacific. More hangars will progressively come online at our airframe MRO facilities in Ezhou, China and Singapore; in engine MRO, we are increasing capacity to support over 400 LEAP and CFM56 engines annually by 2027."

Under pressure

Across the world, supply chain problems have been prevalent in recent years. Current geopolitical unrest (Ukraine, Middle East, US tariffs and so on) is likely to affect it further.

"While conditions have improved from the peak of the pandemic disruptions, there remain, to some extent, challenges in the supply chain environment in Southeast Asia," says Chow. "This reflects many of the broader pressures facing the global MRO industry, as it continues to grapple with parts shortages, longer lead times, labour constraints and uncertainty arising from tariffs and trade policies. More recently, geopolitical tensions have added further pressure on logistics networks, operating costs and market stability."

Ramco's Rajarajan also feels that the Middle East conflict and ongoing Red Sea maritime disruptions have added a further layer of cost pressure. "Critical aero components sourced from European OEMs, which would ordinarily move by sea freight, are increasingly being shifted to air freight to meet induction deadlines, inflating logistics costs and extending transit timelines that were already stretched," he observes.

Rajarajan adds: "Based on industry assessments, US tariffs introduced in 2025 added an estimated 12-18% to the landed cost of key aero components. The threat of further tariff escalation on raw metals or high-tech dual-use components is a live concern for independent SEA MRO shops."

Rajarajan continues: "The geopolitical risks compound the structural ones. Russia's conflict with Ukraine severed a titanium supply line the aerospace industry had long taken for granted, and that gap has never been fully closed. China now controls the dominant share of global titanium supply, and rhenium – the material critical to HPT blade alloys – faces the same geographic concentration. The result is persistent scarcity in raw forgings and engine rotating parts, with lead times that show no sign of normalising."

"The cumulative weight of all these pressures on an already tight supply chain is real. SEA operators, particularly the LCC-heavy fleets of Indonesia, Vietnam, Thailand and the Philippines that run lean balance sheets, are absorbing higher leasing premiums for spare engines, extended aircraft-on-ground situations, and growing inventory holding costs that were not in



▲ Saravanan Rajarajan, assistant vice president and head of consulting – aviation, aerospace and defence, Ramco Systems

"ALONGSIDE REPAIR DEVELOPMENT, AI ADOPTION IS RESHAPING HOW MROS ACROSS SOUTHEAST ASIA MANAGE EVERY LAYER OF THEIR OPERATION"

Saravanan Rajarajan, assistant vice president and head of consulting – aviation, aerospace and defence, Ramco Systems



their original maintenance budgets,” Rajarajan notes. “The region’s more progressive MROs are responding by building buffer stocks of critical rotables, locking in power-by-the-hour agreements with OEMs for parts priority, and investing in in-region repair capabilities to reduce dependence on constrained new-part supply, a strategic shift that is as much about supply chain resilience as it is about cost.”

ADE’s Kumar identifies many of the same supply chain challenges. “Geopolitical tensions, shifting trade policies, export control restrictions and tariff uncertainties continue to disrupt logistics routes and procurement flows, often translating into higher costs and longer TATs,” he says. “In response, the industry

has become more resilient, with airlines and MRO providers diversifying suppliers, building strategic inventories, and expanding regional repair capabilities.”

Kumar adds: “At ADE, our digital marketplace Aerotrade also supports this shift by improving transparency and access to parts, helping to streamline procurement and strengthen supply chain efficiency. With its new RFQ (request-for-quotes) feature, Aerotrade further enables buyers to buy parts more efficiently, and make faster, more informed sourcing decisions. For Southeast Asia, this is both a challenge and an opportunity, as the region continues to position itself as a key global MRO hub, with growing investment in localised capabilities that reduce reliance on long and complex global supply chains.”

Innovative opportunities

Supply chain challenges have had an effect elsewhere too. According to Kumar, supply chain constraints have been a key catalyst in accelerating innovation in aircraft repairs. “The industry is shifting from a replace-and-discard mindset to a repair-and-reuse approach, as limited parts availability and longer lead-times make approved repair solutions increasingly critical,” he explains.

◀ Asia Digital Engineering (ADE) has secured a US\$100 million financing facility from QNB Group to support its continued expansion and capacity growth

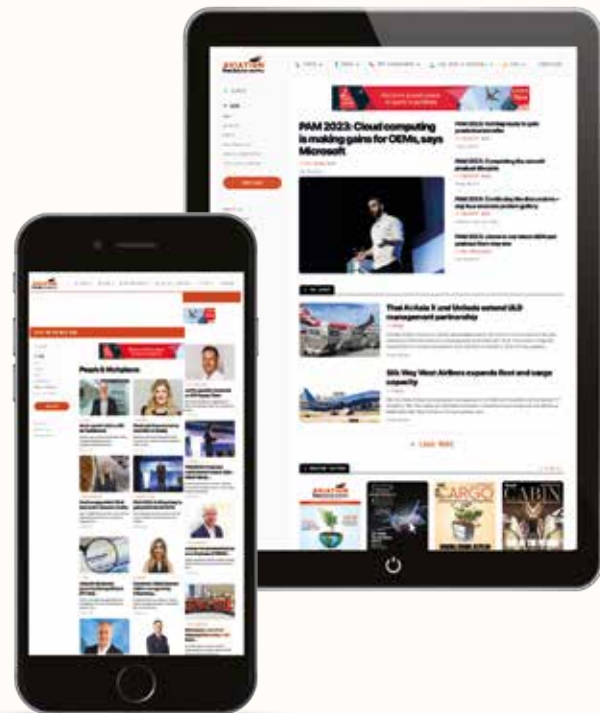
12-18%

US tariffs introduced in 2025 added an estimated 12-18% to the landed cost of key aerospace components, and further trade measures could place additional pressure on Southeast Asia’s independent MRO sector

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▲ In February 2026, ST Engineering's commercial aerospace business agreed an engine MRO deal with Xiamen Airlines to support its CFM LEAP-1A engines



▲ Kevin Chow, president of commercial aerospace, ST Engineering

"This has driven greater investment in advanced repair development, additive manufacturing, digital inspection, specialised component capabilities, and the utilisation of AI to ensure more accurate defect troubleshooting and material forecasting, helping airlines maintain fleet availability while reducing cost and turnaround time," Kumar adds. "What began as a supply chain response has now become a strategic advantage."

ST Engineering's Chow also sees trends in new repairs driven by supply chain issues. "There is growing adoption of digital and advanced repair technologies to improve productivity, reduce TAT and address ongoing supply chain and labour constraints," he declares. "Predictive maintenance will become increasingly common, helping operators optimise maintenance schedules, improve reliability and deploy manpower more efficiently. Automation and robotics are also gaining traction, particularly for repetitive inspection and repair tasks, improving consistency, quality and safety while allowing technicians to focus on higher-value work."

ST Engineering has already embedded these technologies across its MRO operations. Chow provides an example. "A visual evaluation technology solution uses a camera mounted on a robotic arm and AI technology to capture detailed images of the engine's exterior for initial inspection, replacing the need for extensive manual photo-taking and part accountability, while an automated picking and screening sorter autonomously segregates engine parts by quality for repair," he explains.

"For efficient planning and improved schedule quality, we are developing a production planning control system, an AI-driven global scheduling platform that automates and suggests the most optimal utilisation of machinery, manpower and inventory stock."

Ramco's Rajarajan agrees that supply chain pressure has been a major accelerant for repair development. "When new OEM parts are unavailable or carry 12-month lead times, operators and MROs are left with two choices – lease capacity at significant cost or develop a repair to restore the part. That second option is driving a wave of investment," he elaborates.

"Alongside repair development, AI adoption is reshaping how MROs across Southeast Asia manage every layer of their operation. The direction of travel is toward end-to-end digital operations, where maintenance planning, parts availability, and shop floor execution are managed through a single connected intelligence layer rather than siloed systems," Rajarajan remarks.

He adds: "ST Engineering's MoU with Ramco Systems is a concrete example of this shift, embedding agentic AI and advanced MRO platform capability directly into one of the region's largest engine and airframe operations, with the goal of driving measurable TAT reduction and operational efficiency at scale."

With the smart investments and shrewd operations mentioned, the MRO industry in Southeast Asia looks set to flourish for the foreseeable future. ●

"AUTOMATION AND ROBOTICS ARE ALSO GAINING TRACTION, PARTICULARLY FOR REPETITIVE INSPECTION AND REPAIR TASKS, IMPROVING CONSISTENCY, QUALITY AND SAFETY WHILE ALLOWING TECHNICIANS TO FOCUS ON HIGHER-VALUE WORK"

Kevin Chow, president of commercial aerospace, ST Engineering



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DELIVERING REAL VALUE

In our first PAM Conference webinar, Vervon and KLM Cityhopper showcased how using historical and operational aircraft data more intelligently can significantly improve the prediction of potential OAGs and help address repeat parts failures

Of all the challenges faced by airlines and MROs in the aircraft maintenance sector today, one of the most difficult to solve is the problem of data fragmentation.

April's PAM Conference webinar, moderated by ABN's Lee Hayhurst, heard from event sponsor Vervon about how its technology platform is bringing operational and historical data sets together, giving their MRO and airline maintenance team clients a fuller picture of aircraft components and parts so they can take a smarter approach to their operations.

Solving a big problem

Fedor Gorin, vice president of engineering at Vervon, explained how data ownership remains a major issue within the industry, despite the clear advantages of collaboration. He said the management of parts and decision-making around whether to replace or repair is a fundamental challenge that is made harder when data is fragmented.

He outlined a potential hypothesis: "I'm an operator, I have an engine, I take the engine off and send it to an MRO shop. The MRO shop picks up the engine, does a bunch of tests, replaces a bunch of valves and puts it back into the market to a different operator. Then that engine fails again. What happens next?"

"I feel like that becomes a big problem that we haven't solved yet, and technology might be able to solve it. But I think it will be such a mindset change for everybody in the industry to think about how we share the data and collaborate.

"If you talk to folks, they say 'My data is my data, I don't want to share it'. So, there's the data integrity part, and data residency is a big question mark. How do we put the right governance controls in place to have this sort of partnership?"

For KLM Cityhopper, the regulation around data sharing is less of a problem than the will to do so. Robin Duteweerd, fleet manager of the regional carrier, said: "I think it's more the willingness of people to share, because the technology is there already. We are able to share

data, especially in Europe. We have pilot unions that are strict on sharing data so that's sometimes difficult, but we are not interested in how a pilot flies the aircraft. We are just interested in how we can fix it as soon as possible if it breaks down."

Workforce dilemma

Technology is expected to play a vital part in addressing the ongoing global skills crisis in aircraft engineering. With estimates suggesting the sector needs to recruit up to 750,000 mechanics and technicians in the next decade, airlines are looking to technology to plug the gap.

Gorin discussed how airlines face the dilemma of an older workforce that are used to operating in more traditional ways and a new digitally native generation entering the workforce.

"They're not used to looking at maintenance the same way," he said. "You hear that the younger guys want to be handed solutions on a platter. Whereas the older mechanics, they want to look into troubleshooting, understanding the aircraft."

◀ KLM Cityhopper uses the Veryon diagnostic platform

“THE MANAGEMENT OF PARTS AND DECISION MAKING AROUND WHETHER TO REPLACE OR REPAIR IS A FUNDAMENTAL CHALLENGE”



▲ Robin Duteweerd, fleet manager, KLM Cityhopper

Gorin said artificial intelligence (AI) interfaces are being developed that will essentially tell the user what the answer to a particular problem is. But managers still want their mechanics to “learn how the airplane works, and then understand what is failing”. He continued: “How do you come up with the solution for both cases? One part of the answer is the user interface, and how people interact with the technology. They want to see things in the way they are used to, but maybe the information is presented faster.”

Duteweerd said KLM Cityhopper mechanics are generally curious about new technologies. “They want to do troubleshooting correctly, fix an aircraft as soon as possible, and fix it once, not twice because there’s a repeat defect.



▲ Lee Hayhurst, chief operating officer, Aviation Business News (ABN)

“It all comes down to involving them. If we implement a new tool, we always involve our mechanics so they understand why and how it works. That’s basically the key point of all projects that I run; to keep people on board and to actually work with the new technologies or new tools or new ways of working.”

The biggest impact expected of AI is the retention of knowledge to pass on to new technicians as the sector’s workforce ages and experience is lost.

Gorin said: “That’s the biggest gap that we have today that we’re trying to solve with our diagnostics product suite. We have the largest de-identified data set of all the maintenance that has been carried out, and we can identify which fixes work and which didn’t.

“We’re finding that information to give to our line maintenance folks and the reliability guys, to better understand how historically things used to work.”

It is this augmenting of what a skilled human workforce can achieve with technology and information that Veryon has been specialising in for half a century.

Predictive to prescriptive

Gorin said the digitisation of maintenance manuals and maintenance tracking records opens up a future of not just predictive but prescriptive maintenance. “It’s about understanding the impact, the spread, the rate of how many repeat problems are happening, and overall changing the way that we operate as a business.

“If I can look at historical data, that should help me make decisions to transform my maintenance programme. I should be able to analyse patterns, what works in the field and what doesn’t, and understand where the pitfalls are.

“Is it one station that’s performing well? Is it one subsystem of the aircraft that’s failing time and time again? Is it my part supplier? Is it always the engine? Asking the right questions and using AI to plan your maintenance programmes is the strength of prescriptive diagnostics in action.”



▲ Fedor Gorin, vice president of engineering, Veryon

On demand

In the webinar, which is available to watch on demand, Duteweerd gave a live demonstration of how KLM Cityhopper uses the Veryon diagnostic platform.

He said, integrated with its maintenance management system AMOS, it gives engineers much more information on repeat failures. It also allows their engineers to input their own data which helps the system learn and can be used by OEM Embraer to optimise its operations with operational data insights.

“If we can use that data and fix a complaint before it actually breaks down, based on the experience that we have in diagnostics, we can at least prevent repeat defects,” he said. ●

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FROM VENDORS TO PARTNERS

Bob Loycano and **Mitch Enright** discuss why the future of aerospace and defence supply chains depends on stronger, more collaborative partnerships

As the global aerospace community gathers at the Farnborough International Airshow, conversations will gravitate toward next-generation aircraft, new defence technologies and increased production goals. Beneath these topics lies the critical engine making it all possible: the supply chain. With ramped-up manufacturing schedules, long lead times and complex delivery needs, the traditional model of buying and selling parts is no longer enough. Industry strength today is built on long-standing, strategic relationships with supply chain partners rather than transactional vendor relationships.

While basic support like local access and scheduling remains necessary, the modern aerospace landscape demands a more sophisticated approach. The partners adding value today act as vital links between suppliers, OEMs and aftermarket customers, combining broad market reach with deep technical expertise. Providing end-to-end lifecycle support requires nuanced market

▼ Partnership, collaboration and engineering expertise



BOB LOYCANO

vice president - supply chain,
FDH Hardware



MITCH ENRIGHT

executive vice president - supply
chain, FDH Electronics

and apply deep technical knowledge of parts, subsystems and platforms to deliver end-to-end support.

Conversely, the electronics sector requires a different operational rhythm. At FDH Electronics, we are purpose-built for speed and responsiveness, leading with distribution and strong franchised supplier agreements. Focusing on the Power of 3 – interconnect, wire/cable and electromechanical products – we address the expanding demand for high-value components driven by increasing system complexity. We combine the line-card breadth and supplier access of a scaled distributor with the technical expertise and responsiveness of a specialised mil-aero partner.

Despite these operational nuances, the overarching goal remains the same. Forming deep relationships creates shared visibility and transparency across the supply chain that directly improves day-to-day operations. By openly sharing demand forecasts and collaborating on proactive inventory planning, strategic partners empower suppliers to respond smoothly to shifting production schedules. Likewise, OEMs and aftermarket customers gain a clearer view of whether their inventory is sufficient given lead times.

Looking forward, the industry must shift from reacting to shortages to cultivating deep relationships. The supply chains that will thrive in the coming decade will be defined not only by the volume of parts they move but by the enduring strength, agility and expertise of the partnerships they develop and maintain. ●



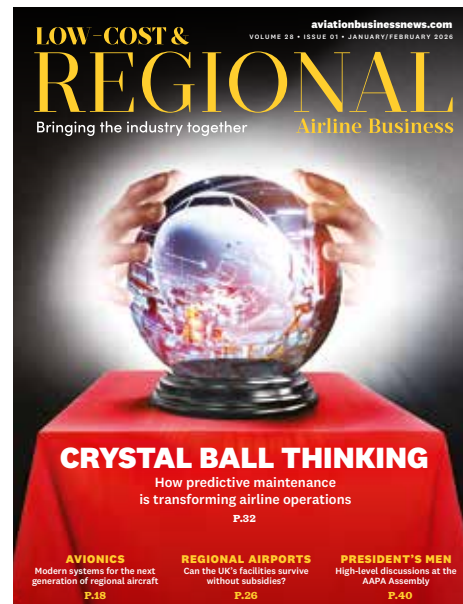
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Swarm tech takes off

Korean Air's **Chan Woo Jung** explains the shift from manual checks to AI-driven drone swarm inspections



“
This technology will directly support improved on-time performance – a vital metric in airline operations
”

CHAN WOO JUNG

senior vice president, head of maintenance and engineering division, Korean Air

► **What problem are you solving, and how does this approach change aircraft inspections compared with traditional visual checks?**

We focused on overcoming the inherent limitations of both conventional manual inspections and single-drone operations.

Firstly, traditional visual inspections are inefficient and physically demanding, requiring technicians to use aerial work platforms to manually inspect the entire exterior of an aircraft. For large aircraft such as the B747 and A380, this process can take over 10 hours which not only leads to variations in inspection quality due to human fatigue, but also exposes technicians to safety risks associated with working at height.

Secondly, the use of a single drone presents its own limitations. Flight-time constraints make it difficult to inspect large aircraft within a single session. In addition, if equipment fails, the inspection area must be reassigned, creating a significant operational burden.

Korean Air's swarm-based operation transforms this process. By carrying out simultaneous inspections, these bottlenecks are eliminated, reducing the imaging time for a widebody aircraft to approximately 20 minutes.

Furthermore, the system incorporates swarm rovers to inspect areas that are difficult for drones to capture, such as the underbelly and engine nacelles. This ensures comprehensive coverage without any blind spots.

► **Korean Air is advancing drone inspections with AI-enabled UAV swarms. What benefits does this deliver in speed, defect detection and efficiency?**
Integrating AI and swarm technologies gives us a decisive advantage across

four key areas. Firstly, it delivers a significant reduction in inspection time. While a single drone typically requires around one hour to inspect a narrowbody aircraft and up to three hours for a widebody aircraft, Korean Air's proprietary drone swarm technology dynamically adjusts the number of deployed drones according to aircraft size. This enables comprehensive external imaging and inspection to be completed in approximately 20 minutes, regardless of aircraft type.

Secondly, it achieves a new level of defect detection accuracy. During inspections, drones and rovers capture thousands of high-resolution images. Rather than relying solely on human inspection, an AI system analyses this data to identify potential defects. This significantly reduces the risk of human error and ensures highly consistent and precise detection.

▼ Korean Air expects drones and rovers to become the industry standard for aircraft diagnostics in the near future





▲ Korean Air is advancing drone inspections with AI-enabled UAV swarms

“The system operates within strictly defined boundaries using geofencing technology”

Thirdly, it greatly enhances efficiency. Instead of manually reviewing every image, the system automatically flags areas of concern, allowing technicians to focus on expert analysis and decision-making rather than repetitive tasks.

Finally, it ensures uncompromising operational safety. The system operates within strictly defined boundaries using geofencing technology. If a drone deviates from its designated airspace, an automatic landing is immediately triggered.

► From an MRO perspective, where is the greatest value in drone-enabled inspection?

While reduced downtime and improved data quality matter, the real value lies in enhancing and standardising safety across two key areas. Firstly, flight safety. Accurate maintenance depends on precise external inspections. Using AI to analyse large volumes of visual data removes the blind spots of manual checks, improving aircraft reliability.

Secondly, occupational safety. Deploying robotic systems in elevated or hazardous environments keeps technicians out of high-risk areas, supporting strict safety standards and reducing workplace incidents. Ultimately, downtime reduction and

better data are by-products of a safer, more precise inspection framework. The goal is a highly reliable environment that minimises human error while maximising safety and consistency.

► How is Korean Air integrating drone inspection data into digital records, analytics and predictive maintenance systems?

The process begins with the seamless transfer of high-resolution visual and sensor data captured by our swarm system to an AI server for initial analysis. Once a technician has completed final expert verification, confirmed findings are automatically integrated into our digital maintenance records. By transitioning away from manual logging, we ensure full transparency and traceability across all inspection results.

However, our vision extends well beyond the identification of current defects. As inspection data accumulates for each aircraft, it becomes a valuable long-term data asset. This enables us to monitor and analyse wear-and-tear patterns across specific components over time.

Ultimately, this growing data foundation will allow us to embed advanced predictive maintenance capabilities into our operations,

shifting from reactive inspection towards proactive, data-driven reliability management.

► How do you think drone technology will evolve in MRO?

While drones cannot yet perform direct physical repairs, rapid progress is expected in two areas: expanded operating environments and more advanced diagnostics.

Firstly, inspection environments will expand to enhance efficiency. Activities will move beyond hangars to designated ‘drone zones’ on airport ramps. By reducing the time required for visual inspections during ground turnarounds, this technology will directly support improved on-time performance – a vital metric in airline operations.

Secondly, Non-Destructive Testing (NDT) will advance significantly. Future drones and rovers will move beyond cameras, integrating tools such as ultrasonic and thermal sensors for deeper, more precise assessment of structures and engine components.

While fully autonomous robotic maintenance remains a longer-term ambition, innovation is accelerating. We expect drones and rovers to become the industry standard for aircraft diagnostics in the near future. ●



MORE THAN FOUR WALLS

1

The modern hangar is becoming far more than a place to park aircraft, with flexibility, efficiency and sustainability redefining maintenance facilities

Few investments demonstrate confidence in the future of aviation quite like a new maintenance facility.

Around the world, MRO providers are announcing ambitious infrastructure programmes. Emirates is developing its vast engineering complex at Dubai South. Lufthansa Technik is expanding its global footprint with major new facilities in Portugal and the Philippines. HAECO is leading development of a new maintenance hub in Vietnam, while Japan Airlines, Textron Aviation and others continue to invest in specialist maintenance capabilities.

Collectively, these projects reflect more than growing demand. They signal a shift in how the industry views hangars themselves.

For decades, hangars were largely judged by one metric: how many aircraft could fit inside. Today, that equation has become considerably more complex. Operators must accommodate larger and more diverse fleets, improve turnaround times, reduce operating costs, attract skilled engineers and meet increasingly demanding sustainability targets, all while ensuring facilities remain relevant for decades.

Capacity still matters, but efficiency increasingly defines competitiveness.

Designing for flexibility

Fraser Currie, chief strategy and commercial officer at Dubai Aerospace Enterprise (DAE) Engineering, believes new facilities must be designed with much broader objectives in mind, and for Joramco, those principles shaped the development of its newest 12,000 sqm maintenance facility, Hangar 7, at Queen Alia International Airport in Amman, Jordan.

“As MRO demand continues to grow globally, expanding capacity is no longer just about adding more hangar space,” Currie says. “The industry needs facilities that are designed to operate smarter, support evolving technologies and

1. Jewers Doors has supplied and installed two sets of Esavian 126-SBR power-operated hangar doors at the British Airways' Fleet Support Unit (FSU) at Heathrow Airport

2. Lufthansa Technik's new facility in Portugal will specialise in the repair of engine parts and aircraft components

Lufthansa Technik



contribute to long-term sustainability goals. At Joramco, we approached the development of Hangar 7 with this mindset from the outset."

Rather than simply adding another maintenance bay, Joramco set out to create a facility capable of adapting to changing operational requirements over the long term.

"Our newest hangar was designed as an eco-friendly facility that combines operational efficiency with environmental responsibility," Currie explains. "From energy-efficient systems and modern infrastructure to a flexible layout capable of accommodating both widebody and narrowbody aircraft, every aspect was planned to maximise productivity while reducing resource consumption."

That flexibility is becoming increasingly valuable. Fleet composition continues to evolve, while maintenance requirements vary significantly between aircraft types and generations.

Facilities designed around a single operational model risk becoming constrained long before the building itself reaches the end of its life.

Currie believes future facilities will increasingly be judged on their adaptability rather than simply their footprint.

He explains: "Ultimately, the next generation of MRO facilities will be defined not by their size alone, but by how effectively they enable operators to deliver higher-quality maintenance in a more sustainable and flexible environment, with scalable capacity designed to accommodate multiple simultaneous heavy maintenance lines, including up to six lines and aircraft as large as the A380."

"FUTURE FACILITIES WILL INCREASINGLY BE JUDGED ON THEIR ADAPTABILITY RATHER THAN SIMPLY THEIR FOOTPRINT"

Design flexibility is only one part of the equation. Once aircraft enter the hangar, operators are equally focused on how efficiently people, parts and information move through the maintenance process.

Currie continues: "One of the key lessons from our Hangar 7 expansion is that successful growth requires balancing multiple priorities simultaneously. Increasing aircraft throughput is important, but it must be achieved without compromising efficiency, sustainability or operational quality.

"The hangar allows us to accommodate a diverse mix of aircraft types while optimising the movement of personnel, equipment and materials throughout the maintenance process. This helps improve turnaround times and maximise the utilisation of our expanded capacity."

Digitalisation has become central to that balance. Currie says: "As we continue our transition toward a paperless maintenance environment, we are leveraging digital tools to improve planning, visibility and decision-making across operations. At the same time, the

facility incorporates energy-conscious design elements that support our sustainability objectives while helping manage long-term operating costs."

The result is a shift in thinking. Rather than designing buildings around maintenance activity, many operators are now designing them around maintenance workflows, ensuring infrastructure supports digital processes just as effectively as physical ones.

Efficiency beyond the maintenance bay

While digital technologies often dominate conversations about next-generation MRO facilities, some of the greatest operational gains can come from infrastructure that rarely receives the same attention.

Hangar doors, for example, are among the largest moving components of any maintenance facility, influencing energy performance, workflow and operational reliability every day.

Jonathan Jewers, director of Jewers Doors, believes their impact is frequently underestimated. "We've delivered doors



1. With Hangar 7, Joramco's capacity has expanded from 17 to 22 maintenance lines. Photo taken at the firm's launch event in October 2025

2. The ceremonial groundbreaking of Emirates' new \$5.1 billion MRO mega-site at Dubai South



Fraser Currie, chief strategy and commercial officer, Dubai Aerospace Enterprise (DAE)

from a modest 18 metres wide up to a single leaf set spanning 584 metres, and everything in between, on every continent bar Antarctica," he explains. "That range isn't incidental – it means whatever the client's opening, we've almost certainly already engineered something close to it, and we're not learning on their project."

Jewers continues: "Reliability isn't a claim we make lightly either. It's backed by our own annual maintenance programme, which keeps doors we installed decades ago – some from the 1980s, some on hangars going back to the Second World War – still operating to current safety standards today.

"With the design foundation right, insulation and sealing then determine

how well that door actually performs day to day. The insulation value of the panel itself is only part of the story – what tends to catch operators out is the sealing: the perimeter seals, the interlock seals between leaves or curtain sections, and the seals at floor level."

He says operators often focus on insulation figures while overlooking where energy losses actually occur.

"A door can carry a respectable U-value on paper and still leak heat if the seals aren't engineered for the real-world tolerances of a large moving structure, or if they degrade after years of cycling in wind and UV."

Operational performance also extends beyond thermal efficiency. "A well-balanced door with an efficient drive system and smooth, low-friction operation doesn't just save wear on the motors – it opens and closes quickly and reliably, which matters more than people assume."

As Jewers explains, reliability has a direct impact on running costs. "Every extra minute a door sits ajar because an operator is hesitant, or the automation is sluggish, is heat or cooled air walking straight out of the building."

His conclusion reflects a broader industry trend towards viewing facilities as integrated systems rather than

collections of individual components. "Door design, insulation and seals have to be treated as one system, not three separate line items," Jewers explains. "Specify them together, with a manufacturer who owns the full depth of that expertise, and a hangar door stops being the weak point in the envelope and starts pulling its weight alongside everything else in the building."

Building for the long term

Sustainability is now influencing almost every aspect of facility design, but increasingly the conversation is moving beyond energy consumption alone.

For many operators, longevity and resilience are becoming just as important as carbon reduction. A building that remains efficient, adaptable and reliable for several decades is likely to deliver greater environmental and commercial value than one requiring continual refurbishment.

Jewers believes this represents a growing appreciation of lifecycle thinking. "A door engineered to still be giving reliable, safe service 40 or 50 years after installation was always the sustainable choice; we just didn't used to call it that."

He adds: "On sustainability specifically, what customers are asking for now is lower-energy drive systems, materials with clearer environmental provenance, and – increasingly – proof that a door won't need major refurbishment for decades rather than years. We'd argue that's exactly the standard we've always held ourselves to, so it's less a shift for us than a welcome bit of validation."

"FACILITIES ARE GETTING LARGER, BUT THEY ARE ALSO EXPECTED TO WORK HARDER"

long-term operational excellence and sustainable growth.”

That observation perhaps best captures why the latest wave of MRO investment differs from previous expansion cycles.

Facilities are getting larger, but they are also expected to work harder. They must enable digital maintenance, support changing aircraft fleets, improve engineer productivity, reduce energy consumption and remain operationally relevant for decades.

As global MRO demand continues its upward trajectory, success will depend on more than simply constructing additional maintenance space.

The facilities delivering the greatest long-term value are likely to be those designed not just for today’s maintenance requirements, but for the operational, technological and workforce challenges the industry has yet to encounter.

In that respect, the modern hangar has become far more than four walls and a roof. It is increasingly one of the MRO sector’s most valuable strategic assets. ●

Reliability is equally high on operators’ agendas. As Jewers explains, “Hangar downtime is expensive, and a door that won’t open on a Monday morning can hold up an entire maintenance schedule.”

The same long-term perspective applies to entire facilities. As far as Currie is concerned, resilience must be considered from the earliest stages of planning.

“Perhaps the most important lesson is that resilience must be built into the facility from day one. The aviation industry continues to evolve rapidly, and infrastructure investments must be capable of adapting to future technologies, changing customer requirements and workforce needs.”

He concludes: “For us, Hangar 7 represents more than additional capacity; it is a strategic investment in Joramco’s

2



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ENGINEERING THE ENVELOPE

Boštjan Bevec, head of the aircraft hangar division and chief commercial officer at Schwarzmann, explores why MRO infrastructure must align with the operational realities of Part 145



1

The European MRO sector is facing an unprecedented capacity crunch. As regional and crossover fleet utilisation intensifies, base maintenance slots have become highly contested premium assets.

For maintenance organisations, reaching absolute capacity limits introduces a severe strategic dilemma: turning down lucrative multi-year contracts from tier-one carriers simply because the physical footprint cannot support the volume.

When a maintenance provider must decline a major regional fleet consolidation tender from a €3 billion international airline due to a lack of available maintenance lines,

infrastructure ceases to be a real estate discussion – it becomes the primary constraint on corporate growth.

To break this capacity ceiling, MRO providers must scale their physical operations without introducing structural inefficiency. However, expanding a footprint is not merely about adding square metres; it requires a fundamental reassessment of how structural infrastructure interacts with shop-floor mechanics and other departments.

Traditional hangar procurement frequently treats the building envelope as a passive commodity, forcing maintenance crews to adapt their workflows to the building rather than vice versa.

Optimising ‘wrench time’ via structural design

A facility is measured through a single, critical metric: ‘wrench time’ – the actual percentage of a shift a technician spends performing hands-on work on the aircraft.

The global industry standard for wrench time hovers between 25-30%. This low baseline is often driven by fragmented facility layouts, inadequate utility access, and sub-optimal spatial configurations typical of converted or rented legacy structures.

To push wrench time toward a more highly efficient target of 35-40%, infrastructure must be purpose-built around lean principles.

The recent completion of Slovenia’s largest EASA-compliant hangar at Ljubljana Airport for Solinair (the nation’s sole operator holding all four regulated aviation licences under a single roof) serves as an instructive case study. By operating parallel lines in an optimised, column-free structure, the facility enables a two-thirds increase in project capacity, scaling operational throughput from 50 to 80 aircraft checks annually.

Maximising wrench time requires a layout that eliminates wasted motion. This means integrating compressed air, multi-phase electrical grids and data drop lines directly into the structural layout to minimise trailing ground lines.

Furthermore, the vertical and horizontal clearances must allow maintenance crews to execute heavy base checks (typically spanning 23 to 35 days) without shifting mobile scaffolding, engine transport dollies or tool cribs to clear adjacent aircraft paths.

1&2 Slovenia's largest EASA-compliant hangar at Ljubljana Airport belongs to Solinair

Operational imperatives for future-proofing

For aviation executives evaluating facility expansion, three core principles should dictate the infrastructure roadmap:

1 Design for targeted wrench time: Reject generic building layouts. Mandate a structural footprint that integrates all applicable regulatory requirements and the maintenance organisation's operational needs, including access, inspection, repair, tooling, safety clearances, ground-support equipment and future modification provisions.

2 Leverage off-site precision: Reduce airfield disruption and security liabilities by selecting experienced partners who utilise advanced planning and pre-fabrication methodologies.

3 Embed scalability into the frame: Ensure the initial structural engineering accounts for future fleet transitions, allowing for dimensional extensions without compromising structural integrity.

Ultimately, infrastructure must match the sophistication of the aircraft it protects. By treating the hangar as a highly calibrated production tool, MRO operators can eliminate operational waste, safeguard technical talent and secure the structural agility required to drive long-term yield. ●

This article incorporates operational insights and data contributed by Matej Tomšič, chief executive of Solinair.



For more information about Schwarzmann, visit: [schwarzmann.eu](https://www.schwarzmann.eu)

“Infrastructure must match the sophistication of the aircraft it protects”

Navigating crossover geometries and strategic scalability

Modern regional and crossover fleet profiles present distinct spatial challenges. Servicing platforms like the CRJ900 alongside next-generation crossover aircraft, such as the Embraer E-Jets (E1 and E2) and the Airbus A220, requires high geometric flexibility. Clear heights must not only accommodate static tail dimensions but must also provide safe operational margins for heavy jacking operations, tail dock integration and the removal of flight control surfaces.

Crucially, an MRO provider's infrastructure strategy must anticipate long-term market shifts. A facility engineered for current regional operations should feature built-in modularity to enable future upgrades without requiring total structural reconstruction. For instance, designing a steel frame with the capacity for a future longitudinal extension, such as a planned 24m structural elongation, enables the facility to structurally adapt to widebody configurations, anticipating future growth up to the Airbus A350 class.

This forward-looking approach ensures the building remains an adaptable asset for decades, protecting the initial capital expenditure and keeping technical expertise in-house.

Mitigating airside construction risks

Deploying critical infrastructure within a highly regulated airport boundary introduces severe operational friction. EASA Part 145 organisations must comply with strict security, Obstacle Limitation Surface (OLS) and Foreign Object Debris (FOD) requirements, leaving little tolerance for prolonged on-site fabrication, welding and heavy machinery usage.

To eliminate these airside risks, the industry must transition to high-precision, off-site pre-engineering. Utilising advanced industrial CNC machinery to fabricate structural steel components under controlled factory conditions ensures sub-millimetre accuracy before any material reaches the airport perimeter.

This pre-engineered methodology compresses the airside installation phase, transforming a disruptive construction site into a rapid, structured assembly process.

Minimising on-site hot work lowers fire-watch mandates near active apron refuelling operations, while predictable assembly sequencing ensures that airport radar line-of-sight and communication paths remain unobstructed throughout the build.



FLEXIBILITY MEETS FOCUS

Mario Pierobon finds out that in the business aviation MRO market, success increasingly depends on combining specialist knowledge with strategic focus and scalable processes

Unlike the commercial airline sector, where narrowbody fleets of near-identical aircraft generate predictable, high-volume workloads, the business aviation MRO market operates in a world of perpetual variety: dozens of platforms, each with its own certification requirements, tooling ecosystems, spare parts supply chains and ownership profiles.

Yet the operators who fly these aircraft demand the same levels of reliability and turnaround performance that airlines have come to expect, and this is a central challenge currently facing MRO providers.

Senior leaders tell *MRO Management* the sector is evolving rapidly, with strategic focus, workforce capability and the intelligent use of data becoming as important as technical expertise and hangar capacity.

Managing fragmentation

In business aviation, fragmentation is the defining characteristic of the market. An independent MRO

often supports a wide range of aircraft types across multiple OEMs, and even within a single model, there can be significant variation because of customisation, affirms Michael Parrish, president and chief executive of Elliott Aviation. “This creates complexity in everything from maintenance schedules and documentation to the availability of equipment and spare parts,” he says. “It also limits the repetitiveness that typically fosters efficiency in a maintenance environment.”

Customisation presents challenges beyond routine maintenance, particularly for refurbishment and modification projects, adds Coralie Wigg, co-founder and director of Starling Aerospace. “Unlike commercial airline fleets, where aircraft are largely standardised, business aircraft are often unique in terms of cabin layouts, materials and onboard systems,” she says. “This creates additional complexity for maintenance, refurbishment and modification programmes, particularly when sourcing bespoke materials, matching existing



1. Embraer Services & Support delivers global maintenance and technical support for Embraer Executive Jets **2.** Keeping Embraer Executive Jets mission-ready

Jeremy Rangel, vice president of aircraft services at Duncan Aviation's Lincoln facility, points out that an independent MRO may support several OEM platforms in the same facility, each with its own manuals, inspections, avionics, modifications, equipment, spare parts needs and approval requirements. "At Duncan Aviation, we manage this complexity by balancing model-specific expertise with the broader capabilities of the A&P technician," he explains. "We rely on experienced technicians who know the ins and outs of a specific model, but we also value the MRO mechanic

as a well-rounded aircraft technician, capable of diagnosing problems, inspecting, repairing, and adapting to different platforms with the right technical guidance. This combination allows us to service a highly diverse fleet while maintaining quality, compliance and on-time delivery."

Strategic focus

Textron Aviation supports a global fleet of multiple aircraft platforms, each with unique maintenance requirements, inspection intervals, and certification standards, Scott Howell, vice president of North America Service Centres at Textron Aviation, points out. "This diversity can make our global service network complex," he says. "As an OEM, we are positioned to manage this complexity thanks to our 20 owned and operated service centres worldwide, data integration, and direct access to engineering and maintenance expertise focused exclusively on the products we manufacture. This allows us to customise the maintenance experience for each aircraft type, while maintaining consistency in execution, helping customers manage fleet variability, and ensuring operational readiness."

Elliott Aviation has made the strategic decision of focusing on the jet and medium-cabin turboprop segment. "This focus allows us to gain deeper expertise, streamline training and create greater consistency in our operations," explains Parrish. "It does not eliminate the inherent variability of business aviation, but it allows us to manage it in a much more controlled and efficient manner."

Parrish continues: "When comparing this model to that of narrowbody commercial aviation, a substantial difference becomes apparent. Airlines operate large fleets of highly standardised aircraft, which fosters efficiency in maintenance planning, spare parts availability and manpower. In business

interiors or integrating new technologies. Certification requirements can also be more involved, as modifications must be assessed for compatibility and continued airworthiness. Careful downtime planning is essential, as owners expect aircraft availability to remain high."

Wigg adds: "As a result, business aviation MRO providers need strong engineering, project management and supply chain capabilities to deliver customised solutions efficiently and compliantly."

The fragmentation of the business aviation fleet adds complexity to independent MRO providers, affirms Frank Stevens, vice president of global MRO centres for Embraer Services & Support. "They must support a wide variety of aircraft types with lower volumes and greater variability," he says. "Embraer's approach is to reduce this complexity by extending uniform standards, tools, and processes across the entire global support ecosystem, both at Embraer-owned facilities and at authorised service centres worldwide. Our model offers efficiency, predictability and consistency, while preserving the flexibility customers expect."

"THE FRAGMENTATION OF THE BUSINESS AVIATION FLEET ADDS COMPLEXITY TO INDEPENDENT MRO PROVIDERS"

Embraer Services & Support

1

Embraer Services & Support

2



Embraer Services & Support

1

▲ Embraer's approach is to reduce complexity with uniform standards, tools and processes across its global support system

aviation, finding a balance between flexibility and complexity is crucial, making focus a crucial element of strategy."

Targeted efforts

Managing multiple OEM platforms under one roof means operating in distinct ecosystems, Brody McKenna, director of MRO operations at Western Aircraft, observes. "Tools and spare parts are not interchangeable," he says. "The standardisation of commercial aviation maintenance is not available in business aviation. The way we managed this was to invest in a targeted manner. One has to correctly identify the platforms to support, develop a thorough understanding, and know when to stop. Operators quickly realise whether an MRO company truly knows its aircraft or has just a general understanding of it."

Bombardier's vision for service and support is being its customers' first choice for aircraft maintenance, modifications and spare parts, and to honouring all commitments, regardless of the specific platform, points out Matthew Nicholls, senior advisor, public relations and communications at Bombardier. "To ensure we achieve this goal, every customer interaction gives us the opportunity to strengthen trust in our service and support ecosystem," he says.

"Our commitment to responsiveness and accountability ensures lasting customer loyalty. And with more than 100 locations worldwide and 24/7/365 customer support, our services extend wherever our customers are. We support them when they need it."



▲ Coralie Wigg, co-founder and director, Starling Aerospace

Nicholls adds: "As part of our commitment to building confidence in our services and support infrastructure, we continue to make targeted investments, infrastructure growth and strategic acquisitions, as part of a broader multi-phase expansion strategy."

As customer expectations evolve, refurbishment and modification capabilities are also becoming an increasingly important differentiator for business aviation MRO providers, says Wigg.

"Business aviation customers increasingly expect aircraft cabins to offer the same connectivity, comfort and technology that they experience on the ground," she says. "MRO providers therefore need expertise in connectivity upgrades, cabin modernisation and the integration of new digital systems."

"Customer expectations for premium, personalised interiors continue to rise and whilst sustainability is not a core consideration in this market, there is a growing demand for refurbishment strategies which result in longer-lasting cabin interiors."

Wigg adds: "Success will depend on combining engineering, certification and design expertise with robust project management processes that minimise downtime and maximise aircraft availability throughout complex projects."

Summing up

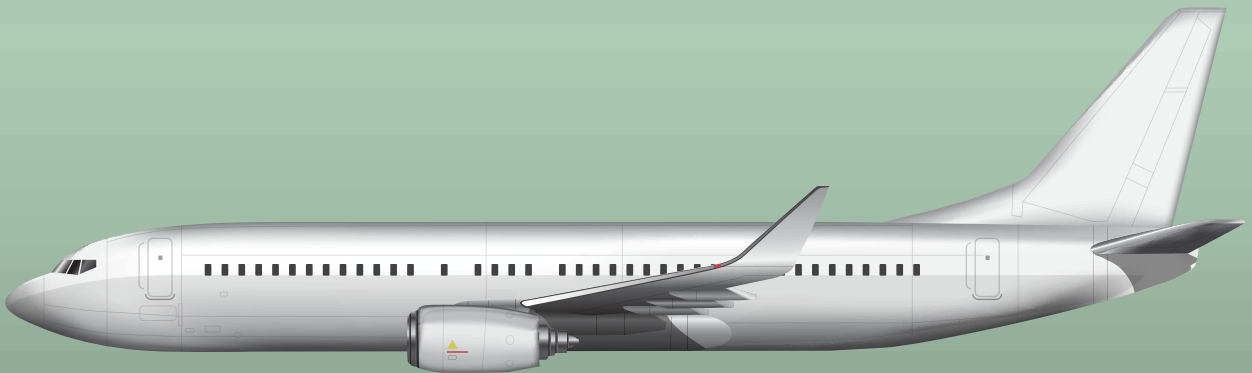
The structural pressures shaping the business jet maintenance environment are unlikely to ease. Technical expertise alone is insufficient. Competitive advantage lies in balancing model-specific knowledge with broader technician capability, strategic investment in targeted platforms, specialist refurbishment and modification expertise, and leveraging data integration and workforce development.

As business aviation fleets continue to grow and operators demand high service reliability, MRO providers who most effectively balance strategic focus with operational flexibility will sustain growth and customer loyalty in this persistently complex market. ●

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Pushing for better

The Aircraft Fleet Recycling Association (AFRA) and Boeing have announced a joint vision aimed at improving transparency and data analysis across aircraft end-of-service management

As part of wider efforts to advance sustainability and circularity in aviation, AFRA and Boeing have outlined a series of initiatives designed to provide better insight into the environmental and economic impact of aircraft retirement, parts reuse, material recovery and recycling.

Announced at AFRA's recent 20th anniversary event, the initiative reflects a growing industry focus on measuring and demonstrating the value generated through end-of-life aircraft management.

AFRA is developing a range of tools to support this effort, including the introduction of voluntary key performance indicators (KPIs) and reporting mechanisms within its accreditation framework. The measures are intended to establish a common baseline for data management, improve transparency and support continuous improvement across the aircraft recycling sector.

According to the organisations, the work complements Boeing's focus on lifecycle traceability, stronger data governance and support for customers managing ageing fleets. It also builds on existing collaboration between AFRA and Boeing to facilitate secure data sharing among suppliers, OEMs, maintenance providers, dismantlers and recyclers.

The organisations are also collaborating with wider industry stakeholders through the International Aerospace Environmental Group (IAEG), where Boeing co-leads Working Group 14 on circularity and end-of-life considerations.

Boeing has increasingly expanded its activities in the aircraft recycling sector. In 2023, the manufacturer committed to using AFRA-accredited organisations for the dismantling and recycling of Boeing-owned aircraft. More recently, it has expanded its used serviceable material (USM) capabilities and launched an Aircraft Recycling Programme aimed at supporting the aviation circular economy.

Lionel G Roques, AFRA's executive director, said: "Boeing has been an integral part of AFRA's journey



since our inception two decades ago, and its growing commitment reflects the increasing importance of collaboration, transparency and measurable outcomes across aviation sustainability.

"20 years on, the conversation is evolving, as aviation sustainability is incomplete without end-of-life management. More reliable and structured data, greater transparency and shared standards are the building blocks of driving measurable progress in aircraft circularity."

Tony Guiliano, director of strategy at Boeing Global Services, added: "Reliable, sector-wide data and traceability are essential to measure progress and scale circular solutions, and we will continue to collaborate across the industry to advance those outcomes.

"High-quality data also underpins more accurate valuation and stronger residual values for aircraft by improving maintenance transparency and customer confidence.

"We remain committed to using AFRA-accredited organisations for Boeing-owned aircraft and to practical actions that increase availability of used serviceable material for our customers." ●

▲ (L-R) Boeing's Rafael Ferro, Tony Guiliano and Christin Datz with AFRA's Lionel G Roques

"MORE RELIABLE AND STRUCTURED DATA, GREATER TRANSPARENCY AND SHARED STANDARDS ARE THE BUILDING BLOCKS OF DRIVING MEASURABLE PROGRESS IN AIRCRAFT CIRCULARITY"

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