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Cost-effective Spare Engine Solutions

What experts recommend

Hot Spot Florida
What makes the sun state so attractive?

Sustainability in MRO
How MROs fight the climate change

Executive Talk
Insight from AerFin's David Greenwell

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Dear industry colleagues,

This month, we have once again engaged with the industry to provide our readers with insights on various topics. David Dundas has been gathering information in Florida, a state which hosts a multitude of companies from the aviation industry. So, what makes this location so attractive to the industry?

The market for spare engines has been in turmoil for some time. There is an oversupply for certain engine types, while for other models, there are issues meeting demand. We have asked experts how best to navigate the situation.

For several years now, the topic of sustainability has been prominent in our industry. Most companies take this issue very seriously and have developed various strategies to contribute to environmental protection. Swaati Ketkar spoke with several companies to provide an overview of the diverse initiatives currently in operation.

I hope you enjoy reading.

Peter Jorssen
Publisher


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Managing the Availability of Spare Engines

ADE Cambodia receives AMO certification

Asia Digital Engineering (ADE), the Maintenance, Repair and Operations (MRO) subsidiary of Capital A, has released that ADE Cambodia Co Ltd (ADE Cambodia), a joint venture with Sivilai Asia, has received the approved maintenance organisation (AMO) certification from the Cambodian State Secretariat of Civil Aviation (SSCA). This achievement marks a significant milestone as it is the first ADE entity outside Malaysia to obtain business approvals in the country. ADE Cambodia will play a crucial role in supporting the aviation ecosystem in Cambodia, leveraging its expertise to provide MRO services not only to AirAsia Cambodia but also to other airlines operating in Cambodia's major airports. Mahesh Kumar, CEO of Asia Digital Engineering, said: "We are delighted to have received approvals to commence operations of ADE Cambodia. We look forward to providing top-notch MRO solutions to airlines operating to and from Cambodia, in addition to supporting Cambodia's thriving aviation industry, which will positively impact the local economy and create job opportunities in the country. We would like to record our sincere appreciation to the Cambodia State Secretariat of Civil Aviation (SSCA) and the Cambodian Government for their warm welcome and recognition of our capabilities. Looking ahead, we are committed to investing further in state-of-the-art technologies, enhancing our capabilities, and developing a skilled workforce at our facility. This also marks the beginning of our growth journey in 2024, as we gear up to expand to other countries soon." ADE Cambodia operations will be headquartered at Phnom Penh International Airport, Cambodia's busiest airport and primary international gateway, but will expand to other airports in Cambodia as well. This strategic location positions ADE Cambodia to efficiently serve the aviation needs of the region, leveraging the airport's vital role in connecting Cambodia with the world. Established in

Asia Digital Engineering (ADE) has received AMO certification from the Cambodian State Secretariat of Civil Aviation *© Shutterstock*

2020, ADE has earned customer trust through its professional MRO services, digital products, glowing testimonials and partnerships with airlines across the region. In December 2023, ADE completed its 100th C-check within 2.5 years, setting a record time frame since inception. Looking ahead, ADE is focused on its vision to continually deliver exceptional services, expand capabilities, and remain at the forefront of the MRO industry. ADE's state-of-the-art 14-line hangar in Kuala Lumpur is scheduled to be launched in Q3 this year, further enhancing its ability to serve clients with excellence and efficiency. ADE's dedication to maintaining the utmost quality and safety standards in aircraft MRO is emphasised by a string of milestones. Among these achievements stands the attainment of the EASA Part 145 approval from the European Union Aviation Safety Agency (EASA), complementing an extensive array of existing maintenance certifications and authorisations.

SIAEC appointed strategic partner by Air India for base maintenance facilities development

SIA Engineering Company (SIAEC) has been appointed by Air India as the strategic partner for base maintenance (BM) facility development in Bangalore, India. In collaboration with Air India, SIAEC will oversee the planning, construction and operationalisation of Air India's BM facilities in Bangalore. Expected to be operational by 2026, these facilities will include wide-body and narrow-body hangars, alongside repair shops, to cater to the growing maintenance, repair and overhaul (MRO) requirements of Air India Group's aircraft fleet. Chin Yau Seng, CEO of SIAEC, commented: "We are delighted to be able to play a small part in Air India's amazing transformation journey and look forward to working closely with the Air India team to ensure the success of this project. This appointment marks another significant milestone in the development of the partnership between Air India and SIAEC. Going forward, we hope to have even more opportunities to collaborate with Air India in the MRO space in India." Campbell Wilson, Chief Executive Officer and Managing Director, Air India, said: "The collaboration with SIA Engineering Company will not only help Air India become more self-reliant for the maintenance of its own fleet but it also reiterates our commitment to strengthen India's aviation infrastructure by boosting the growth of the country's MRO industry." The transaction is not anticipated to materially affect the net tangible assets per share or earnings per share of the SIAEC Group for the financial year ending March 31, 2025. None of the directors or controlling shareholders of SIAEC have any direct or indirect interest in the transaction, except through their shareholdings in SIAEC.

Commercial Jet gains 737 MAX certification

© Commercial Jet

Commercial Jet Services LLC (Commercial Jet) has released that its Dothan, Alabama MRO facility has received certification for the Boeing 737 MAX-series aircraft. This certification enables the company to offer full maintenance, modification and overhaul services for the MAX-series aircraft. Commercial Jet's Miami, FL MRO facility already has the capability to service the 737 MAX aircraft. “We are very excited to now have the 737 MAX added to Commercial Jet’s Dothan, Alabama facility’s list of aircraft MRO capabilities,” said Rick Townsend, the company's Vice President of Sales & Marketing. “With our complete MRO and modification capabilities, including a state-of-the-art paint facility, Commercial Jet - Dothan enhances the comprehensive lease transition and MRO services we can offer to our commercial operators and leasing companies. This new approval now expands our capabilities to better serve all our customers.” Both Commercial Jet facilities in Miami and Dothan are FAA- and EASA-certified repair stations, with additional approvals from other global civil aviation authorities. The company specialises in both scheduled and unscheduled heavy maintenance, line maintenance, modifications, all airframe inspections, freighter conversions, interior modifications, avionics upgrades, and aircraft painting. With over half-a-million square feet (46,000 m^2) of multi-bay hangar facilities in Miami, Florida (MIA) and Dothan, Alabama (DHN), it serves passenger/cargo airlines, owners, lessors, regional and military customers globally.

AeroSHARK rolled out to entire SWISS Boeing 777 fleet

Over the past one and a half years, SWISS International Air Lines (SWISS) has equipped its entire Boeing 777-300ER fleet with AeroSHARK, the sharkskin technology from Lufthansa Technik and BASF. The AeroSHARK surface film mimics the flow-optimising characteristics of sharkskin. Applied to the fuselage and engine nacelles, it reduces drag during flight, promoting lower fuel consumption and lower CO_2 emissions. All twelve modified Boeing 777 aircraft have been in service with SWISS since this month. This marks the first time the entire Boeing long-haul fleet of an airline has been optimised with this new technology. AeroSHARK recreates the drag-reducing features of sharkskin. Thanks to the special surface structure, which consists of fine riblets about 50 micrometres wide, the aerodynamics of the aircraft are optimised and drag during flight is reduced by about one percent. Consequently, less fuel is required, and emissions are reduced. With its gradually upgraded fleet, SWISS saved over 2,200 tonnes of kerosene and reduced emissions to around 7,100 metric tonnes of CO_2 in 2023. The last remaining aircraft, registered HB-JNF, was fitted with AeroSHARK at the beginning of this month. "We are very pleased with the results that we have achieved with AeroSHARK to date," said Claus Bauer, SWISS's Head of Technical Fleet Management. The implementation of AeroSHARK followed years of research and development by Lufthansa Technik and the chemical company BASF. At the end of 2022, the European Aviation Safety Agency (EASA) granted Lufthansa Technik approval for the series conversion of two Boeing 777 aircraft types with AeroSHARK after an extensive examination process. A total of 17 Lufthansa Group aircraft have already been modified with AeroSHARK, and the number is growing. Lufthansa Technik and BASF intend to continue developing AeroSHARK for other aircraft types and larger areas to support airlines worldwide in achieving their emission targets.

All Boeing 777s at SWISS have been equipped with AeroSHARK © SWISS

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Caerdav launches dedicated line maintenance station at Cardiff Wales Airport

© Caerdav

Independent UK MRO, Caerdav, has unveiled a dedicated line maintenance station at Cardiff Wales Airport, initially catering to support ACMI (aircraft, crew, maintenance, and insurance) operator, Avion Express. The new station will conduct overnight daily and weekly maintenance checks for Avion Express, ensuring the smooth operation of its aircraft throughout the summer 2024 contract with TUI. Chris Coleman, Managing Director at Caerdav says: "This is a major step forward in Caerdav's ongoing growth strategy, enabling our skilled workforce to provide outstanding line maintenance to a major international airport. As a proud Welsh business, we're excited to add this string to our bow, establishing new relationships with both Avion Express and Cardiff Airport that we hope to develop further over time." The station is staffed by six dedicated technicians from Caerdav, all certified to work on Airbus A320, Boeing 737, 757, and 767 aircraft. Initially focusing on the A320 operated by Avion Express for TUI Airways during the 2024 summer season, Caerdav intends to establish it as a permanent fixture at the airport. Spencer Birns, CEO at Cardiff Wales Airport, added: "It's excellent to witness Caerdav enhancing its services by offering line maintenance at Cardiff Wales Airport." The new line station commenced operations this month for the summer season, with plans underway to make it a permanent fixture at the airport.

Astronics Corporation reports first-quarter loss

Astronics Corporation has reported financial results for the three months ended March 30, 2024. Consolidated sales were up $28.5 million, or 18.2%. Aerospace sales increased US$28.0 million, or 20.7%, driven by increased demand in its Electrical Power & Motion product line. Test Systems sales increased US$0.5 million. Consolidated operating income was US$1.7 million, compared with an operating loss of US$2.4 million in the prior-year period. Improved operating income reflects higher sales volume, partially offset by US$3.6 million in non-cash stock bonuses as the company's bonus programs resumed. The prior-year period operating loss benefited from a US$5.8 million liability reversal of a deferred revenue liability that increased sales in the Test Segment. In the first quarter of 2023, the company recognised a US$3.4 million gain from the final earn-out payment for the 2019 sale of its semiconductor test business, as well as US$1.8 million within other income associated with the reversal of a liability related to an equity investment. Consolidated net loss was US$3.2 million, or $0.09 per diluted share, compared with a net loss of US$4.4 million, or $0.14 per diluted share, in the prior year. Tax benefit in the quarter was US$1.4 million, compared with a tax expense of US$1.3 million in the prior year. Consolidated adjusted EBITDA increased to US$19.1 million, or 10.3% of consolidated sales, compared with an adjusted EBITDA of US$6.1 million, or 3.9% of consolidated sales, in the prior-year period primarily as a result of higher sales. Bookings were US$205.3 million in the quarter resulting in a book-to-bill ratio of 1.11:1. For the trailing twelve months, bookings totalled US$771.6 million, and the book-to-bill ratio was 1.08:1.

Latvian flag carrier **airBaltic** has reported the inauguration of the **airBaltic Technical Academy** – a leading-edge training venture tailored for individuals aspiring to embark on or enhance their careers in aircraft maintenance. The academy is currently open for applications for its trio of specialised programmes, in partnership with **Riga Technical University, Liepaja State Technical School** and the exclusive **airBaltic Mechanics programme**. The airBaltic Technical Academy will provide cutting-edge training facilities in Riga and Liepaja, offering hands-on experience primarily with the Airbus A220-300 aircraft. The programmes are crafted to cater to a diverse spectrum of applicants – from graduates of secondary or technical schools to seasoned mechanics – ensuring that there is a suitable pathway for all career aspirations. Moreover, airBaltic is dedicated to expanding its fleet of Airbus A220-300 aircraft and has set an ambitious target to recruit and train nearly 400 new aviation maintenance professionals by 2030, with plans to enrol approximately 70 individuals annually. The establishment of the airBaltic Technical Academy is a strategic response to these objectives, providing employment and training across three distinct streams. Through these programmes, the airline offers tuition-free education with the opportunity to integrate work and studies, as well as secure employment in a highly skilled profession.

Safran, GDAT Group ink helicopter engine support deals

GDAT H225 helicopter © *GDAT Group*

During Chinese President Xi Jinping's official visit to France, Safran Helicopter Engines, in the presence of CEO Olivier Andriès and GDAT Group Chairman Peter Jiang, has sealed support-by-the-hour contracts with GDAT. These contracts are set to maintain the Makila engines, propelling GDAT's Airbus H225 helicopter fleet and the Arrano engines empowering GD Helicopter Finance's (GDHF) H160 helicopters, which will soon commence operations. The two SBH®-type agreements encompass in-service support and MRO for 140 Arrano 1A and Makila 2A1 engines. The responsibility for managing these contracts falls under Safran Helicopter Engines China, the premier supplier of helicopter engines in the nation, boasting over 500 engines in service. In China, one out of every two helicopters is propelled by Safran engines, either manufactured by Safran or under license. Cédric Goubet, CEO of Safran Helicopter Engines, expressed his pride, stating, "We are particularly proud that a leading helicopter company like GDAT Group has placed its trust in us for the operational follow-up and MRO of its engines. GDAT Group has an ambitious fleet development strategy, and we're going to support them with the best possible services for their success." GDAT stands as China's premier low-altitude economy entity, concentrating on helicopter operations and operating the largest H225 fleet in the nation. It offers helicopter rescue, transport, notably offshore transport, and aerial work missions, alongside serving as a highly proficient helicopter maintenance firm. Founded in 2012 and headquartered in Shanghai, GDAT boasts subsidiaries in Hong Kong, Suzhou and Ningbo. GD Helicopter Finance (GDHF) is an emerging helicopter leasing and finance enterprise based in Dublin, Ireland. It aims to swiftly expand a substantial portfolio of state-of-the-art, efficient, cost-effective, multi-mission helicopters, including the Arrano-powered H160, and lease them to clients globally.

SIA Engineering Group posts net profit of SG$97.1 million for financial year 2024

The SIA Engineering Group has unveiled its financial performance for the fiscal year ending March 31, 2024, reporting a revenue of SG$1,094.2 million. This represents a notable increase of 37.5% compared to the previous year, driven by a sustained recovery in demand for aircraft maintenance, repair and overhaul (MRO) services. Despite a rise in group expenditure by 32.8%, primarily attributed to increased manpower costs and material usage, the growth in revenue outpaced expenditure. The Group's operating performance witnessed a significant turnaround, improving by SG$28.6 million year-on-year. This marks a shift from an operating loss of SG$26.3 million in the preceding year to an operating profit of SG$2.3 million, marking the first year of operating profit since the onset of the pandemic. Excluding government wage support recorded in the previous year, operating performance improved by SG$39.8 million. Moreover, the share of profits from associated and joint venture companies saw a substantial increase of SG$23.2 million (+29.8%), reaching SG$101.0 million. Profits from the engine and component segment surged by 28.2% to SG$97.7 million, while profits from the airframe and line maintenance segment grew to SG$3.3 million. In the final quarter of the financial year, the SIA Engineering Group concluded its participation in the Pratt & Whitney PW1500G engine Risk-Revenue Sharing Programme (RRSP), resulting in a one-time write-off of SG$25.1 million in net assets. Including other non-operating items, the Group achieved a net profit of SG$97.1 million for the financial year ended March 31, 2024, marking a SG$30.7 million increase compared to the previous year. (US$1.00 = SG$1.35 at time of publication).

C&L Aerospace expands global reach with new warehouse in Johannesburg

The new warehouse in South Africa *© C&L Aviation Group*

C&L Aerospace, a subsidiary of the C&L Aviation Group, has inaugurated a new warehouse in Johannesburg, South Africa, slated to be fully operational by July 2024. Positioned strategically between Johannesburg's two main airports, O. R. Tambo International Airport and Lanseria International Airport, this facility serves as a pivotal shipping hub for customers across the African region. Initially stocking inventories for ERJ 135/145 and ATR 42/72 aircraft, the warehouse will expand to accommodate other aircraft types as demand dictates. "This new warehouse location allows us to more swiftly support our customers in Africa, which is a burgeoning market for us," remarked Chris Kilgour, CEO of C&L Aviation Group. "This warehouse is yet another stride in a coordinated plan we have initiated to establish and provision distribution centres strategically around the world." In a bid to further enhance support for their global customer base, C&L's expansion efforts for 2024 included the opening of two additional facilities earlier this year in Wichita, KS, and Leipzig, Germany. Additionally, C&L maintains warehouses in the United States, England, Scotland, and Australia.

WLFC posts first-quarter pre-tax income of US$29.9 million

Willis Lease Finance Corporation (WLFC) announced record first-quarter total revenues of US$119.1 million and record quarterly pre-tax income of US$29.9 million. For the three months ended March 31, 2024, aggregate, core lease rent and maintenance reserve revenues were at an all-time high of US$96.8 million, up 26% as compared to US$76.7 million in 2023. The growth was predominantly driven by core, recurring lease and maintenance revenues associated with a strong, resurging aviation marketplace and airlines leveraging WLFC's leasing, parts and maintenance capabilities in order to avoid protracted engine shop visits. WLFC's reported lease rent revenue of US$52.9 million in the first quarter of 2024 was in-line with lease rent revenue of US$53.2 million in the first quarter of 2023. During the three months ended March 31, 2024, the company purchased equipment (including capitalised costs) totalling US$62.8 million, which consisted of two aircraft and four engines and other parts and equipment purchased for its lease portfolio. During the three months ended March 31, 2023, the company purchased equipment (including capitalised costs) totalling US$55.7 million, which consisted of five engines and other parts and equipment purchased for its lease portfolio. Maintenance reserve revenue was US$43.9 million in the first quarter of 2024, an increase of 86.7%, compared to US$23.5 million in the same quarter of 2023, reflecting the high level of usage of the company's assets by its customer base. WLFC's engines on lease with "non-reimbursable" usage fees generated US$37.6 million of short-term maintenance revenues in 2024, compared to US$23.5 million in the prior year. There was US$6.3 million of long-term maintenance revenue recognised in the three months ended March 31, 2024, compared to no long-term maintenance revenue recognised for the three months ended March 31, 2023. As of March 31, 2024, and March 31, 2023, there were US$26.7 million and US$13.7 million, respectively, of deferred in-substance fixed-payment use fees included in unearned revenue associated with engines on short-term leases. These deferred in-substance fixed-payment use fees represent portfolio utilisation beyond the maintenance reserve revenues reflected in the company's unaudited consolidated statements of income.

Pro Star Aviation commences construction on cutting-edge facility

Pro Star Aviation has announced the commencement of construction on a new USD$12.4 million, 37,000 ft² hangar and office complex at the Grand Rapids Gerald R. Ford International Airport. The development encompasses a multi-bay aircraft maintenance hangar with a supporting mezzanine, alongside a 17,000-square-foot steel-framed office building. The hangar is designated to operate as a dedicated Pilatus Aircraft sales and service centre. Additionally, the project includes the construction of a new 56,000 ft² ramp and a taxiway connector. Pioneer Construction is undertaking the role of the project's principal contractor, with Bowers and Associates serving as the architects. The expansive two-storey office complex incorporates substantial clerestory sections made entirely of glass, facilitating the influx of natural light into the building. The interior boasts contemporary amenities such as a pilot lounge and customer relaxation zones. Construction is anticipated to conclude by the end of 2024, with occupancy expected in early 2025. Henry Laughlin, Group CEO, remarked, "Our company has witnessed remarkable growth over the past decade, and this expansion into the West Michigan area is a significant achievement. We eagerly anticipate providing outstanding support to our Pilatus customers in the region from our exceptional new premises."

Ground breaking at Grand Rapids Gerald R. Ford International Airport © *Pro Star Aviation*

In response to mounting financial difficulties and a decline in deliveries to **Boeing Co., Spirit AeroSystems Holdings Inc.** intends to trim its workforce by approximately 450 employees at its Wichita, Kansas headquarters. The reduced production of 737 Max airframes and other components has necessitated a downsizing, according to a spokesperson representing the company. Affected staff members will be notified in the upcoming weeks. Spirit is facing heightened financial strain and undergoing scrutiny from various federal investigations alongside its former parent, Boeing. This follows a near-catastrophic incident involving a 737 Max aircraft in January. The aerospace supplier disclosed a depletion of US$444 million in free cash during the first quarter, attributing it to the decreased deliveries of 737 airframes to Boeing and losses incurred from contracts to supply Airbus SE's A220 and A350 airliners. Boeing confirmed discussions regarding the potential acquisition of Spirit in March, a move aimed at stabilising its supply chain and gaining more direct oversight over aircraft production. The decline in Spirit's shipments to Boeing ensued after the planemaker ceased acceptance of 737 fuselages with missing or incomplete components from the supplier. Both companies anticipate a reversal of this trend in the latter half of 2024, coinciding with the implementation of new quality measures.

GE Additive is undergoing a transformation, emerging anew as Colibrium Additive – an entity within the GE Aerospace fold. Forming part of **GE Aerospace's Propulsion & Additive Technologies (PAT) division**, Colibrium Additive, formerly known as GE Additive, was established towards the end of 2016. Today, it stands as a trusted ally and producer of industrial metal 3-D printers, metal powders and services for a burgeoning clientele spanning various industrial sectors. The moniker "Colibrium Additive" is a fusion of "collaborative" and "equilibrium," encapsulating the company's commitment to standing alongside customers throughout their additive journey, delivering dependable and scalable manufacturing solutions. This rebranding signals Colibrium Additive's proactive stance at the forefront of the additive industry, engaging with regulators, partnering with academia, and nurturing the next wave of additive talent. As a stalwart in the additive sector, the company pledges to continue offering reliable, balanced perspectives as the industry navigates through evolution and change. "We were ready for a change. GE becoming three standalone companies provided an ideal opportunity to review our corporate identity," said Shaun Wootton, Head of Communications at Colibrium Additive. "Our new name and brand identity are both modern and dynamic. Both were designed to reflect our focus and company values, the pace of change in the additive industry, while accruing to GE Aerospace's overall brand identity," he added. As part of this brand overhaul, both the Concept Laser and Arcam EBM legacy brands will be retired. Originally, these names belonged to the two companies acquired by GE in November 2016 to form GE Additive, and they have since served as product brands for Colibrium Additive's printer range. Furthermore, AP&C, Colibrium Additive's powder business headquartered in Montreal, Canada, has undergone a subtle brand rejuvenation, featuring a new colour palette, a slightly tweaked logo and an updated attribution line, "a Colibrium Additive business," aligning with GE Aerospace's brand framework

Lux-Airport and Luxair open the new aircraft maintenance hangar

Lux-Airport and Luxair has marked a significant moment in its collaborative journey with the unveiling of the new Luxair aircraft maintenance hangar. The official ceremony was graced by the presence of Mrs. Yuriko Backes, Minister of Defence, Mobility, Public Works, Gender Equality, and Diversity, alongside Mrs. Jacqueline Breuer, Mayor of Sandweiler. This new structure, spanning 110 metres by 100, stands at a height of 22 metres and covers an area of around 5,000 m². It is designed to simultaneously house up to three Boeing 737s, offering optimal space for the maintenance of Luxair's forthcoming aircraft. Apart from being environmentally sustainable, the Luxair maintenance hangar also incorporates multiple maintenance workshops, spare parts storage facilities, and administrative offices. "The aviation field is experiencing constant growth in our country, which requires infrastructure, services and maintenance facilities adapted to meet the needs of its customers. In order to remain at the forefront of modern aviation and succeed on the international scene, the construction of this new maintenance hangar was essential for our national airline, Luxair, to guarantee the reliability of its operations. This new hall perfectly illustrates the dynamism of the aviation sector, aiming to make the airport a strategic, modern and exemplary infrastructure for this domain," announced Yuriko Backes, Minister of Defence, Mobility and Public Works and Gender Equality and Diversity.

Azzera, Inc. (Azzera), a company specialising in sustainability solutions for business aviation, has been selected by **Pratt & Whitney**, an RTX business, to provide carbon credits for **Pratt & Whitney Canada's Carbon Offset Service**. Azzera will supply a portfolio of high-quality carbon credits, rated through its impact score, ensuring transparency and integrity. This collaboration marks a significant step towards impactful action in aviation. Pratt & Whitney Canada's Carbon Offset Service is available to all Pratt & Whitney Canada-powered aircraft, including business jets, helicopters and regional and general aviation aircraft. It serves as a flexible add-on to the Eagle Service™ plan or Fleet Management™ programme engine maintenance agreements. This service offers customers a straightforward way to offset the carbon footprint caused by their aircraft usage in a transparent and cost-effective manner, aiding their sustainability objectives. "Our collaboration with Pratt & Whitney Canada underscores our shared commitment to driving sustainability in the aviation sector," said Puja Mahajan, CEO and Co-Founder of Azzera. "The Azzera Impact Score ensures that the carbon credits provided are both high-quality and have verified and significant environmental impact. Working with customers such as Pratt & Whitney Canada, we are making it easier for aircraft operators to not only offset their emissions but also to understand and quantify the positive environmental impact of their contributions." Azzera plays a crucial role in Pratt & Whitney Canada's Carbon Offset Service. The Azzera Impact Score, a distinctive feature of Azzera's services, serves as a reliable quality assurance measure for carbon credit projects. It addresses concerns in the voluntary carbon markets regarding the validity and impact of carbon credits, offering a tangible and auditable metric that mitigates the risk of greenwashing. By evaluating each project's critical financial and technical achievements, the Azzera Impact Score guarantees impactful environmental action and provides meaningful comparisons vital to public interest. "We are committed to providing our customers with a seamless way to offset aviation carbon emissions," said Irene Makris, Vice President, Customer Service, Pratt & Whitney Canada. "Through our arrangement with Azzera, we offer our customers a means to compensate for their aviation emissions and help them ensure the quality of their sustainability investment. We are focusing exclusively on CORSIA-eligible credits, adding an additional layer of due diligence to our Carbon Offset Service."

Kate Harbosin, Business Development, Business Transformation & Aftermarket Services, P&WC and Puja Mahajan (r) CEO Azzera *© P&WC*

MRO Aftermarket Hotspot – Florida

What makes the sunshine state so attractive?

By David Dundas

Florida is a popular location with a number of MRO aftermarket operators, and we were keen to find out from some of them what it is about Florida that made it such a strategically good location for them, along with many other aviation-related companies. We wanted to know about the location fits in where logistics and distribution are concerned, if there are any skill shortages in the region, and whether there are any cost advantages.

Location and infrastructure

To begin with, we wanted to discover how Florida's geographic location and infrastructure support its position as a preferred destination for aviation companies.

Jason Reed, President, Flight Solutions Group, a GA Telesis company describes how working in the aviation industry in southern Florida has become a generational thing: "The South Florida region personifies the aviation hub for good reason. Aviation is in the DNA of the state, with many employees being second or third-generation aviation families within the South Florida area. Florida consistently provides a wealth of aviation talent, tax benefits, distribution facilities, MRO, and global logistic ease all in one space. The ability to have a close-knit group of aftermarket suppliers and MROs in one space creates an aviation ecosystem like no other around the world."

Oscar Torres, President and CEO, Kellstrom Aerospace Group, Inc. again pinpoints south Florida as the key location: "Florida, and specifically South Florida, provides a number of significant advantages for aviation companies. Its geographic location combined with thriving tourism have made Florida a gateway to and from international destinations, primarily South and Central America, the Caribbean and Europe which has resulted in many of the largest global airlines establishing hubs and significant operations throughout the State. In addition, the state is home to several Universities and Technical Schools that have created programs specifically centred around all aspects of the aviation industry," adding that "the most important determining factor in making a geographic area a preferred destination for any organization is the quality of the available workforce."

Peter Kjeldsen, COO Leki Aviation sees Florida as an ideal location to serve customers in both North and South America: "Leki Aviation's facility is 20 minutes west of Fort Lauderdale Airport and 40 minutes north of Miami International Airport. It provides excellent connectivity with access to an extensive network of daily flights, making it a great gateway to support our customers in North and South America for both our

> "Florida, and specifically South Florida, provides a number of significant advantages for aviation companies."
>
> *Oscar Torres, President and CEO, Kellstrom Aerospace Group*

Oscar Torres, President and CEO
Kellstrom Aerospace Group, Inc.

distribution sales and our MRO facility."

David Whetstone, Director – Strategic Sourcing / Global Engine Acquisitions at PTS Aviation, a StandardAero company, sees Florida providing good access even further away. "Florida's geographic location and close proximity to the Caribbean and Central/South America makes the state a key international hub for the aerospace industry. Florida's excellent transportation linkages also enable business with customers in Europe and West Africa to be conducted within the same business day, with same-day flight arrivals available as required."

Timothy Russo, President STS Component Solutions, part of the STS Aviation Group, highlights the presence of a diversified workforce in Florida. "Florida's geographic location and infrastructure contribute significantly to the success of STS Aviation Group (STS) and are extremely appealing for aviation organizations for several reasons. Primarily, the strategic geographic location allows STS to effectively serve our global customer base, reducing transportation costs and transit times. Additionally, aerospace companies based in Florida reap the advantages of a proficient and diversified workforce with expertise in all aspects of aerospace – engineering, maintenance, manufacturing, and supply chain management."

© Leki Aviation

Logistics and global distribution

We then wanted to get a better idea of how Florida fared in terms of logistics and global distribution.

According to Peter Kjeldsen, "Florida's well-developed transportation infrastructure, with its extensive access to airports and flights, ensures the efficient movement of our daily shipments to customers across the Americas. The transit time is crucial, and our location's extensive connectivity network makes it an ideal choice to have the shipments reach our customers."

David Whetstone focuses on speed to market. "With speed-to-market being one of the most critical factors in conducting business within our industry, Florida stands out as a premier location from where to do business with clients in Central & Latin America, thanks to the state's multitude of international airports and shipping ports," while Timothy Russo identifies the advantages of both seaports and airports: "Florida's transportation infrastructure, which includes multiple international airports and seaports, provides various options for import/export of material to all global customers, saving both time and money. Whether supporting our customers in South America or the Middle East, Florida's geographic location is pivotal in providing timely and cost-effective logistics solutions."

Jason Reed sees the criticality of being able to distribute from Florida: "The South Florida region, where most aviation companies lie within the state, provides three different airports for which to distribute products around the world. Except for Asia, the region has

Peter Kjeldsen, COO Leki Aviation

David Whetstone, Director Strategic Sourcing and Global Acquisitions, PTS Aviation

> "Florida stands out as a premier location from where to do business with clients in Central & Latin America."
>
> *David Whetstone, Director – Strategic Sourcing / Global Engine Acquisitions, PTS Aviation*

State of the employment market

Our next question focused on the employment market in Florida and how the respondents felt Florida was fairing, bearing in mind there is a skills shortage in many industrialised nations.

David Whetstone pinpoints the wealth of industry professionals in the tri-county area Florida's large population of industry professionals – especially within the tri-county area which: "represents rich pickings for any aerospace employer, and new talent is continuously entering the local market thanks to the large number of local colleges offering relevant degrees. Florida is well known for its active aerospace MRO industry, and the state continues to attract new players. Florida itself has significant appeal for employees looking to relocate, with incredible diversity, a peninsula offering almost 365 days of sunshine, and access to all needed direct trucking or direct flights around the globe. North and Latin America alone represent over 9,000 aircraft in operation, which is over 40% of the world's flying fleet. Thus, the strategic ability to provide distribution from the area is critical."

Oscar Torres is very pro Florida as a great location, save for the cost of real estate, and high insurance costs owing to the threat of windstorms. However, he makes it clear that "Florida has several significant advantages with regards to supply chain considerations within our industry. With the possible exception of the threat of severe windstorms, weather does not have an adverse impact on logistics and distribution throughout any portion of the year. Also, Florida's location in the Southeast portion of the Continental United States, coupled with the large number of large international airports and seaports, create an ideal location for relatively quick access to the rest of the Americas, Europe, the Middle East and Africa. The one issue that Florida does face from a logistics and distribution standpoint is its relatively higher cost than other regions. The combination of high real estate costs and higher insurance costs, because of the threat of windstorms, does create higher facilities and personnel costs relative to other logistics and distribution hubs."

Engine components Standard Aero

Timothy Russo, President STS Component Solutions

© STS Aviation Group MLB

an excellent reputation for education. However, he does warn about salary package costs: "On the flip side, Florida is now one of the most expensive U.S. states to reside in, and organizations must therefore ensure that their compensation packages remain competitive in order to attract and retain talent."

Timothy Russo recognises Florida as a leader of employment in the aviation industry, adding that: "With the presence of the nation's premier aerospace education institution, Embry-Riddle Aeronautical University, Florida benefits from a robust talent pipeline that continually feeds the aerospace industry. While STS faces similar skill shortage challenges, being in close proximity to the talent pool offers unparalleled advantages."

Jason Reed sees employment being strong and ever-growing in Florida. "Coming back to the employee tax benefits, talent availability, and distribution/MRO facility presence in the area, the ability to grow employment in the area is endless. When one reviews a resume for employment at an aviation company today within the South Florida region, you will see a common thread of backgrounds working in the South Florida parts or MRO space. In addition, the overall size of the market and the weather here create a large draw of talent from around the US as well."

Oscar Torres, as with others, acknowledges that demand for skilled technicians currently outstrips supply in Florida: "Because Florida is an aftermarket services aviation hub, these market conditions have resulted in great demand for skilled technical labour to support the existing fleet. As noted previously, the presence of aviation companies and educational facilities focused on aviation within the state create a strong pool of qualified personnel for companies operating in the state. However, the demand for those skills has continued to exceed supply creating a very competitive dynamic amongst aviation companies struggling to grow their workforce to keep pace with market opportunities."

Peter Kjeldsen also acknowledges the shortage of skilled technicians. "While skill shortages are a global challenge, Florida is not exempt. However, we have managed to assemble an exceptional team to support our business. We are always on the lookout for talented individuals to join our mission and have been fortunate to find the perfect team members."

> "The overall size of the market and the weather here create a large draw of talent from around the US as well."
>
> *Jason Reed, President, Flight Solutions Group*

Cost advantages

Our final question was a simple and straightforward one. Does the location of Florida offer cost advantages?

Flight Solutions Group's Jason Reed gave an equivocal yes to the question. "Yes, Florida offers multiple advantages of company state income tax rates, no employee state tax, and no overall state inventory tax which are all significant

Jason Reed, President Flight Solutions Group

> “Cost is probably one of the few areas where Florida may not provide as many advantages as other locations.”
>
> *Oscar Torres, President and CEO, Kellstrom Aerospace Group*

© Kellstrom Aerospace

corporate and employee benefits. Many states around the country cannot offer the same level of benefits. Not only that, the lack of need for shovels and snowblowers always helps the wallet as well.”

Kellstrom Aerospace Group’s Oscar Torres was less certain about any cost advantages, stating that: “Cost is probably one of the few areas where Florida may not provide as many advantages as other locations. The political and tax environment in the state does provide certain cost benefits as compared to other locations. However, the cost of real estate and insurance, two very important cost factors for both aviation businesses and employees have led to an environment whereby costs are higher than other locations. Ultimately, the other benefits that we have discussed provide great opportunities and incentives to locate within the state, but costs would not be one of the factors that I would say probably falls on the disadvantage side of the ledger.”

Peter Kjeldsen at Leki Aviation feels the cost advantages are not as great as they used to be, saying that: “Compared to other states in the U.S., Florida offers lower operating costs for businesses, but this has been diminishing over the past several years. Although cost is an essential factor, and compared to other states and locations, Florida might be a more expensive choice, we still see this as the preferred location due to the connectivity in and out of Florida and proximity to our customers.”

PTS Aviation’s David Whetstone is more positive about the situation, commenting that: “Florida certainly does offer cost advantages with respect to logistics, when compared to other regions which lack the Sunshine State’s transportation hubs, especially with regards to doing business with customers in Central/South America. Florida’s cost of living is – as already noted – one of the highest in the nation, but this is offset by the excellent climate (which maximizes productivity in terms of working days per year) and the state’s large aerospace industry, which offers agglomeration benefits in terms of the local supply chain and labour pool.”

Lastly, Timothy Russo of STS Component Solutions highlights the tax advantages: “The state of Florida actively supports the aviation industry by implementing initiatives focused on facilitating business growth and fostering innovation. Recently, STS joined a group of aerospace businesses based in Florida at the Singapore Air Show. Each company showcased their capabilities, whether in aerospace manufacturing, supply chain, or MRO, to thousands of visitors within the Asia Pacific region. Additionally, Florida has a relatively favourable tax environment for businesses compared to some other states. It has no state income tax, which can be attractive for both businesses and individuals working in the aviation industry.”

All in all, it would seem that there are more advantages than disadvantages when it comes to operating MRO facilities out of Florida, the prime reason being it’s geographical location, which may also go a long way to explaining why there are so many aviation-related businesses in the state.

StandardAero Fort Myers team gets FAA award

© StandardAero

Jay Aiken, Standard Aero and Peter Jorssen, AviTrader *© AviTrader*

Standard Aero´s Growth Plans

Peter Jorssen spoke to Jay Aiken, Vice President Sales at StandardAero

AviTrader MRO: Standard Aero has an impressive portfolio of services. What do you believe are the most important elements of your portfolio?

Jay Aiken: We pride ourselves on our diverse range of services and products, catering to various product and engine types. With a vast network spanning over 50 locations in 12 countries worldwide, we maintain a strong global presence, enabling us to offer local support on a global scale. Customer satisfaction is at the core of our values; as an independent MRO, we prioritise our customers' needs above all else. StandardAero sets itself apart from Airline MRO's and OEMs because we aren't distracted with production or have our own engines to support.
We have a very large component repair business, boasting unparalleled capabilities in this field. Our focus on centres of excellence ensures that each location specialises in specific engine types, leveraging our extensive network to deliver tailored solutions. We utilise our large network to really focus on a particular engine type as much as we can.

You've recently expanded out your CFM56-7B operation in Dallas. Can you tell us a little bit more about that expansion?

It's very exciting in Dallas right now. We opened the facility in Q3 of last year, introducing hospital shop services for the CFM56-7B currently with full repair and overhaul capabilities to come later this year. This summer we're expanding into an additional 150,000-square-foot facility located adjacent the DFW test complex.

Last year you signed an agreement with CFM International to provide maintenance services for the LEAP engine. How far are you with ramping-up this major project?

We announced at the MRO America's last year that we were awarded the license, so this was a really fast ramp-up. Now, we're fully operational and we're inducing quick turn around and continue time engine maintenance (CTEM) work scopes for both the LEAP-1A and LEAP-1B.
Currently, our test cells are undergoing correlation in San Antonio, and by the end of this year, we'll be inducing performance restoration shop visits for both the LEAP-1A and LEAP-1B.

Now with the CFM56-7B and the LEAP engine, you're covering a significant market. How many engine shop visits do you foresee in the future?

Given our redundant capabilities across our facilities, our Dallas Fort-Worth facility is a pivotal hub, as you've noted. When we reach maturity there, we anticipate a capacity of 200 engine overhauls annually. In San Antonio, once we achieve optimal efficiency with the LEAP engines, we'll be able to service between 200-250 shop visits a year. Our Winnipeg facility in Canada will continue to service 100-150 overhauls annually. In total, we have two CFM56 test cells in Winnipeg, one in DFW and San Antonio will have two test cells for the LEAP engines, bringing our total capacity across the three facilities to an estimated 500 engine overhauls a year.

> **"Now, we're fully operational and we're inducing quick turn around and continue time engine maintenance (CTEM) work scopes for both the LEAP-1A and LEAP-1B."**

Scott Butler, CCO, Ascent Aviation Services and Peter Jorssen *© AviTrader*

We are a Full-Service Aircraft Maintenance Provider

AviTrader speaks to Scott Butler, CCO of Ascent Aviation Services

By Peter Jorssen

AviTrader MRO: Ascent Aviation Services has just broken ground at the Pinal Air Park in Marana, Arizona, on two new wide-body hangars. With this project, you're investing US$55 million on a 180,000-square-foot hangar facility. Scott, how will you be utilizing this area?

Scott Butler: We're going to be performing the passenger-to-freighter conversions for IAI, Israel Aerospace Industries. So that will start at the end of 2024 and continue for decades to come. And we'll have two lines of 777 conversions going on, as well as the C-checks and everything involved with that. It's a really significant investment into the Marana community, into the Arizona community, and into our global aviation community.

> "It's a really significant investment."

Ascent will convert two lines of Boeing 777-300ER aircraft for Israel Aerospace Industries in the new hangars. Can you tell us more about this cooperation with IAI?

It's a 15-year contract that's going to cover a multitude of aircraft for a multitude of customers. It'll involve obviously the conversion of the aircraft, the heavy maintenance of the aircraft, and paint and other services with the aircraft. Many of these customers are already our existing customers, so the P2F conversion will be an expansion of our offerings to the market. IAI will be our customer and the STC holder, but we will also work very closely with the end operator, many of who we already work with, like DHL and Kalitta and Atlas Air.

IAI is in the Middle East, and it's not really in the neighbourhood of Arizona. Is Ascent providing services to worldwide customers?

We are the only North American provider of this service for IAI. We're only going to be doing the 777-300ER at our site. They've launched two other sites worldwide in the Middle East at Etihad Engineering, also in Korea at Sharp Technic, and so we're going to be providing the fourth location so they can serve that market immediately and replace the existing, 747s and other widebody freighters in the market.

How would you summarise or describe your service portfolio?

We are a full-service aircraft maintenance provider. We have landing gear, we've got storage, we've got heavy maintenance, now we have conversions. There's pretty much nothing on an aircraft we can't touch and can't repair. Ascent is serving all aircraft types from Airbus to regional jets, also Boeing 777s and everything in between. I think at this point, it's safe to say we're one of the largest MROs in North America.

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Kellstrom Aerospace is uniquely capable of supporting aircraft owners, operators and MROs with cost-saving solutions and value-added services at each phase of the aircraft's lifecycle. We work closely with our clients to ensure that as their needs for aircraft and engine parts change, we are well positioned to offer solutions to maximize their profitability. Our products and services are tailored to the commercial aftermarket enabling organizations to:

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Managing the Availability of Spare Engines

Experts recommending strategies in times of shortages

By David Dundas

In the post-pandemic period, the commercial aviation sector of the aerospace industry has recovered quicker than many had predicted or expected. One of the consequences is that the manufacturing sector, especially the production of new aircraft and engines, has not recovered to the same degree, primarily through a lack of qualified engineers.

Thus carriers, especially those with larger fleets of aircraft, have been forced to look to alter and adapt previous strategies to keep their aircraft operational, and one area that has become key to any strategy has been that of spare engines. We decided to approach a dozen key companies involved in the MRO aspect of aircraft engines to discover what cost-effective solutions were being offered where spare engines were concerned.

Is the industry facing a shortage of spare engines?

During the COVID crisis airlines tried to preserve cash by delaying engine shop visits. The recovery of the industry has created a peak in the number of shop visits and consequently a high demand for spare engines. We asked whether the industry currently faces a shortage in the availability of spare engines?

Oliver James, VP Trading at AerFin comments: "Significant delays in new aircraft deliveries have forced airlines to operate older aircraft longer, creating additional spare engine requirements that were not initially anticipated.

> ***"Significant delays in new aircraft deliveries have forced airlines to operate older aircraft longer."***
>
> *Oliver James, VP Trading, AerFin*

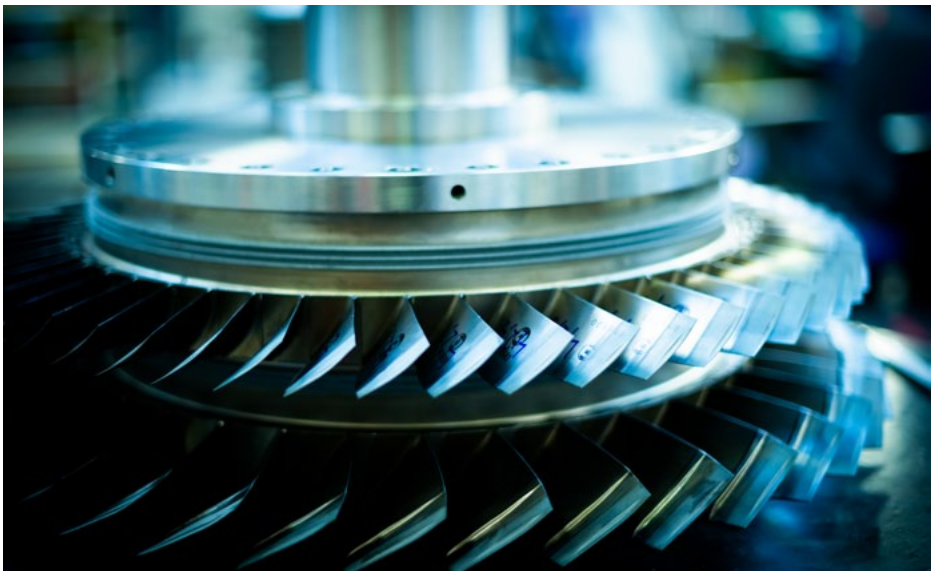
Oliver James, VP Trading, AerFin

Simultaneously, MRO capacity issues, due to labour and material shortages, have resulted in longer turnaround times for engine maintenance, further increasing the demand for spare engines. As a result, certain engine types are now experiencing demand that exceeds supply."

Anca Mihalache, Managing Director at AERO CARE feels that finding certain engine types for lease has become very challenging, advising that "During the pandemic times, and even after, most airlines and lessors did their upmost to avoid shop visits in order to maintain availability of cash. But this is only sustainable for so long, and we have now reached a point where these shop visits are desperately needed for airlines to be able to continue flying this summer."

Evren Akca, Global Account Manager at Aero Norway says, succinctly, that: "the industry is currently experiencing a shortage of spare engines due to the increased demand for shop visits after the recovery period. The backlog from delayed maintenance has led to a higher need for spare engines, creating a supply challenge," while Andres Jimenez - Vice President Materials and Operations at Aero Engine Solutions feels that: "Shop visits are taking longer than usual due to MRO's capacity problems, backlog, and staff retention. These issues create a domino effect that impacts both assets and materials' availability world-wide."

Anca Mihalache, Managing Director, AERO CARE



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Interestingly, Wasim Akhtar, Director of Engines at AJW feels that: "the current shortage of useable serviceable engines will stay with us at least for the next 18-24 months while the OEMs get to grips with their issues on the new-technology engines and associated aircraft," while John McKirdy, CCO at Kellstrom Aerospace Group, Inc. is of a like mind: "The industry continues to cooperate to find solutions to a global problem that has the potential to last for the next two to three years as availability for new engines improves and turnaround time, available materials improve, and maintenance is overlaid by the increasing demand by the flying public and cargo operations." Also in agreement is John McCarthy, Director of VAS Europe, VAS Aero Services who notes that: "We believed airlines were going to reduce some of the impact from delayed maintenance by exiting or retiring the aircraft with the alignment of new deliveries. The fact that we face delayed deliveries with narrow-body aircraft creates additional pressure to operate aging fleets longer, resulting in a higher demand for engine and material availability. The situation is more severe than expected and we expect it will continue through 2025."

Bruce Ansell, Technical Manager Engine Division, APOC Aviation points out that: "There is an acute shortage of most engines variants in the single-aisle sector. 7B's have been taken up by operators to hold as spares, the extended shop visit (SV) times are playing havoc with fleet maintenance planning, and airlines are keeping these spare engines to cover any shortage in availability. Plus, the return to service of Next Gen B737s has also resulted in further demand."

Toma Matutyte CEO at Locatory.com, part of Avia Solutions Group, bluntly identifies the main cause of a lack of spare engines – "travel recovery has triggered a wave of overdue engine repairs," adding that: "The engine shortage has pushed some airlines into a precarious situation. A lot of carriers have been forced to

> ***"During the pandemic times, and even after, most airlines and lessors did their upmost to avoid shop visits in order to maintain availability of cash."***
>
> *Anca Mihalache, Managing Director, AERO CARE*

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reduce their flight schedules to create a buffer and minimize cancellations. This might improve on-time performance, but it comes at the cost of reduced travel options for passengers."

Gunnar Már Sigurfinnsson - President of GA Telesis Engine Services Oy points out that "airlines became more conservative due to uncertainty in investments in general, among others renewing their fleet, that increased the use of older generations, and we definitely see a shortage of, for example, the CFM56/7b – as they are in use more than probably planned a couple of years ago." However, Fabrizio Laurenti, Head of Leasing, MTU Maintenance Lease Services feels that demand varies across engine types, commenting that: "In general, we see high, scarcity-related demand for lease engines in most of the platforms that we support: mainly, for CFM56-7B, V2500 (both Select and pre-Select), GE90-110/115B and CF34-10E engines. The CF6-80C2 is back to pre-COVID stability and demand has slightly softened recently. There is still soft demand for the CFM56-5B but this is likely to pick up with the coming summer. The lease demand for the PW2000 is almost at a standstill."

David Blackburn, Senior Vice President, StandardAero identifies manpower shortages as being at the root of the engine shortage problem: "The aerospace sector is still experiencing a lack of skilled technicians, mechanics and aviation-specific asset managers due to the retirement wave experienced during 2020-21, and this has also led to labour and used serviceable material (USM) USM problems, coupled with delays associated with engine and component repairs. This has left our industry with a noticeable shortage of available/serviceable engines and components to support the current demand in the engine marketplace."

How do airlines cover their spare engine needs?

We then wanted to know how airlines should cover their spare engine needs based on operational requirements and financial aspects.

Toma Matutyte came up with several viable options, including: "And it now seems that engine pooling, where airlines with similar engines share a pool managed by a third party, is gaining more and more popularity. This approach has worked perfectly well for smaller airlines, as it reduced individual investment and spread out the risk. Today, it is becoming more popular with operators of all kinds. Power-by-the-hour agreements are still popular, as both small and larger airlines are willing to let the manufacturer take care of the spares and guarantee availability. It's a good way to avoid upfront costs, but those usage fees can add up over time."

Gunnar Már Sigurfinnsson advises that: "The airlines are more frequently fully utilising the engines, and they do that by being creative on engine work scoping to extend the green time of the engines. Modular replacement is an example of how engine owners fully utilise the life of an engine which otherwise would be partly lost," while John McKirdy states that "the more effective an airline can be in on-wing troubleshooting of deteriorating

© CFM56-7B at DFW

Fabrizio Laurenti, Head of Leasing, MTU Maintenance Lease Services

> ***"We can support airlines opting for a lower level of spares to invest in other strategic initiatives and get their engine only where and when actually needed."***
>
> *Fabrizio Laurenti, Head of Leasing, MTU Maintenance Lease Services*

and problematic engines and enacting a preventive maintenance plan, the longer these engines can perform on wing and generate much-needed lift hours." He points out that: "Supporting effective on-wing troubleshooting, the Vortex Aviation organization within Kellstrom supports airlines on wing on site and in our four shops in Europe and in the US in effective hospital shop and on-wing maintenance troubleshooting. These experts are dispatched to the aircraft to solve engine problems and minimize aircraft and engine downtime and direct maintenance costs by using the latest technology, equipment, and tooling to keep an airline's engines flying.

Fabrizio Laurenti makes it clear that the question "depends entirely on an airline's commercial goals and on relevant engine fleet age, although the going industry standard is to reserve ten percent of an engine fleet as spares. With the provisions of MTU Maintenance Lease Services, which include engine exchanges, short-term leasing as well as long-term leasing through our network partners, we can support airlines opting for a lower level of spares to invest in other strategic initiatives and get their engine only where and when actually needed."

David Blackburn feels that "Airlines should focus on bolstering their serviceable spare engine programs by strategically planning on reliable and economical engine maintenance and repairs, in both the short and long term. As such, airlines should ensure that they are supported by MRO providers which proactively invest in engine modules and serviceable material, in order to anticipate and meet the needs of operators," pointing out that: " StandardAero, for example, is constantly and actively purchasing available engine assets in the marketplace in order to 'feed' our overhaul facilities with high-quality parts at least 2-3 years in advance, focusing on well-traced and well-maintained powerplants and material."

John McCarthy recommends airlines follow four key steps: "Engine planning should be scoped up to five years ahead to secure future engine shop slots. Plan critical hard-to-get material such as Life Limited Parts in advance with your USM provider and shop. Plan spare engine availability by incorporating a mix of owned, short- and long-term lease, and access to guaranteed engine availability on demand. Utilise a carefully integrated long-term operational approach with tailored support and financial solutions with a mix of exchange and lease engines, as this can provide an airline with complete security of supply."

Anca Mihalache is very pragmatic: "Green time leases are rarely an option at the moment and fresh-from-shop engines are very sought after, making it difficult to source spare engines. At AERO CARE, we advise our airline customers that forward planning is the most important element in ensuring their spare engine needs are met. But planning requirements nowadays are different from planning pre-COVID, now it needs to be done many months, if not years, in advance." Evren Akca is similarly succinct: "Airlines should implement a robust planning system for shop visit scheduling and collaborate with flexible MRO providers that can support urgent needs, a factor we understand the importance of at Aero Norway. This strategic planning helps balance operational requirements with financial limitations, ensuring spare engine availability when needed."

Evren Akca, Global Account Manager, Aero Norway

> ***"Airlines should implement a robust planning system for shop visit scheduling and collaborate with flexible MRO providers that can support urgent needs."***
>
> *Evren Akca, Global Account Manager, Aero Norway*

> ***"The leasing and aftermarket sectors should work together to create and manage an asset/lease portfolio for operators and MROs that don't have the infrastructure or knowledge in place."***
>
> *Andres Jimenez, Vice President Materials and Operations, Aero Engine Solutions*

Andres Jimenez, Vice President Materials, Aero Engine Solutions

Andres Jimenez feels that: "The leasing and aftermarket sectors should work together to create and manage an asset/lease portfolio for operators and MROs that don't have the infrastructure or knowledge in place to deal with the maintenance, risk and extended lead times involved in the process," while Wasim Akhtar makes it clear that: "Airlines need to look at their future schedules, current fleet, current engine removal plan, and the availability of spare engines already accessible to them and use that information to decide on what inventory is needed."

Bruce Ansell gives a broader view of the options available: "From an operational viewpoint it is usual to have a pooling agreement, however in times of high demand an alternative solution should be planned for, either by airlines holding their own spare engines, or having additional agreements with lessors to support them. Financially, few operators are content to keep spare engines on their balance sheet, with many going down the sale-and-leaseback path, this way they can plan the amortised costs over the lease period. Most lessors now offer short-term leasing

© MTU Maintenance Lease Services

to cover SV requirements, whilst this type of lease may have elevated rates, it can be preferable to retaining an engine over a longer period when it may not be fully utilised."

What spare engine solutions are available?

We then asked our contributors to advise us as to what solutions they could provide to mitigate the spare engine problem.

According to John McKirdy, "At Kellstrom Aerospace, we support the global fleet with green-time engine leasing availability or outright sale on the CFM56, V2500, CF6-80, and PW4000. In addition, we support module replacement hospital shop strategies through a combination of available spare modules and the support of our Vortex Aviation Engine MRO specialising in quick and cost-effective module swaps reducing downtime and minimizing costly exposure to heavy maintenance workscope creep. While partnering with our airline and MRO customers, we advance plan the acquisition and repair of critical time sensitive and expensive engine components and LLPs based on build goals, eliminating delays on material availability."

Fabrizio Laurenti explains: "MTU Maintenance's leasing arm, based in Amsterdam, has a global team of leasing experts and asset managers which specialises in placing engines with airlines and other operators, and spare engine support forms part of the core of our SERVICEPlus provision. Depending on the existing spare engine level of an airline, we offer short-term leases, engine pooling and a number of stand-by arrangements to optimize their reserves. Alternatively, we can facilitate long-term leases via our partner network.

"If the operator has no spares, they have two options. Either they opt for a short-term lease, which runs for a defined period of time, with all-around support for the duration of the lease, including during maintenance events. Alternatively, they can choose a long-term option with flexible cost structures, cost-effective constant thrust and buy and lease-back options in cooperation with our industry partners.

"For operators with a minimum level of spares, a stand-by arrangement would make sense as a short-term solution, which guarantees availability of dedicated engines at the agreed confidence level, located at preferred facilities. The long-term solution at this spare engine level is engine pooling that gives direct access to MTU's engines which are strategically located across the globe and can be delivered within 48 hours.

"For those with adequate spares levels, engine pooling is also a good long-term solution, whereas in the short-term, the operator may want to take advantage of our remarketing service. Surplus engines are always a good source of extra revenue, either through lease-outs as a green-time engine or by selling the engine outright to MTU if it is being retired from active revenue service. Alternatively, we can tear the engine down and repair remarketable parts through our MRO network and sell the serviceable material on consignment. Our spare engine support is very flexible, and we work closely together with our customers to create the best possible solution for them."

David Blackburn summarises PTS Aviation's contribution: "Through PTS Aviation, LLC, a StandardAero Company, we can offer full serviceable time-continued assets for sale or for lease, along with serviceable fan, core, and low-pressure turbine (LPT) major module assemblies for customer exchange and/or outright sales."

John McCarthy explains: "For over 45 years VAS has built a proven track record of supporting airlines and lessors, so we are confident in our ability to provide solutions for spare engine needs.

"For all the popular narrow- and wide-body applications we offer Used Serviceable Material (USM) to support

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the material supply into both the airlines and the engine MRO's. We also have long-term agreements in place that have proven their value over 20-plus years. We offer lease engines and maintain a stock of serviceable engines for immediate and long-term lease.

"We can offset shop visits, where appropriate, by providing an engine immediately and taking the removed engine in exchange. We work to ensure that this process is seamless by forming a deal team with the technical, legal and operational people working with the airline to complete the process.

"We partner with airlines and lessors and map out integrated immediate, short-term and long-term engine solutions. Where lessors or airlines are phasing out aircraft (not just Airbus aircraft), we tailor the solution to the phase out schedule optimizing spend and cash for lessors and lessees. This is where we leverage VAS' innovation and experience to provide unique and effective solutions to engine needs."

According to Oliver James, "For the past ten years AerFin has been providing tailored services to airlines and asset owners in the mid- to end-of-life space. We offer flexible services for those customers seeking immediate solutions for their spare engines. The company can either buy, maintain, store or lease manage the asset depending on the investor's long-term plans.

"Our strong technical/asset management background coupled with our engine MRO facility, gives us the ability to store, maintain, technically assess, and repair engines in-house. This means we are not as reliant on third-party MROs at a time when engine shop capacity is limited. This ultimately means we can turn engines quicker between leases, thus generate revenue quicker to investors. The company typically focuses on shorter-term leases from Six (6) to Twenty-Four (24) months. Recent years have seen a diversification of our product lines which now include but which are not limited to the CFM56, V2500, PW4000, CF6 and Trent 700."

Anca Mihalache advises that: "At AERO CARE we specialise in green-time leasing, and part-out when an engine becomes unserviceable. But we also offer lease management services for narrow-body engines. Another area we focus on is the supply of USM parts, where we work hard to support the industry by supplying components with as short-as-possible lead times, which in turn enables MRO shops to supply lessors with engines faster."

Where Aero Norway is concerned, Evren Akca advises: "We can facilitate connections with lessors we partner with to provide spare engines. Depending on the programme's structure, we can explore various tailored solutions to meet specific customer needs."

Andres Jimenez explains that Aero Engine Solutions: "focuses on the supply of commercial aircraft parts, components, and accessories through the sourcing and disassembly of whole aircraft. In addition, our expertise covers engine leasing and logistics support. Our customers include many of the world's leading airlines, MROs, aircraft leasing organisations, and financial institutions. We currently have a lease pool of around 15 assets (both engines and modules) at any given time, to supply to our customers and meet their requirements to keep their aircraft flying."

Wasim Akhtar points out that "AJW offers a broad range of reliable engine services across a range of engine types,

Wasim Akhtar, Director of Engines, AJW

> **"AJW offers a broad range of reliable engine services across a range of engine types, including the leasing and repair of Airbus and Boeing aircraft engines."**
>
> *Wasim Akhtar, Director of Engines, AJW*

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Bruce Ansell, Technical Manager Engine Division, APOC

> **"Being a part-out company as well as a lessor, APOC is able to offer green-time engines at very competitive rates."**
>
> *Bruce Ansell, Technical Manager Engine Division, APOC Aviation*

including the leasing and repair of Airbus and Boeing aircraft engines. We are an award-winning independent specialist in the supply and repair of aircraft spare parts and pride ourselves on our customer service and flexibility to support the customers' needs, helping to reduce their operational costs and improve efficiency."

At APOC, Bruce Ansell explains that the company: "works in the narrow-body sector, specialising in mature CFM56-7B, 5B, 5A, and V2500 engines. Being a part-out company as well as a lessor, APOC is able to offer green-time engines at very competitive rates. We are also purchasing further mid-life engines to support our customers; these are available for longer lease terms, or for installation on one of our airframes."

Toma Matutyte advises that: "While we don't directly sell or lease engines ourselves, we still act as a quite important facilitator in the spare engine marketplace. Think of us as a high-tech swap meet for the aviation industry, but on a global scale.

"The strong point of Locatory.com is that we connect all the key players – engine and parts traders, maintenance service providers, airlines, or lessors – on a single, user-friendly platform. This creates a dynamic environment where airlines and other operators facing a spare engine shortage can quickly find solutions. They can browse listings from a vast network of verified traders, with a high likelihood of finding a suitable solution at a competitive price.

"Now, you mentioned the current challenges in the engine parts and spare engine market – shortages, disruptions, you name it. Locatory.com is specifically designed to address those very issues. By being a proactive and market-sensitive platform, we offer a solution that's more relevant than ever. Besides, Locatory.com empowers airlines to navigate the current challenges in the spare engine market. It's a win-win for everyone involved – airlines find the parts they need faster and at better prices, and vendors gain access to a wider customer base."

Gunnar Már Sigurfinnsson briefly explains that: "GA Telesis has its own leasing operation within the company, LIFT, and we cooperate with them in case we need spare engines for our customers."

CFM56-5B

> ***"... being creative with the work scope to increase utilization of all LLP in the engine, by doing that they extend the lifetime and that creates less need of engines..."***
>
> *Gunnar Már Sigurfinnsson, President GA Telesis Engine Services Oy*

Gunnar Már Sigurfinnsson, President GA Telesis Engine Services Oy

Is smart shop visit planning a solution?

We wanted to know how our contributors felt about the benefits of smart shop visit planning and if this would help to eliminate the shortages in spare engine availability.

Evren Akca at Aero Norway is quite clear: "Effective shop visit planning involves staggering maintenance schedules, comprehensive material planning, and securing critical parts such as key airfoils and LLPs well in advance. Through this careful approach at Aero Norway, we are able to optimize maintenance schedules and turnaround times, ensuring a steady supply of spare engines and reducing the risk of shortages," while Andres Jimenez at Aero Engine Solutions feels that: "Many airlines and MROs across the world are not set up to hold stock of engines and materials for their requirements. Instead, they plan for when they need it in hopes of availability, which is not the case sometimes depending on the asset, timeframe, and type of request."

Wasim Akhtar at AJW feels the following is a solution: "Smart shop visit planning and implementing a proactive approach to inventory management are key for any airline if it wants to continue its operations without any engine-driven AOGs, delays, cancellations, or similar issues. It will offer insight into possible repair costs, allowing the airline to proactively search or earmark USM as per their build goals. If the airline has its own spares, it could proactively invest in upgrading or modifying these to the latest standard requirements to contain the high TAT issues currently being faced at different components MROs. In addition, the airline could liaise with the relevant MROs to lock induction slots and WS discussions."

Bruce Ansell at APOC advises: "Regular boroscope inspections and monitoring of the available flight data provides a great indication of what work is going to be required, and what parts will be needed. The early purchasing, or reservation of these parts is critical to SV planning, as too often SV's are delayed due to component shortage. By working with their MRO, operators can plan for those 'unpleasant surprises' which can cause so much trouble," while GA Telesis' Gunnar Már Sigurfinnsson reminds us: "That is as we said before, being creative with the work scope to increase utilization of all LLP in the engine, by doing that they extend the lifetime and that creates less need of engines. This is what we do at our SPAH operation in Helsinki and Wilmington, we help engine owners to fully utilise all LLP in their engines. We see more interest from the owner side utilising the SPAH service."

Locatory.com's Toma Matutyte comments: "By planning shop visits as smart as they can, airlines are able to identify engines that are nearing overhaul or service intervals. This gives them a window of opportunity. And here we see that it is precisely one of situations where marketplaces like ours play their crucial role. In such situations airlines can scour Locatory.com for the specific parts or engines they need, which gives them the ability to secure them well before the actual maintenance visit. That is extremely important as we all know how such benefits can go beyond just avoiding a parts scramble. Smart shop visit planning is also a shield against much dreaded AOG situations, which is every airline's financial nightmare."

Toma Matutyte, CEO Locatory.com

> ***"By planning shop visits as smart as they can, airlines are able to identify engines that are nearing overhaul or service intervals. This gives them a window of opportunity."***
>
> *Toma Matutyte, CEO Locatory.com*

At MTU Maintenance, Fabrizio Laurenti points out: "we work closely with customers to garner as much technical information as possible about each and every engine and can create a tailor-made maintenance strategy with our in-house developed engine fleet management software CORTEX. That requires factoring in a number of variables: age and make-up of the fleet, the environments in which it operates, maintenance history, expected changes to the fleet and others. Having access to that kind of information and feeding it into CORTEX allows us to generate precise, individual MRO scenarios for a customer, give them the ideal timing for a shop visit and optimize the maintenance costs over the lifetime of the engines."

David Blackburn at Standard Aero believes: "Airlines should continually and constantly review on-wing engine condition monitoring (ECM) performance data, including exhaust gas temperature margin (EGTM) degradation, oil consumption, fuel-flow and rotor-speed data in order to help determine on-wing longevity and proper planning for future spares support. Airlines should also work with engine MROs in advance in order to ensure they have the right material available at the right time for each individual shop visit, at cost-effective prices."

John McCarthy at VAS Aero Services suggests you should: "plan heavy removal and shop visit inputs in the off season if possible. Boost spare engine availability in advance of a sustained removal and shop visit schedule. Trust your trend data and planning systems. Schedule engine removals with some space for the unexpected across the fleet. We have seen some very tired engines being offered with four cycles remaining and narrow EGT margins. We don't recommend living life that close to a problem that could impact flight operations."

Anca Mihalache at AERO CARE believes it makes perfect sense for carriers: "to extend the life of an engine by conducting a repair on wing or through a hospital shop visit, where possible. With relation to performance restoration, the power plant departments will know far in advance when the time for a heavy shop visit is approaching. This allows them to make provisions for this event in good time, planning with both with the MRO and their purchasing department to source the required parts. If we are talking about LLP replacement, that's also pretty straightforward – as a general rule – the better planned it is, the cheaper it is to source the LLPs."

Avoiding "Zero Spare" situations

Obviously a "zero spare" situation is far from ideal for a carrier, so we next wanted to know what remedies or respondents could suggest to avoid this situation happening.

John McKirdy advises: "Having a strong maintenance planning and engineering organization and partnering with a balanced approach within the leasing community, an

John McKirdy, CCO Kellstrom Aerospace Group, Inc.

> ***"Having a strong maintenance planning and engineering organization and partnering with a balanced approach within the leasing community, an airline can significantly improve its spare engine asset availability..."***
>
> *John McKirdy, CCO at Kellstrom Aerospace Group, Inc.*

airline can significantly improve its spare engine asset availability while minimizing costs set aside for risk management," while Fabrizio Laurenti points out that: "At MTU Maintenance Lease Services, we are able to deliver a lease engine in less than 24 hours from the time of the request. That means the airline is able to react to an unscheduled event as if it had a spare available at its facilities, even when considering the time required to remove the unserviceable engine."

David Blackburn suggests that: "Airlines can maximise their likelihood of avoiding engine "zero spare" situations through proper fleet performance monitoring, engine/material planning, engine workscoping and engine shop visit forecasting," while John McCarthy comments that: "VAS recommends a multi-action approach, including a combination of on-lease engines, lease options, and owned engines. The number of available spares varies with the cyclical nature of the shop visits. Essentially the total number of engines available should cover in-shop engines, scheduled and unscheduled shop visits, and include a buffer to cover the unexpected. With this approach the capital commitment and cost are balanced and tailored to the current need."

Oliver James makes it clear that spare engine requirement will depend on the type and age of existing equipment, adding that: "Effective engine management goes a long way towards mitigating zero-spare situations. Owning engines has become increasing more expensive in recent years, making it harder for airlines to own them outright. In some cases, engine leasing is a smart option for engine management; airlines not only save on the upfront purchase cost but benefit from increased operational flexibility."

Anca Mihalache feels that this is not a major problem for large carriers but is definitely a headache for smaller carriers. She points out that: "There are various lessors and MROs who offer short-term leases, and this can be a big help for airlines. However, when there are no engines available (as is the situation right now with a couple of narrow-body engine types), it is not an easy situation to navigate. So again, it really comes down to good planning and extending engine life where possible, with support of the technical department."

Evren Akca advises that: "To avoid "zero spare" situations, airlines should engage in proactive material sourcing, ensuring timely procurement and working closely with MRO providers for flexible support. Regular monitoring and forecasting of engine maintenance needs are essential to avoid unexpected shortages," while Andres Jimenez feels that this is not a situation that can be totally avoided: "There are different things an airline can do – some of which we have discussed in previous questions, but it will not eliminate the issue, in my opinion. This is a very dynamic industry, and we can only plan so much based on market forecast and industry trends."

Wasim Akhtar has a simple solution to the problem for carriers: "An airline could opt to approach a company like AJW who offers bespoke engine management and associated services. We provide several engine leasing options which can guarantee avoiding a "zero-spare" situation for the airline as our vast inventory always ensures spare engine availability." Meanwhile, Bruce Ansell has concerns when an AD is issued which affects one engine variant: "Airlines need to work with the OEM or their preferred lessor to ensure they always have

David Blackburn, Senior Vice President, Standard Aero

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>
> *David Blackburn, Senior Vice President, StandardAero*

access to available engines, or they need to retain sufficient numbers of spare engines themselves. The troublesome part is when an AD affects all engines of one particular variant, and every engine is required to enter the shop for inspection and repair. A dual-variant aircraft fleet helps to overcome this usually, as different engines are required for each variant."

Toma Matutyte believes that being proactive as opposed to reactive can make a huge difference: "By knowing their upcoming maintenance needs early, airlines can proactively search our marketplace to potentially secure used engines or parts before their aircraft is grounded. Needless to say, it is about getting ahead of the curve, not scrambling at the last minute when a crucial engine component needs replacing."

Gunnar Már Sigurfinnsson highlights a couple of issues: "All airlines try to maximize the utilization of the fleet, so they try to operate the fleet with as few engines as they can to save cost, though not in a way that lack of an engine will ground the aircraft. All airlines try to have as few engines as they estimate they can get away with, to save cost. That can create a problem and then airlines try to lease in engines from lessors or engine owners to bridge the gap."

Exchange or repair an engine?

Finally, we arrive at the most challenging situation, and that is recognising the point where it becomes more financially viable to exchange an older-generation engine rather than repair it.

AerFin's Oliver James feels that: "This decision really comes down to where the engine is in its life cycle. It's common for airlines and investors to avoid making large-scale repairs to their engines. Under this scenario investors can look to exchange older engines for younger, more capable engines. This not only has major economic benefits but also avoids the repair process altogether where lead times are unknown and repair costs are not certain." Anca Mihalache at AERO CARE sees exchanging engines becoming a more popular option: "This is a growing trend and not only from an airline perspective, but lessors are also increasingly looking to exchange engines. It is a sellers' market and as a buyer you have a better chance of being considered if you can offer an engine in exchange. This gives shops the opportunity of more work during the low season, over the summer for example, and also more availability of spare engines to offer airlines. This in turn makes them a more attractive partner for shop visits, as airlines will often choose a shop that can offer them an engine to lease for the duration of the maintenance period."

Aero Norway's Evren Akca urges caution when it comes to exchanging engines: "Exchanging engines can be a short-term solution but comes with risks. Airlines are familiar with the engine maintenance history for the engines in their fleet, while exchange engines might have unforeseen issues,

> ***"The advantage is having an engine available immediately. VAS Aero Services can also deliver an exchange ready-to-install engine to the airline in advance of the engine change..."***
>
> *John McCarthy, Director VAS Europe, VAS Aero Services*

leading to unscheduled removals that can significantly impact operations," while Aero Engine Solutions' Andres Jimenez is another proponent of proactivity: "Airlines are being very proactive in changing the way they operate, but it is not easy to change their business model. Fleet size, destinations, staff, training, licenses, etc., are some of the things that prevent an airline from switching to a new-gen aircraft fleet. Legacy engines are still being repaired and operated by many airlines and continue to generate growth in many aspects of the industry."

AJW's Wasim Akhtar feels that where the engine is in its lifecycle is key: "Investing millions in repairs may lack viability when the engine's remaining lifespan is limited. This is when it becomes pivotal to accurately determine the engine's lifecycle stage when making the choice between repair and replacement. Exchanging engines instead of repairing older-generation engine types has its advantages. Firstly, it helps avoid costly engine shop visits, saving the operator both time and money. Secondly, the exchange service provides a guaranteed cost advantage compared to traditional repair shop visits. Additionally, airlines benefit from AJWs specific engine data review, ensuring they receive engines with sufficient life and performance to meet operational demands."

Bruce Ansell at APOC acknowledges that while airlines have been exchanging engines rather than repairing the older-generation ones: "as the supply of available engines is drying up, we are seeing more airlines now putting these older assets into the shop to maximise the remaining life in each engine. Other operators are investing heavily and installing new OEM-supplied components, due to lack of good USM available. The airlines are currently facing some hard times, with new aircraft being grounded, or delivery being delayed, resulting in older aircraft having to be retained and extensive maintenance being required to keep these older aircraft and engines in operation."

At Locatory.com, Toma Matutyte feels there has to be a balancing act between an airline's financial budget and the current market climate, adding that: "finding a suitable used engine of the desired generation can be a treasure hunt. So, which path is the smarter one? Airlines with a healthy bank account and a strong market for used engines might lean towards exchanging for a newer, potentially more fuel-efficient model. Yet, it is as a long-term investment – lower fuel costs and fewer maintenance headaches down the line. On the other hand, airlines with tighter budgets might prioritise repairs in a sluggish used-engine market. It can be a more cost-effective option in the short term, but those maintenance expenses could creep up over time."

Gunnar Már Sigurfinnsson at GA Telesis is concerned about problems with new-generation engines and takes a more cautious approach: "We believe that every asset should be fully utilized before it is taken out for newer generations. That will maximise the investment and is also a strategy that is environmentally friendly. We have also seen lot of issues with new-generation engines, meaning that the older engines are very much in demand, as for example the CFM56/7B engine."

Fabrizio Laurenti at MTU advises that the answer depends on the airline's future plans for its engine fleet, though at MTU: "When a shop visit for an old-generation engine is performed and the airline is not able to exploit the full post-maintenance life (residual green time) before the respective fleet is phased out, we can add the engine into our lease pool and remarket it to our customer base, thus allowing the airline to extract the remaining life of the engine even after the fleet is phased out."

John McCarthy, Director VAS Europe, VAS Aero Services

David Blackburn at Standard Aero strongly recommends a shop visit cost analysis before any decision is made: "A thorough shop visit cost analysis, coupled with a complete evaluation of engine and component availability in the current marketplace, should be performed each and every time before making a 'shop visit vs. engine exchange' decision. Airlines should be prepared with a strong and knowledgeable financial modelling team which will determine the best path forward when it comes to providing continuous, reliable and uninterrupted engine utilisation and operation."

To end with, John McCarthy at VAS Aero Services is very much in favour of engine exchanges, saying that: "The advantage is having an engine available immediately. VAS Aero Services can also deliver an exchange ready-to-install engine to the airline in advance of the engine change ensuring a seamless engine change."

It is clear there is no 'one size fits all' solution to the challenges airlines face with regard to spare engines. Much depends on the size of the airline and an MRO budget, but from the section of answers provided by leading engine MRO specialists above, it is clear that there is a solution available for the majority of spare engine requirements.

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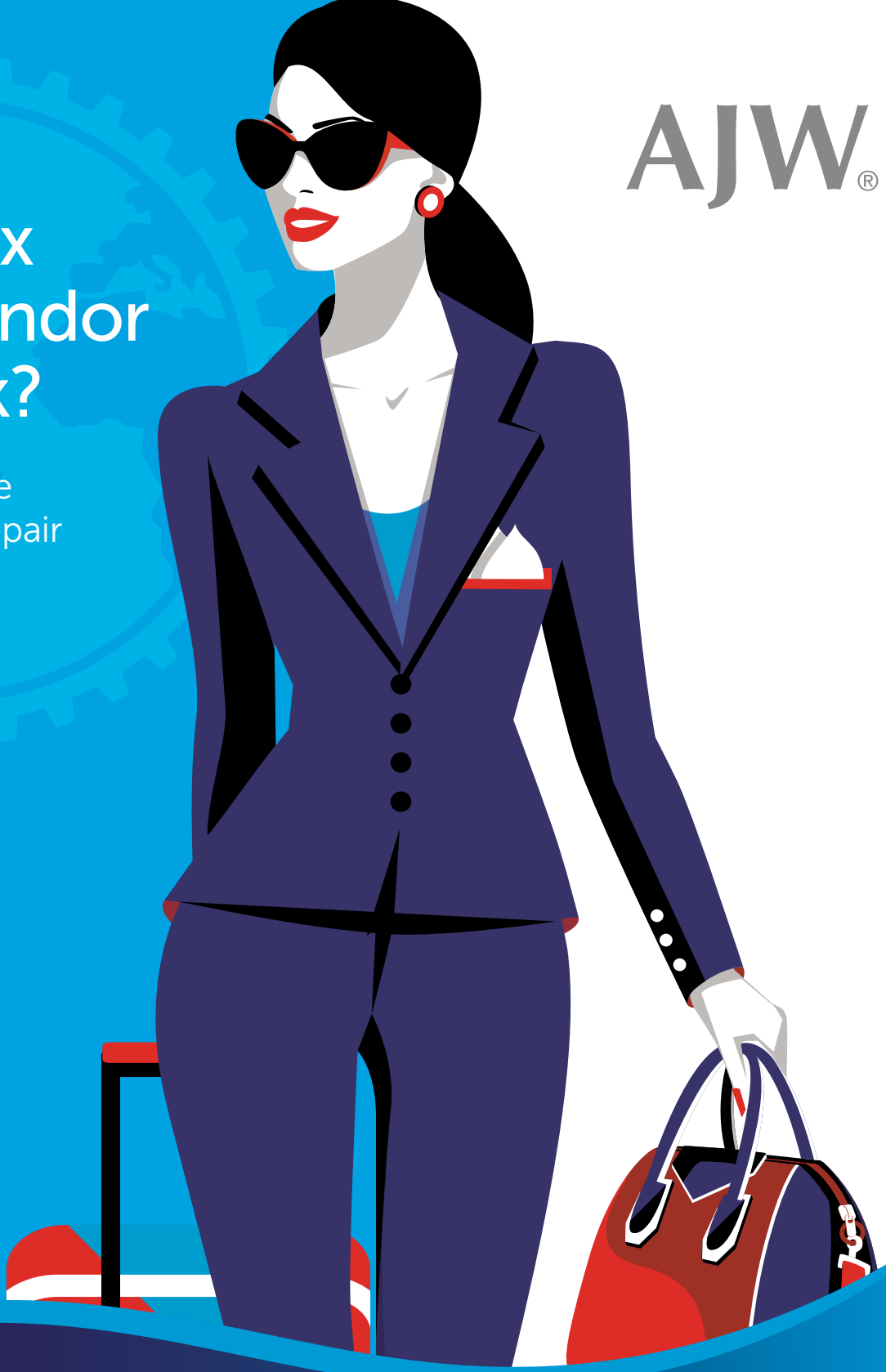

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"There was an exodus of talent across the repair network"

Talking to David Greenwell, SVP Supply Chain, AerFin

By Peter Jorssen

David Greenwell, SVP Supply Chain, AerFin

AviTrader MRO: The industry has been talking for a while now about a massive supply shortage of materials. Is AerFin also being affected by this?

David Greenwell: There are a number of factors leading to current supply chain issues all the way to the lost production slots during the COVID era for manufacturing new aircraft; now that demand has started to normalise, demand for aircraft is very robust. This is preventing the USM market recycle the number of aircraft and engines per year we have been accustomed to as there is a case to return to service as a whole asset vs in parts. Next, there was an exodus of talent across the repair network also during COVID that now has more work flowing into the system but the overall level of experience is below 2019 levels, so we see lead times being extended, yields are inconsistent and access to material to complete some repairs is also limited. The overall knock-on effect is that we are all witnessing a multi-faced crunch on the "normal" USM supply chain. Fewer parts are entering the surplus market and when they do, they are taking longer to repair, so you see the shortages occur more frequently. To counteract some of these pressures, AerFin is using robust data models to optimize the company's inventory position to meet the demands of its global customer base.

> "We are seeing that certain assets are trading at the breakeven point of teardown or repair, so the competition is increasing around these assets."

What do you think the major challenges are for a supply chain executive?

The major challenges for a supply chain executive currently includes meeting the need to source assets for teardown and feed the USM supply chain whilst retaining fiscal responsibility and ensuring the economics of the deal make sense. We are seeing that certain assets are trading at the breakeven point of teardown or repair, so the competition is increasing around these assets. A supply chain executive needs to ensure that the deal should be profitable and risks are mitigated. The other risks are being too cautious and underestimating customer demand. The aim is to balance the inventory position against your target market, but being either too optimistic or too cautious can lead to increased holding costs in repair fees or missed opportunities to help the customer.

From where do you ship your parts or the orders to your customers? Is it from a centralized location or are you spread out around globally?

AerFin is a true global distributor with various warehouses or 3PL solutions located around strategic locations that best serve our customer base. Our European operations are primarily served from our Gatwick Airport facility that is a 24/7 AOG service provider, but we have other warehouses near Cardiff and a new 35,000-square-foot facility we have just opened in Miami to better serve our US and Latin American customers, particularly as we expand our unique hybrid PBH solutions to the Americas. In Asia we have offices in Singapore served with 3PL facilities in Singapore and also in Australia. We conduct asset teardowns globally, so having regional distribution centres serves us well and enables us to achieve higher levels of customer support when a part is needed fast.

What aircraft types does AerFin specialise in?

AerFin are a solutions-orientated business that offers a number of service levels to our Airline and MRO customer base. We are not limited to any certain platforms. With our organic growth we continue to evaluate new platforms to serve, but we do support a number of customers across PBH and Hybrid PBH contracts on the Embraer 170-195 platforms. We are also heavily involved in the Airbus A320, A330 products, Boeing B737, B777 and B787 platforms and the associated powerplants.


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Sustainability in MRO

How the Industry Tackles Environmental Challenges

By Swaati Ketkar

We all love and care deeply for our planet and hope that our effort, in whatever little way, will help to make 'Our Earth' a better place to live for future generations. Although all industries, companies and governments are making a combined effort to reduce carbon emissions that are causing ozone depletion, aviation in particular is at the focal point of sustainability.

Terms like clean aviation, green aviation, Co2 – No2 emissions have become a common norm these days with sustainability being the most trending topic in aviation and aerospace circles. While airlines can opt for sustainable aviation fuel (SAF) and advanced or hybrid engines to achieve their sustainability targets, what can Maintenance, Repair and Overhaul operations (MROs) do to achieve the same? Let us explore the various ways in which leading MROs of the world are trying to achieve their sustainability targets.

MROs are a significant part of the aviation industry's circular economy as the sectors helps in maintaining aircraft and thus prolonging their useful life. Professional maintenance and overhaul of components lead to lower demand for new parts, reducing the need for resources in production and the number of parts scrapped.

MROs – the dos and dont's for achieving net zero targets

If airlines: SAF then MROs: ? While trying to navigate around this puzzle, Dan Taylor, Head of Consulting at IBA makes a straightforward statement – "Sustainable aviation fuel is just an interim solution to a long-term goal." "As an industry, all elements need to work together to create a truly sustainable outcome. MROs could be adopting 'recycling and re-use' through part-out and repairing or recertification programmes to contribute to this," Taylor adds.

In sync with Taylor's views, Lea Klinge, spokesperson at Lufthansa Technik also feels that SAF will undoubtedly play a pivotal role in helping operators meet their sustainability goals, however going a step ahead she draws out a new chart for MROs to follow by underlining how Lufthansa Technik has embraced a multifaceted approach for sustainability.

> "Sustainable aviation fuel is just an interim solution to a long-term goal."
>
> *Dan Taylor, Head of Consulting, IBA*


Dan Taylor, Head of Consulting at IBA © FL Technics

> "This essentially means continuous learning, training and education."
>
> *Kristina Klioraite, FL Technics Group CFO and ESG Officer*

• Driving efficient operations by optimising processes and procedures to minimise waste and energy consumption.
• Switching the facilities' energy supply to renewable energy sources (e.g. electricity, heating) and investing in new technologies.
• Exploring environmentally friendly materials and promoting recyclable packaging.
• Offering training and awareness programs to educate employees about sustainability practices.
• Developing and offering products that support customers in achieving their sustainability goals, such as our drag-reducing film AeroSHARK or efficiency-increasing Cyclean® Engine Wash.
• Fostering collaboration and innovation by supporting research and development efforts.
• Develop and offer products that support customers in achieving their sustainability goals.

Kristina Klioraite, FL Technics Group CFO and ESG officer explains many simple strategies which MROs can integrate in their day-to-day operations to achieve their sustainable goals like energy-efficient technologies, water recycling and reuse systems, hazardous substance management, use of recycled or sustainable materials for packaging, optimising transportation and logistics, and similar measures.

Apart from adoption of different technologies, Klioraite mentions one of the most important points – "Embedding sustainable solutions in our system". This essentially means continuous learning, training and education. "In our opinion, the most important aspect is the culture of continuous improvement (LEAN) within the organization, along with employee training and education. This combination naturally drives ideas for sustainability and nurtures their implementation in the most beneficial way," Klioraite adds.

MROs can achieve sustainability by reducing the environmental impact of their operations. With advances in technologies such as digitalisation, automation, additive manufacturing and data analytics, MRO facilities can be made more energy efficient, while work processes can be streamlined and optimised to achieve greater productivity.

Kristina Klioraite, FL Technics Group CFO and ESG Officer
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Bio fuel
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> "MROs can also facilitate engine on-ground testing to evaluate performance with SAF."
>
> *Jeffrey Lam, President Commercial Aerospace, ST Engineering*

Apart from incorporating advanced technologies, MROs can play a role in supporting operators as they transition to the use of sustainable aviation fuel suggests Jeffrey Lam, President Commercial Aerospace, ST Engineering. He gives an example as to how MROs could work with the OEMs to provide operators with technical expertise on the compatibility of SAF with existing aircraft engines and fuel systems. "MROs can also facilitate engine on-ground testing to evaluate performance with SAF, and provide insights into how SAF might affect engine performance and maintenance schedules."

True, MROs can support the airlines but SAF is currently being scaled to production and unfortunately is being produced at a rate that is less than approximately one percent of global demand, Brian Skrobarcek, Enterprise Vice President Environmental, Health, Safety & Sustainability at StandardAero points out. Skrobarcek seconds Lam's opinion of using SAF in engine test cells. "As operators get more comfortable with the use and cost of SAF, we as MROs can begin to use it in our engine test cells and lower our carbon emissions and footprint as we are required to fully test and run all of our engines prior to returning to customers," Skrobarcek further adds.

Agreeing to Lam's point, Jaideep Mirchandani, Chairman Sky One also advises different MROs to collaborate with stakeholders to develop and implement sustainable practices throughout the supply chain. "We should work towards net zero carbon footprint utilising the large expanses of facility surfaces to generate renewable energy".

As different MRO practises, technologies, regulations, etc. differ in different parts of the world, (e.g., Europe vs. Asia), this emphasises the need for MROs to collaborate with stakeholders. "By collaborating with suppliers, partners, and other stakeholders, MROs can attain a higher ground essential by sharing best practices and leveraging expertise to ensure a uniform sustainability approach," Klioraite sums up.

Let us now look at some of the practises that MROs can inculcate to reduce carbon emissions on a regular basis. Plus, are these practises really practical and viable? Let's find out.

Off-wing Maintenance

Environmental sustainability while maintaining aircraft airworthiness does depend on factors such as the type of repair, aircraft downtime, and available resources. While everyone unanimously agrees that off-wing maintenance practices can lead to reduced carbon emissions by improving the efficiency and performance of the aircraft, "Off-wing maintenance varies depending on the component," clarifies Taylor.

"Off-wing maintenance practices can reduce carbon emissions by minimizing the need for engine run-ups and reducing fuel consumption during ground operations," Mirchandani says. "Off-wing maintenance also involves the replacement of older, less efficient parts with newer, more environmentally friendly components, further reducing emission," Klinge adds.

For regular off-wing MRO repairs, when strategically planned and executed, aircraft troubleshooting is done by teams of ground-based engineers when the flights are in progress, thereby reducing the grounding time of the aircraft and the use of

Jeffrey Lam, President Commercial Aerospace, ST Engineering
© ST Engineering

APU and GPUs. Thus, regular maintenance can ensure that the aircraft is operating at its optimal level, reducing fuel consumption and emissions.

Speaking on the feasibility aspect of off-wing maintenance Klinge says: "Many airlines and maintenance facilities carry out off-wing MRO repairs on an aircraft regularly by adhering to a regular maintenance schedule." This ensures that the aircraft are operating efficiently with fewer carbon emissions," Klinge adds.

Taylor further emphasizes the need of reducing rescue or ferry flights, and for this Taylor feels that a good understanding of aircraft reliability along with maintenance planning would be a great start. "Material provisioning would also be a key component in the reduction of 'rescue' flights."

OEMs Versus MROs – Are the OEMs doing enough to ensure all-rounded sustainability?

Sustainability is still making its way into the OEM and MRO sectors. There is a lot of discussion about the aircraft design process, such as the use of lightweight materials,

> "Off-wing maintenance also involves the replacement of older, less efficient parts."
>
> *Kristina Klioraite, FL Technics Group CFO and ESG Officer*

energy-efficient engines, and eco-friendly coatings to reduce fuel consumption. Klioraite of FL Technics feel that OEMs could offer guidance on eco-friendly maintenance, best practices for waste management, or certification programmes for sustainability standards, as well as access to data and analytics for more efficient and sustainable maintenance. "Manufacturing components and parts with the end of the product lifecycle in mind, aiming to enhance recyclability, is also crucial," she adds as an afterthought.

Lea Klinge from Lufthansa Technik too agrees that OEMs may work closely with MROs to develop joint sustainability initiatives and goals. "This can involve sharing best practices, data, and resources to collectively work towards reducing environmental impact thus leading to more repairs and less waste," Klinge says.

Some OEMs are actively contributing to sustainability efforts, by leveraging research and innovation to create more efficient products and solutions.

Klinge goes a step ahead in citing a few examples of symbiotic relations between OEMs and MROs, the 'Working Group on Climate-Neutral Aviation' brings together companies, associations, research, civil society and unions. The working group is supported by the Federal Ministry for Economic Affairs and Climate Protection and the Federal Ministry for Digital and Transport with the aim of making Germany a pioneer in CO2-neutral flying. "Lufthansa Technik is chairing the Quick Wins sub-working group, which is discussing technical retrofits for the aircraft flying today and expected to remain in service for decades to come," Klinge adds.

Mirchandani also feels that OEMs can offer support, technology, and guidance to aid MROs in achieving sustainability targets by developing eco-friendly materials and components, providing training on sustainable practices, and collaborating with MROs to implement innovative solutions like AI-driven methods.

Drag-reducing film AeroSHARK © *Lufthansa Technik*

All-in-all, commercial, technological and political lifecycles of aircraft can all contribute to sustainability. As an industry, we are all in this together. Taylor stresses the need for collective guidance and input from all sectors along the way in order to make any changes. "The variety of SAF and the infrastructure around this need to be utilised in larger volumes, but MROs and OEMs do not stand alone under this regulatory mandate, but they should be working together to ensure that the pace of change is the same throughout the industry." Taylor very rightly sums up the OEMs versus MROs war, with a simple note, we need to work together to save and protect our planet.

Sustainability at core of MRO ops

Let us have a brief overview of some of the practises that MROs all around the world regularly follow to make their operations eco-friendlier. One of the key initiatives taken up by FL Technics involves employee engagement. This includes

• Engaging the employees in sustainability practices and encouraging them to contribute ideas

• Seeking feedback from stakeholders to ensure meaningful progress

Apart from this FL technics also actively practices minimizing energy consumption in the facilities by using energy-efficient lighting (smart LED lighting with motion sensors and efficient wiring technologies), heating, ventilation, and air conditioning systems. FL Technics carry out the following practices judiciously,

• Implementing waste reduction and recycling programmes to minimise waste generated during operations (in hangars and offices).

• Segregating recyclable materials such as paper, cardboard, plastics, and metals and ensuring they are properly recycled

• Ensuring proper storage, handling, and disposal of hazardous chemicals to prevent environmental contamination, including the proper treatment of water collected during the manufacturing process in hangars.

• Regularly monitoring water usage and seeking opportunities to reduce consumption and minimise water waste.

• Exploring the use of eco-friendly materials and processes for packaging.

While listing all of the above initiatives, Klioraite adds that they have also abandoned disposable paper and plastic cups and introduced paperless office routines and similar initiatives. Several years

> "Lufthansa Technik is chairing the Quick Wins sub-working group."
>
> *Lea Klinge, Spokesperson, Lufthansa Technik*

Hydrogen Aviation Lab

© *Lufthansa Technik*

ago, FL Technics obtained the prestigious ISO 14001 Environmental Management certificate, that is testament to their efforts in achieving carbon neutrality.

Let us now explore what Lufthansa Technic does to ensure carbon neutrality in everyday ops. "We at Lufthansa Technik operate one of the most efficient production networks in the aviation industry and constantly reduce our own environmental footprint," explains Klinge. She further dives into a list of practices adopted everyday at their various hangars and offices.

• We invest in and use energy-efficient tools and equipment for our MRO activities to reduce energy consumption and lower our carbon footprint. All company sites in Germany, along with subsidiaries like Component Services in the US, Turbine Shannon in Ireland, and Landing Gear Services UK, are now sourcing 100% of their electrical energy from renewable sources. Additionally, numerous other subsidiaries and sites are actively striving to increase the proportion of renewable sources in their energy mix. For instance, Lufthansa Technik Philippines has opted to install photovoltaic panels on its main hangar to further diminish its carbon footprint by an additional 15% annually.

• We actively promote waste reduction and recycling in our operations by properly sorting and recycling materials such as metal, plastic, paper, and electronics.

• We optimize our transportation and logistics processes to minimise emissions and fuel consumption, such as consolidating shipments and using electric vehicles if possible.

• We provide training and raise awareness among our staff about the importance of sustainable practices, such as internal articles, exhibitions, workshops and group-wide development programmes, and encourage them to adopt eco-friendly habits in their daily work.

• With innovative products like the drag-reducing film AeroSHARK, jointly developed with BASF, and Cyclean® Engine Wash; we also help our airline customers to reach their ambitious sustainability goals.

Summing up the list Klinge goes on to explain their various pioneering research activities, such as the Hydrogen Aviation Lab, to further develop resource-saving MRO practices and solutions for the aviation industry.

Apart from commercial MROs, private charter MROs also play their part in saving the environment. "We, at SKYONE prioritize sustainable practices such as optimising energy usage, minimising waste generation through recycling and reusing materials, implementing eco-friendly cleaning

> "We, at SKYONE prioritize sustainable practices such as optimising energy usage."
>
> *Jaideep Mirchandani, Chairman, Sky One*

solutions, paper-free offices, solar panels for energy and greywater recycling," Jaideep Mirchandani explains.

He also stresses the importance of investing in employee training and awareness programmes to foster a culture of sustainability within the organization.

At ST Engineering, Jeffery Lam throws light on their various initiatives to progressively transition to cleaner and more energy-efficient operations on a daily basis. "We are working towards using greener energy in our operations to reduce our carbon footprint," Lam states. "Our MRO facilities, especially the newer ones, incorporate features such as solar panels to harness renewable energy as well as light harvesting skylights and motion detection lighting systems to reduce electricity consumption," Lam further adds.

Interestingly, all the ST Engineering airframe facilities in Singapore have solar panels installed on their roofs accounting for 30% of the energy needs while in Dresden, Germany, ST Engineering's freighter conversion facility fully meets its electricity needs through renewable sources such as wind and solar.

Lam proudly announces how ST Engineering is gradually evolving into a more energy-efficient electric-powered ground support equipment to replace older diesel-powered models. As far as MRO is concerned Lam gives an example of their patented EcoPower engine wash system that utilises a closed-loop wash process to collect and filter the water for reuse. "Through this method, we maximise the use of water during each wash and generate only filter elements as waste," Lam concludes.

"At StandardAero, we have initiated our GreenERmro initiative in 2021, as our company's multi-faceted and multi-year approach to drive sustainability and reduce impact by design," explains Skrobarcek. Initial areas of improvement include energy reduction methods like

- modification of usage
- LED and use control systems
- optimized compressed air systems/ pressure reductions,
- process tank heating controls, etc.

CFM56-7B case inspection © *StandardAero*

In 2022, StandardAero expanded the GreenERmro areas of focus to include operations (energy, emissions, waste), engine testing (testing efficiency, SAF review), green procurement (materials purchased and dispositioned) supporting the production life cycle, logistics (low- and/ or zero-carbon transit) and ultimately the products and services it provides. Expected benefits include reductions in resource use, waste, energy and carbon emissions.

Diving into the future, Skrobarcek explains their plans to pursue further measures that include the decarbonisation of electricity usage starting in Europe, Asia and the United States. "This will include the implementation of solar PV systems, battery energy storage systems, power purchasing agreements, carbon sequestration and/or carbon offsetting initiatives," Skrobarcek further adds.

> "At StandardAero, we have initiated our GreenERmro initiative in 2021."
>
> *Brian Skrobarcek, Enterprise Vice President Environmental, Health, Safety & Sustainability, StandardAero*

Waste Management, Recycling and Waste Reduction

One of the most crucial aspects of achieving sustainability is efficient waste management which mainly includes recycling, waste reduction, eco-friendly ways of waste disposal along with promoting a culture of environmental responsibility. MROs all over the world face the problem of waste management as aircraft maintenance operations led to large scale bio-hazardous waste which needs efficient recycling or disposal.

By reducing waste and recycling materials, companies can minimise their environmental impact and contribute to the overall sustainability of the industry. In addition, following waste reduction and recycling practices can also lead to cost savings for MRO companies. By reusing materials and reducing the amount of waste generated, MRO companies can lower their operational expenses and improve their bottom line.

"We believe that integrating waste reduction and recycling practices into the MRO sector is crucial for both environmental

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and financial reasons," explains Klinge. "This can be achieved through implementing efficient waste management systems, adopting circular economy principles, and promoting the use of recycled materials in MRO operations. We at Lufthansa Technik reduced overall amount waste within the last years, with some locations already having recycling rates of about 90%," Klinge further states.

ESG is becoming more and more prominent in every aspect of the modern world, aviation is no exception! Feasibility studies or MRO expansion documentation are including all elements of ESG within their planning. "How the MRO is powered, process improvements and willingness to quantify green credentials is going to continue to increase as ESG and sustainability becomes more and more prominent in the public eye," Taylor sees the MROs at large.

Mirchandani advocates simple steps like paper-free working environments resulting in more efficient processes and supply chain management efficiencies and results in obvious waste management reduction.

StandardAero, on the other hand has a long history of promoting and providing environmental protection as part of its operations around the world. In the last four decades, StandardAero has achieved a remarkable feat of reducing water consumption by over one billion gallons and significantly reduced hazardous waste generation through facility redesign and optimisations. Skrobarcek further goes on to explain how StandardAero is on its path of achieving its carbon reduction goals of 45% net by 2030 (Scope 1 and Scope 2) and achieve zero carbon emissions by the year 2050 as a part of its enhanced commitment to the world. "The actions we take to reduce our carbon footprint are associated with our production life cycle," Skrobarcek says. "This includes the resources and services required for production (e.g., materials/consumables, logistics, etc.), operational efficiency (e.g., facility rationalization and optimization, process improvements, etc.), and plans to reduced/zero carbon logistics within operations and product shipments to our customers," Skorbarcek further adds.

FL Technics has implemented several processes for waste treatment of all kinds (recyclable and non-recyclable waste separation, collection and treatment of hazardous substances, chemicals, water, etc.). In addition to being certified and continuously monitored under ISO 14001 certification, the organization also belongs to an association of manufacturers and importers that audits waste collection and recycling in accordance with environmental regulations.

To sum up, IBA recently did a full lifecycle analysis of a narrow-body aircraft, and it has shown that waste reduction and recycling processes are key. "It is important to keep this in context though and aircraft recycled in a 12-month period would contribute less than 5% of the annual aluminium recycled worldwide," Taylor concludes.

This leads to further the discussion to a crucial point: what is an aircraft part that cannot be recycled? How to dispose of it in an eco-friendly way?

"We can think about various alternatives, but in practise, apart from occasional usage of unserviceable components in manufacturing of let's say furniture like a chair or table (which was an out-of-the-box idea of our creative employees), the way to proceed is to critically evaluate whether the unserviceable component can be refurbished, repaired, or repurposed for another application within aviation or related industries (as a part for other component repair or for trainings purposes)," Klioraite says.

"Sustainable methods for disposing of used parts that cannot be recycled include exploring options for repurposing or refurbishing the parts for alternative applications," Mirchandani explains. Apart from this, using environmentally responsible disposal methods, such as thermal treatment or chemical neutralization, can minimize environmental impact," Mirchandani adds.

Skrobarcek however states that most used parts can be recycled at end of life through StandardAero's metals recycling network of Tier One suppliers. He further emphasizes on the repair rather than replace policy at StandardAero that helps in cost optimisation along with reducing turn around time (TAT) for customers. Skrobarcek further goes on to explain StandardAero's in-house engine trading and teardown capabilities along with its asset management strategy to utilise used serviceable material (USM) where appropriate. "Finally, the

utilisation of engine health monitoring (EHM) also helps operators to avoid expensive maintenance events by catching and correcting issues early," Skrobarcek clarifies.

"After the LRUs the USM market can absorb have been removed and the metals shredded for recycling, not a lot (by weight) remains," Taylor adds.

Used parts that cannot be recycled for their raw materials are used simply for composite material. Taylor points out to more recent developments in carbon fibre recycling and other materials that may be suitable for use as insulation in other products once processed.

In the unlikely event when no other option is found, working with waste management partners, such as certified disposal facilities or specialised service providers, to ensure that used parts are disposed of in an environmentally responsible manner seems like the only way out.

CFM56-7B in test cell © *StandardAero*

Can toxicity be replaced by eco-friendlier options for maintenance?

StandardAero actively seeks to reduce the use of toxic chemicals and waste generated from its operations, Skrobarcek says. He further goes on to explain this concept with an example, "Replacement of chlorinated solvent use for wax removal with modern chemistry and processes. In 1999, StandardAero as part of its operational redesign and industrialization at former Kelly AFB, Texas, implemented this innovative dewaxing process using the industry's most tested and approved solvent for wax removal- BIOACT 280. Used per manufacturer's recommendation, it quickly dissolves masking wax. The USDA Certified Biobased Product Label verifies this cleaner is composed of 74% renewable biobased ingredients. It is safe (does not require ventilation) and long lasting (18-24 months). BIOACT 280 is designed to replace trichloroethyelene (TCE), perchloroethyelene (PERC), and petroleum-based solvents of traditional vapor degreasing operations." Skrobarcek example reflects on how a single process can change the chemical substitution and successfully reduced toxic chemical use and hazardous waste generation in everyday operations.

Klinge however feels that replacement of substances of very high concern (SVHC) by less harmful ones is difficult as MROs always depend on the maintenance procedure of the OEM. "Some OEM provide good alternatives, e.g. chromate-free substance which than will then be preferred. For some work, it is also implemented to substitute Chrom VI by Chrom III as being less harmful," Klinge adds.

Going ahead, Klinge points out that there is still work to go in the aviation business which always as to balance safety (corrosion-proof material treatment as part of aviation safety where the aircraft must withstand temperatures ranging from minus 55°C up to 50°C as well as wet condition etc.) with considering the possibilities of the material for surface treatment (where often chromates come in place).

Some of the simpler eco-friendly alternatives to certain toxic chemicals in MRO operations include biodegradable cleaning agents, water-based paints and coatings, and non-toxic hydraulic fluids. These alternatives offer comparable performance while minimising environmental impact and ensuring compliance with regulatory requirements.

Technology, Research and Sustainability

Can technology like 3-D printing and AI aid in sustainable MRO operations?

Technologies like 3-D printing and AI can aid in sustainable MRO operations by enabling more efficient part production, reducing material waste, and optimising maintenance processes through predictive analytics and condition monitoring. This reduces the need for large-scale manufacturing and long-distance transportation, ultimately reducing the carbon footprint of MRO operations. Mirchandani asserts that these technologies have the potential to revolutionise MRO practices, making them more sustainable and cost-effective in the long run. Klioraite wholeheartedly agrees with Mirchandani, that AI offers options to optimise maintenance processes, including improving technical tasks and procedure planning, organising the workforce, and implementing

Cyclean Engine Wash

© *Lufthansa Technik*

predictive maintenance algorithms in collaboration with airlines. "Ultimately, this helps reduce downtime and maximise the lifespan of aircraft components."

In the supply chain and procurement, AI can assist data analysis for better inventory management, including potential savings and efficiencies related to transportation. 3-D printing, once fully approved by regulatory bodies, may enable the production of parts on demand, faster procurement, and hopefully reduce waste in manufacturing.

"3-D printing may enable new designs for lighter spare parts, which could lead to reduced fuel consumption during flight operations," adds Klinge. Explaining this concept with an example Klinge says "AI technology, such as Lufthansa Technik's AVIATAR solutions, can aid in sustainable MRO operations by optimizing maintenance schedules and predicting equipment failures, thereby reducing the need for unnecessary maintenance and minimizing downtime." This can help to extend the lifespan of equipment and reduce the overall environmental impact of MRO operations.

Lam of ST Engineering stresses on another important aspect of 3-D printing and its uses in cabin interiors and replacement of parts that have enhanced durability for less frequent change-outs and lighter weight for reduced fuel consumption. "These features contribute to savings in energy and labour resources, reducing lifecycle costs for operators. Furthermore, as these parts can be printed on demand, operators can reduce their inventory and minimise raw material wastage," Lam further adds.

For Taylor the most interesting is the 3-D printing of titanium and high-strength alloys. "Aside from the time saved in rapid prototyping a significant amount of time and energy can be saved compared to traditional CNC methods," Taylor says.

Computers have been used to help design efficient aircraft from their beginning, but perhaps AI can help larger operators with a variety of aircraft platforms optimise the aircraft to route network dynamically?

R&D – A necessary investment

Protocol suggests that every MRO needs to invest in efficient R&D to stay ahead of the game. But can R&D really help in newer methods of sustainable MRO practises? Let's find out.

R&D can help in developing newer methods of sustainable MRO practices by focusing on innovations in materials, processes, and technologies that reduce environmental impact, increase efficiency, and minimise waste. This can include the development of more sustainable materials, the implementation of advanced predictive maintenance techniques, the utilisation of renewable energy sources, and the introduction of more efficient and eco-friendly processes for MRO operations. Klinge explains how Lufthansa Technik is actively involved in various research and development efforts aimed at advancing sustainable MRO practices, for example:

• Our Hydrogen Aviation Lab will shape the future of aviation by researching how hydrogen-powered aircraft can be handled and maintained effectively in the future, in collaboration with our project partners German Aerospace Center, the ZAL Center for Applied Aeronautical Research and Hamburg Airport. The project is funded by Hamburg's Ministry of Economic Affairs and Innovation as well as the city's investment and development bank (IFB Hamburg).

• Moreover, the company has a dedicated project team that focuses on developing environmentally friendly product solutions for our airline customers, with a special focus on aerodynamics, weight reduction,

power consumption and energy efficiency.

At SKYONE, Mirchandani comments that: "we are actively involved in groundbreaking research projects aimed at enhancing sustainability in aviation maintenance, including exploring innovative materials, processes, and technologies to minimize environmental footprint and maximize efficiency"

Mirchandani has challenged the researchers to come up with a technology to minimise or avoid the wastage that occurs during removal of fuel from fuel tanks during maintenance. As this fuel can't be re-used and needs to be disposed off, Mirchandani urges the industry to find a sustainable solution to avoid this wastage.

At ST Engineering, Lam and his team are always on a look out for partners with the right technology and resources that can operationalise ideas to bring solutions into reality and customise to their exact needs. "For instance, we are seeking solution providers with innovative carbon capture technologies to capture and reduce emissions during engine testing at our engine test cells," Lam adds thoughtfully.

At StandardAero, Skrobarcek and the team are engaged with leading R&D and manufacturing companies and make investments to provide services for advanced products that accelerate and enable sustainable life-cycle product management for aviation. In May 2023, StandardAero signed an agreement with CFM to provide LEAP engine MRO support to airlines and within a few months it met major LEAP industrialization milestones including receipt of Operating Specification (IPsec) approval from the Federal Aviation Administration (FAA), induction of its first customer engine, and graduation of the first class of trainees from the newly launched StandardAero Training Academy. In June 2023, StandardAero entered into a teaming agreement with Boom Supersonic to support the design of its Symphony engine and provide engine MRO services to operators of its Overture aircraft. Boom's Overture is the first commercial airplane designed for net-zero carbon operations, able to operate on 100% SAF.

"We are also positioning ourselves to provide maintenance programme design and services and product manufacturing solutions to Ampaire, magniX, and ZeroAvia as they develop and certify their lower-emissions products," Skrobarcek sums up the achievements.

> "Sustainability is not a trend, but a necessity."
>
> *Jaideep Mirchandani, Chairman, Sky One*

Conclusion

Air travel is at its all-time peak and MROs, in whatever way possible, can play a vital role in reducing the environmental carbon footprint.

Some may think that sustainability is a kind of "fashion wave" to be soon forgotten. However, there were many such "fashion waves" in the past, which now form irreplaceable parts of our everyday lives - computerization, digitalisation, artificial intelligence, and finally sustainability itself. "As every change it has its costs and takes time, however we see sustainability as the only 'new normal' way to exist for organisations and societies in the long term," Klioraite says. "Worth to mention, all those efficiency and sustainability initiatives correlate a lot with continually improving LEAN culture we are sharing in FL Technics, so we are going to "ride this wave" further," Klioraite adds.

Explaining the concept of sustainability in rather strong words, Klinge feels sustainability is not just a trend. "For Lufthansa Technik, embracing sustainability is about committing to practices that create added value for our customers, employees and shareholders and meet our responsibilities toward the environment and society."

"Sustainability is not a trend, but a necessity," says Mirchandani. "By embracing sustainable practices, we can drive innovation, improve efficiency, and safeguard the planet for future generations," he sums up. Echoing Mirchandani's words, Skrobarcek says that we view environmental sustainability as key to our business success. "Our experience has been one of a symbiotic and generative relationship within our business. From my perspective, there has not been a trade-off. What has been good for the environment has been good for business."

Building and maintaining relationships within the entire MRO value chain including customers and suppliers is important to the success in reducing carbon emissions throughout the production life cycle. "Resource use, specifically in the energy and logistic spaces, are primary contributors of carbon footprint," Skorbarcek adds. "Decarbonization in these key scopes of our emissions will be key to our success as we progress towards our net-zero 2050 goal," Skorbarcek concludes.

Additionally, businesses that prioritise sustainability may attract environmentally conscious consumers, investors, and partners, contributing to its long-term financial success. This is in turn crucial for environmental stewardship, regulatory compliance, meeting market demands, and ensuring long-term viability. Hence is our collective responsibility to prioritise sustainability and work towards a cleaner, greener future for aviation.

Air transport is disproportionately visible compared to the emissions it is responsible for which has led to the public perception of air travel being a significant risk to manage. As an industry, there has been a lot of educational media to try to give the facts about air travel to alter this perception. Dan Taylor feels people need access to information to be able to decide the cost/benefit of air travel for themselves. "Within the industry itself we have seen a huge shift in the last two years of people discussing the importance of sustainability. With the regulations around transparency becoming more established there is more information available for both the industry and the public to review," for him sums up the MRO sustainability debate.

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The Route to Successful Technical Training

By David Dundas

The safety and airworthiness of aircraft lie very much in the hands of aircraft mechanics, which makes their training and expertise vital within the aviation industry. However, with the passage of time, modern aircraft systems have become increasingly complicated and the speed at which technological advancements have been made have created numerous challenges when it comes to effective training for would-be aircraft mechanics.

With the volume of information and knowledge that needs to be disseminated throughout those who are involved in maintaining aircraft, ensuring the highest safety standards and proficiencies are upheld and streamlining of technical training has become paramount. So, how can this be achieved?

First, we can look towards digital learning platforms. These are capable of delivering stimulating and engaging training modules through the use of multimedia resources including videos, animations and stimulations. These all help to enhance understanding and the ability to retain information on complex concepts. These platforms offer one great advantage, and that is allowing mechanics to learn at their own pace, in any location where there is access to the internet and on any of a variety of devices.

Next, we have hands-on training which is generally seen as the next step to theoretical or ‘classroom’ training where mechanics learn to operate in a real-world environment and develop practical skills. Established well-equipped training facilities with a mock-up of an aircraft system and components will provide the required realistic training environment, enabling trainees to grow in confidence and develop the required problem-solving capabilities.

We can next look to the benefits of virtual reality (VR) and augmented reality (AR) which can realistically simulate real-world maintenance challenges. Mechanics can become fully immersed in a virtual environment where such tasks as engine inspections and parts replacement can be practiced.

Competency-based training focuses primarily on developing specific skills and abilities essential for effective aircraft maintenance. Learning objectives can be clearly defined, while competencies can be easily aligned to industry standards and industry requirements. Progress of mechanics can be easily identified through regular assessments and evaluations.

Collaborating with industry partners helps mechanics’ training programmes remain up to date with industry trends and advancements. This can be achieved by establishing partnerships with aircraft manufacturers, maintenance providers and regulatory agencies while also helping to develop training resources and a curriculum pathway.

It is essential that mechanics be offered the opportunity to develop their skills and have access to additional training through workshops and seminars, as well as online courses. Mechanics should also be encouraged to obtain certificates and qualifications to personally reward them for their achievements while helping them stay up to date with the industry’s best practices.

Offering mentorships and apprenticeship programmes is a great way to encourage knowledge transfer from seasoned mechanics to those entering the industry. There genuinely is no substitute for experience and learning from a highly competent and experienced mechanic in a real-world environment would be of tremendous benefit to any trainee mechanic.

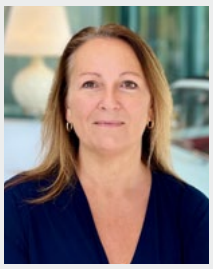
Finally, there is the effective use of performance data and analytics which can help to track training outcomes and measure the effectiveness of training practices. The assessment of on-the-job performance can give a clear indication of the effectiveness of training programs, as well as an engineer’s proficiency and productivity. Insights gained from data analysis can also be used to refine training strategies.

In summary, embracing all or a good selection of the above strategies will ensure that mechanics are equipped with the knowledge, skills, and competencies needed to excel in their roles and meet the constantly evolving demands of the aviation industry.

on the move


Louis Philippe Mallette

Also this month, AJW Group has promoted **Louis Philippe Mallette** to the position of President of AJW Technique, AJW Group's premier maintenance repair and overhaul (MRO) facility situated in Montreal, Canada. With over 25 years of international operational and strategic experience in the aviation sector, Mallette brings a wealth of expertise to his new role. His distinguished career includes serving as MRO Workgroup President of Aéro Montréal, where he contributed to enhancing cohesion and competitiveness within Quebec's aerospace cluster, fostering sustainable growth in the region. Before joining AJW Technique, Mallette spent 23 years at Bombardier, progressing to the role of General Manager. Since assuming the position of Senior Vice President at AJW Technique in September 2021, Mallette has effectively guided the facility through its post-pandemic recovery, demonstrating strong leadership and a commitment to excellence. As President of AJW Technique, Mallette will oversee all aspects of the facility's operations, aiming to enhance efficiency and drive strategic growth initiatives while fostering a culture of innovation and excellence. He will continue to work closely with **Clyde Buntrock** FCILT, CEO of AJW Aviation and AJW Technique.


Clare Brown

AJW Group has appointed **Clare Brown** as Chief Financial Officer (CFO), AJW Aviation. With an extensive career spanning more than 25 years within the aviation industry, including eight years of invaluable service at AJW Group, where she has occupied central positions such as Finance Director and Senior Vice President Finance, Brown brings a wealth of experience and expertise to her new appointment. Prior to her tenure at AJW Group, she served as Finance Director at Thomas Cook. In her capacity as Chief Financial Officer, Brown assumes a pivotal role in overseeing the company's financial assets, ensuring stability, and upholding excellence in financial management and planning. Working closely alongside Chairman **Christopher Whiteside** and CEO of AJW Aviation and AJW Technique, Clyde Buntrock, she will spearhead AJW Group's growth trajectory in line with strategic objectives.


François Biarneix

Vallair, the seasoned aircraft asset specialist committed to supporting operators and lessors, has appointed **François Biarneix** as Operations Director. Based in Châteauroux, Luxembourg, Biarneix will lead the strategic deployment and operations of Vallair's aerostructure and composite shop, engine shop, logistics department and aircraft dismantling activities. Biarneix's extensive management background enhances Vallair's senior team and capabilities. With over two decades of experience, Biarneix previously served as Technical Manager for a supplier specialising in parts production for Airbus and Safran programmes, before assuming the role of Plant Manager in the automotive sector. During his career, Biarneix led the successful transfer of A330 component production from Airbus' Nantes facility to its Indraero facility. This involved establishing and expanding a technical department and orchestrating significant plant transformation, resulting in considerable revenue growth.


Andrea Coccetti

The Board Members of ATR have appointed **Andrea Coccetti** as the company's new Senior Vice-President Finance and Chief Financial Officer, effective May 1, 2024. He succeeds **Antonio Di Gennaro**, who will assume new responsibilities within the Leonardo Helicopters management team. In this role, Coccetti joins ATR's Top Management team, reporting to the company's Chief Executive Officer, Nathalie Tarnaud Laude. He will be based at ATR's headquarters in Toulouse, France. Coccetti brings 20 years of experience, having held key financial leadership positions at Leonardo. Since 2015, he has been the Chief Financial Officer for the Cyber & Security Solutions Division. Coccetti began his career with Fantuzzi Reggiane, a large material handling equipment manufacturer with operations in Italy, Germany and China. He holds a Master of Science in economics from the University of Parma, Italy, and completed an executive leadership programme at Imperial College London. As the new CFO, Coccetti will play a crucial role in shaping ATR's financial strategies and contributing to the manufacturer's continuous innovation and development initiatives.