

AviTRADERTM MRO

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November 2022

HEAVY CHECKS

Suppliers caught
in the middle of
demand and
capacity

IATP Conference

Airline cooperation
lands in Lisbon

Software Technologies

Enabling efficiencies
in maintenance

MRO Europe

Industry resilience
shows out in London



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October set the tone for an industry comeback

Last month AviTrader attended two major aviation conferences, the International Airlines Technical Pool (IATP) in Lisbon and MRO Europe in London. Both events were a fantastic opportunity for us to meet and greet our colleagues and friends, some for the first time since the pandemic. Both shows were very successful in bringing together the key stakeholders in the airline, MRO and aftermarket sectors to discuss the challenges and new opportunities as aviation climbs out of what has been a turbulent few years. At IATP in Lisbon, 420 airline and associate members attended the event and that reached pre-pandemic levels; a remarkably positive result since the physical events have resumed, as IATP noted.

As airlines continue to rebuild their schedules and networks post-pandemic, access to parts and services becomes even more crucial to maintain steady operations especially in AOG situations, and this was one of many take home messages from the IATP gathering.

Meanwhile in London, MRO Europe saw 9,000 registered attendees from 86 countries and over 450 exhibitors and the show drew over 900 qualified buyers from airlines and lessors in attendance. We are pleased to have met many of our readers and advertising clients in London and again, some for the first time. We also had the opportunity to get some feedback on our publications from various readers and clients. I'm glad to report that the feedback has been overwhelmingly positive and that we are helping to drive positive visibility and exposure for our clients.

Thank you for your continued support.

Keith Mwanalushi
EDITOR



MRO Europe, London.

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Airbus

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Safran signs exclusive NacelleLife™ service contract with Avianca




Avianca A320neo nacelles

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Safran Nacelles has signed a four-year agreement with Avianca for the support of the nacelles of the airlines' Airbus A320neo aircraft, powered by CFM International LEAP-1A turbofan engines of which 17 aircraft are already in service. Avianca has plans to rapidly grow the fleet. Avianca will have access to Safran Nacelles' shared pool of nacelles end-items. The airline will also benefit from OEM guaranteed MRO solutions at Safran Nacelles repair station in Indianapolis, Indiana, U.S.A. Safran Nacelles' repair services and spares resources are part of the company's NacelleLife™ support programme, which ensures responsive, cost-effective, and high-quality services that keep airliners in operational condition while minimising costs.


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J&C Aero supports Crown Airlines with cabin refurbishment and livery production for its new fleet

J&C Aero, an international aviation design and production company and Libyan start-up airline Crown Airlines have signed an agreement for cabin refurbishment and aircraft branding support during the delivery of the carrier's first two Airbus A320s. Signed shortly after the Aircraft Interiors Expo in June 2022, the agreement covers the design and production of a variety of aircraft cabin interior elements, such as seat dress covers, carpets, seat belts, as well as cabin

curtains. The contract also includes galley modifications according to the specifications of the new operator of the two aircraft. In addition, the Libyan air carrier entrusted J&C Aero with the design, production and installation of the fleet's branded livery. The latter, together with cabin refurbishment and modification works, are already completed on both Crown Airlines' Airbus A320s.



Crown Airlines entrusted J&C Aero with the design, production and installation of the fleet's branded livery

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Recaro lands massive Lufthansa Group order for 24k economy-class seats



Lufthansa CL3710 headrest

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Lufthansa Group has placed an order for nearly 24,000 Recaro Aircraft Seating (Recaro) CL3710 and CL3810 seats for economy-class cabins in approaching 100 combined aircraft in the Lufthansa and SWISS fleets. Delivery has been slated to commence in Q4 this year. The CL3810 economy-class seats are 15% lighter in comparison to their predecessor, which will save the carriers thousands of pounds in fuel costs and optimize cabin performance. They will be retrofitted to SWISS Airbus A330-300 and Lufthansa Boeing 747-8 aircraft. The seats will be dressed in Lufthansa's signature colours, while the modular design of the CL3710 will minimise maintenance and keeps total cost of ownership low. The six-way adjustable headrest with neck support enhances sleeping comfort for the passenger, while

the seat's amenity flap is built to store personal smart devices for extra convenience. Both seat types have been built with sustainability in mind and feature lightweight structures, thus reducing carbon emissions for the aircraft. Recaro Aircraft Seating is a global supplier of premium aircraft seats for airlines and OEMs. The family-owned company is the market leader in economy-class seating and is recognised for product innovation, award-winning customer service and "driving comfort in the sky."



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Lufthansa Technik carries out world-wide first Performance Restoration Shop Visit (PRSV) of LEAP-1A engine



LEAP-1A engine

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Lufthansa Technik is currently carrying out the first ever Performance Restoration Shop Visit (PRSV) of a LEAP-1A engine. The PRSV serves to restore the performance of the engine. This special shop-visit gives Lufthansa Technik the opportunity of being the first maintenance organisation to analyse the new engine type under real operating conditions. This will help to identify further design requirements for component repair. The LEAP-1A engine is owned by the Swedish charter company Nova Airlines AB (Novair). Novair signed a long-term contract for engine services in 2019, becoming Lufthansa Technik's first-time customer for the new engine type. An initial test run is used first to analyse which modules are responsible for the efficiency losses. The goal is to make the dismantling and repair effort efficient while keeping the incurred costs for the customer as low as possible. In addition, the initial analysis also helps to acquire data to create a digital twin of this engine type. This data can then also be used for the digital platform AVIATAR as part of the engine health monitoring. "It is with great expectations that Novair now submit its first LEAP-1A to Lufthansa Technik for performance restoration," said Thomas Krook, Director Technical Operations at Novair. "Few things mean as much to our airline as getting engines through the shop with the best possible outcome. We look forward to Lufthansa Technik not only delivering the baseline product, but as seen in the past – developing knowledge and methods for sending engines back to us with the highest possible return of investment in the shop visit."



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China Eastern and China Southern sign extended Fleet Hour Agreement with IAE for 100 P&W V2500 engines powering 50 Airbus A320ceos

China Eastern Airlines (China Eastern) and China Southern Airlines (China Southern), two of China's largest carriers, have signed maintenance support contracts at the China International Import Expo 2022. The agreement will cover engine and component MRO including spares support as well as diagnostics and engine monitoring for over 100 Pratt & Whitney V2500 engines that power a fleet of 50 Airbus A320ceo-family aircraft. The maintenance work will be performed at the Shanghai Engine Center (SEC), a joint venture between China Eastern and Pratt & Whitney that is well equipped to service a range of P&W engines, including the V2500 and more recently, the PW1100G geared turbofan family. Separate to this agreement, China Southern has extended its ten-year component support agreement with Collins Aerospace. That agreement adds inventory management support for Collins' integrated drive generator and other aircraft generators, including the A320neo, Boeing 787, as well as COMAC's ARJ21 regional jet. Established in 2007 and operational in 2009, SEC underlines the long-standing relationship between China Eastern and Pratt & Whitney. SEC has become an important maintenance, repair and overhaul (MRO) facility in the region with growing capabilities including Line Maintenance Service for Pratt & Whitney GTF engines recently certified by the Civil Aviation Administration of China.



China Eastern Airbus A321

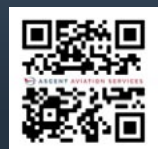
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The FlightSense® contract will provide Hainan Airlines' fleet of Boeing 787s with customizable support solutions
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Collins Aerospace and China's **Hainan Airlines** have inked a FlightSense® contract to provide Hainan Airlines' fleet of Boeing 787s with customizable support solutions to reduce repair time and costs. The agreement with Hainan Airlines, which builds on a 30-year relationship between the two organisations now includes a total of 185 aircraft on multiple platforms through 2025. The FlightSense agreement is a tailored maintenance programme designed for Hainan Airlines' unique operational requirements. And Collins will help ensure availability of Hainan Airlines' maintenance, repair and overhaul (MRO) supply chain management. Products supported under this contract include the air management and electric power systems on Hainan Airlines' fleet of 40 B787 aircraft.

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Willis Lease Finance Corporation reports third-quarter pre-tax income of US\$8.4 million

Willis Lease Finance Corporation has reported third-quarter total revenues of US\$76.9 million and pre-tax earnings of US\$8.4 million. For the three months ended September 30, 2022, aggregate lease rent and maintenance reserve revenues were US\$60.0 million and spare parts and equipment sales were US\$7.0 million. The company reported increased total revenues in the third quarter when compared to the prior year period, primarily due to an increase in lease rent revenue. Maintenance reserve revenue was US\$20.4 million in the third quarter of 2022, a decrease of 13.6% compared to US\$23.7 million in the same quarter of 2021. This decrease was due primarily to a reduction of US\$14.1 million in long-term maintenance revenue relative to the comparable period in 2021, which was offset by a quarter-over-quarter increase of US\$11.0 million in short-term maintenance reserve revenue, which is directly influenced by on lease engine flight hours and cycles. Spare parts and equipment sales increased to US\$7.0 million in the third quarter of 2022, compared to US\$5.1 million in the third quarter of 2021. The increase in spare parts sales was driven by improved industry wide demand for surplus material compared to the prior year period. Gain on sale of leased equipment was US\$0.9 million in the third quarter of 2022 reflecting the sale of two engines. Gain on sale of leased equipment was US\$2.4 million in the third quarter of 2021, reflecting the sale of six engines, one airframe and other parts and equipment. (£1.00 = US\$1.15 at time of publication).

Astronics Corporation reports third-quarter 2022 preliminary net loss of US\$15 million

Astronics Corporation (Astronics) has released that preliminary revenue in the quarter was approximately US\$131 million, up 18% compared with the prior-year period and up 2% over the trailing second quarter. Preliminary revenue was below earlier expectations due to a combination of supply chain constraints and programme reschedules by customers. Approximately US\$112 million of preliminary revenue was from the Aerospace segment and US\$19 million from the Test segment. Preliminary bookings in the quarter were US\$184 million, up 20% compared with the prior-year period and up 24% over the trailing second quarter. Preliminary orders included a record US\$166 million in orders for the company's Aerospace segment and US\$18 million in orders related to the Test segment. Backlog at the end of the quarter was an estimated US\$547 million including a record US\$464 million in backlog for the Aerospace segment. The company's preliminary consolidated net loss for the quarter ended October 1, 2022, is estimated to be approximately US\$15 million, compared with a net loss of US\$7.2 million in the prior-year period. This is reflective of US\$4 million of legal and customer accommodation expense and increased labour and material costs for the quarter ended October 1, 2022, while the prior-year period benefited by US\$1.1 million from the Aviation Manufacturing Jobs Protection Programme Grant. (£1.00 = US\$1.14 at time of publication).

MENA Technics establishes new MRO facility in Bahrain in partnership with Aviance Global (NextGen)

MENA Technics, a subsidiary of Bahrain's MENA Aerospace Enterprises, and U.S.-based Aviance Global will establish a regional MRO service centre in Bahrain, covering both commercial and private jets. The centre will be a collaboration with NextGen Aviation Services (formerly known as Pulsar Aviation Services), a subsidiary of Aviance Global and introduces Part 145 EASA set up for base maintenance. Together with Aviance Global/NextGen Aviation Services, MENA Technics will offer a full turn-key solution to its clients, making Bahrain a competitive location for both private aviation and commercial airlines for their heavy checks. This partnership bolsters the MRO industry in the region and the two-party collaboration plans to expand the services to the Kingdom of Saudi Arabia in the near future, to offer the same support services to their clients there. As part of the agreement, MENA Technics and Aviance Global/NextGen Aviation will offer their expertise in developing and training Bahraini personnel who are accredited with aircraft maintenance licenses. It is estimated that ten Bahraini aircraft engineers and 20 technicians will benefit from the training over the next three years. This training programme is supported by Tamkeen under its 'Train and Place' programme.

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IATP reinforces the spirit of cooperation in Lisbon

IATP conference was supported by TAP Air Portugal.
All photos: Keith Mwanalushi

The International Airlines Technical Pool (IATP) met in Lisbon, Portugal in October for its biannual conference to further strengthen its objectives of sharing technical resources among its members. *AviTrader MRO* was present at the event.

By Keith Mwanalushi

The 126th IATP conference in Lisbon was an eclectic mix of international airlines, aircraft OEMs and aviation aftermarket suppliers coming together in the spirit of cooperation and *AviTrader MRO* was the only industry publication in attendance to capture all the action.

The conference was supported by TAP Air Portugal and was attended by over 420 attendees from around the world.

The general ambiance at the conference was about building relationships and strengthening networks amongst members which made the conference quite unique to other industry events. Despite several members being competitors in the market, IATP creates a platform for them to share in the pooling of resources and derive value by saving costs and investments while still

maintaining service levels and support from other member airlines.

IATP membership has now reached 123 global airlines and 40 associate members – these being OEMs and service providers. The organisation facilitates the sharing of technical resources such as aircraft spare parts, line maintenance support, equipment and aircraft recovery kits.

“We are an independent, non-political global organisation based on a democratic culture with equal opportunities for all members,” says Giorgio Pietra, IATP’s President. IATP organises two conferences every year before the airline business seasons starts (summer and winter). The bi-annual conferences are



Giorgio Pietra, IATP's President



The IATP board at the close of the conference

working meetings during which member airlines representatives negotiate terms and conditions for pooling agreements regarding spare parts, aircraft recovery equipment and line maintenance support for the forthcoming season. Pietra indicates that this also enables airline members to review all the technical issues affecting the air transport industry and receive an update concerning the status of new aircraft entry into service.

"It is important to note that IATP is not the owner of the parts or recovery kits but acts as a facilitator via our platform and through our events and day to day activities. What we do is facilitate and make possible the sharing of resources," Pietra stresses.

A particularly interesting example came from a delegate from a UK airline that said the carrier benefited immensely from the pooling section, especially around the line maintenance of their outstations while working closely with another UK competitor carrier to access each other's equipment.

As airlines continue to rebuild their schedules and networks post-pandemic, access to parts and services becomes even more crucial to maintain steady operations especially in AOG situations, and this is where IATP steps in. The critical difference however is that in general AOG cases, the operator will scour the globe for a part whereas in the IATP case, the spare part will be already waiting in a pool at a line station

provided by a member airline. IATP will then facilitate the invoicing for the use of the component between the pool members.

The parts pool is categorised by letter coding: K for the B737; M-B747, P-A220, CRJ and Embraer; Q – MD11, DC10 and all other Airbus aircraft; S-B757, B767 and B787; T-B777 and G is for avionics and common parts, which can be interchangeable between fleet types.

The consolidated pool organised by IATP shares around 5, 284 items valued at \$128 million and provides reciprocal technical support at worldwide line stations with the aim of generating savings through the pooling of resources.

As an example, an Airbus type operator will logically stock Airbus parts in its inventory and may dedicate certain parts into the pool to make them available to other operators and also participate in the pool.

When speaking to delegates at the conference it was evident that finding spares for the A220 for instance was a challenge. IATP has called on more airlines to participate in its pooling programme, specifically pool "P" which includes the A220, CRJs and Embraer's.

Aircraft recovery equipment can be a huge investment for airlines and considering the relatively low incident rate that an airline may encounter, it makes economic sense to have a pool arrangement in place. This has become an operational requirement by aviation authorities and airports globally.

Incidents that require recovery of the aircraft can be problematic for both airlines and airports especially where there is no or inadequate recovery systems in place. A runway incursion for example that lasts 24 hours can cause severe traffic disruptions, diversions and even an airport closure due to the inability to have the aircraft recovered. When such incident occurs, it is the airline operator's responsibility for the recovery.

In an interview with this publication during the conference, Idi Donald Maswaure, the Head of Corporate Quality at US Bangla Airlines indicated that the airline was extremely keen [and under pressure] by authorities and airports to quickly join a recovery. "First of all, this was the first conference we have attended, and it is part of the process of being considered into



David Kerr, Technical Supply Chain Manager at Norse Atlantic Airways accepting membership into IATP

membership,” he says. US Bangla Airlines attended the event as an observer airline, with intentions of joining membership.

Maswaure indicates that organisations like ICAO are increasingly requiring airlines to have an emergency recovery response plan in place. “We see authorities insisting on it in order to fly to certain airports, they want you to submit your emergency response plan and your aircraft recovery plan. We have seen some airports in the Middle East that insist on that or you may not be allowed to operate into such airports if you don’t,” he states.

Qatar Airways for instance, which is part of the recovery pool, owns a kit that can lift aircraft such as the A380 and covers the Middle East and parts of Africa regions. Qantas and its kit cover Australia and parts of Asia with other carriers covering the global regions.

In Lisbon, five new airlines joined membership, Flyadeal, Norse Atlantic Airways, cargo airline SF Airlines, Air Peace and SunExpress. Air Peace of Nigeria had a specific focus on setting safe their

operations by joining the recovery kits. SunExpress, a subsidiary between Lufthansa and Turkish Airlines also joined and operates a fleet of 737NG and MAX aircraft. Norse Atlantic plans on bringing B787 related parts to the IATP pool at bases such as London Gatwick and Oslo in Norway.

Three associate members – Aviation Integrated Services Group (AISG), SilkExpress Freight, and Turkish Technic also joined the organisation. Turkish Technik reported that it was trying to increase its line maintenance business but was somewhat constrained by labour issues that are affecting the global aviation industry.

Looking ahead, IATP is keen to increase its presence in areas such as Africa and South America as Pietra indicates – “Africa is an area we are looking to grow. Currently we have eight member airlines in Africa and we have identified the need to be more present in the continent, so we are trying to explain the benefits of being a member of IATP, hence our presence in Kigali, Rwanda recently at Aviation Africa,” he points out.

Africa has several airlines that operate smaller regional aircraft types like the Embraer and CRJs and would be ideal

fit to participate the new pool “P” that is dedicated to these types of aircraft.

It’s also worth noting that some smaller carriers are guests of larger member airlines which means they are paying a fee to use the capacity of the full members but they don’t provide any services or parts. In addition, membership to the organisation requires airlines to meet internationally recognised standards.

Airbus and Boeing were also present in Lisbon pushing the effort for sustainability and using digitalisation to provide a central digital platform for tools and aircraft. TAP provided an interesting update on their Corporate Social Responsibility strategy and actions, inclusive of their activity on environment protection in their maintenance facilities and confirmed the company commitment in achieving net zero carbon emission by 2050, as per the outcome of the 41st Session of the ICAO Assembly.

The conference also enabled IATP airline members to check on progress with the new engine pooling programme which is coming soon.

IATP’s next conference is scheduled for March 2023 in Manama, Bahrain.



AviTrader MRO editor with the EGYPTAIR MAINTENANCE & ENGINEERING team at IATP in Lisbon.

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There is greater motivation to transition to paperless and digital processes.
Photo: WinAir

Software technologies target efficiencies in maintenance processes

E-enabled platforms are playing an increasingly key role in integrating MRO and airline processes and even more critically, when compensating for labour shortages.

By Keith Mwanalushi

There is plenty of evidence showing that MRO organisations are now more willing than ever to transition to paperless and digital processes to optimise their operations. Traditionally, MROs have been amongst the slowest to digitise in aviation.

Arturo Melendez, TRAX Software Development Manager believes the intent has been there for quite a long time now, but the motivation to implement these

changes represents a marked departure for many companies. "Funding that had previously been skewed toward IFE, operations, and customer-facing software projects, is increasingly being dedicated for maintenance operations," he says.

Melendez reckons this seems to be driven by the severe labour shortages experienced since the pandemic and the consequent need for efficient operations, as well as by the apparent



Arturo Melendez, TRAX Software Development Manager

return on investment (ROI) derived from technologically advanced MRO software solutions.

During a recent TRAX user conference case study presentations by users revealed the results of their implementation of the eMobility suite of apps, followed by heavy attendance at the 'Transitioning to TRAX eMRO' breakout session on moving from the desktop to the device-agnostic web-based software version – "The ROI testimonies often focused on the benefits derived from a mobile, paperless, and

“ Operators need the flexibility to rapidly ramp up or down their fleet size since the post-pandemic market is still vulnerable to ups and downs in utilisation and demand.

Arturo Melendez, TRAX

”



Creating dashboards could easily highlight any bottlenecks in the process flows.

Photo: TRAX

technologically advanced MRO software solution," Melendez reports.

At Rusada Aviation Software they are not particularly seeing a role change due to manpower shortages but rather manpower shortages are highlighting areas of inefficiency that have always been present in MRO operations and have been exacerbated now resources are tight. "This is prompting people to act, when previously these issues were ignored," says David Purfurst, Global Pre-Sales Director at Rusada.

Purfurst believes the best way to combat the current supply chain issues is with more informed decisions. He says organisations need better insight into potential shortages so that they can plan accordingly to avoid disruptions. "The more data they have at their disposal the easier this becomes. This is yet another reason people are moving towards more modern MRO software solutions, which keep a record of all inventory transactions and utilisation, rather than legacy systems or spreadsheets that do not correctly capture this vital information."

Given the current market environment, organisational and cost efficiency are major objectives among airlines, MROs, OEMs and distributors. Nauman Saeed, Chief Operator Office at SkySelect advises the best way to achieve both objectives is by automating recurring tasks such that operations can effectively scale with

business and market requirements. "This is especially true as the market ramps up globally post-pandemic to 2019 demand. Cash constraints, supply chain volatility and human capital shortages compound the need for operational efficiency."

Saeed observes that digitisation, which is a recurring theme among organisations and machine learning are poised to help aviation stakeholders speed up repetitive and intensive tasks. "Today, more so than ever before, technology is getting more affordable and easier to scale, while enabling current human capital to focus on strategic tasks of the organisation."

For example, Saeed indicates that with SkySelect, airlines and MROs can automate up to 90% of material purchasing, especially consumable and expendables - and effectively shift focus of procurement agents from tactical to strategic buying.

With the shortage of technical skills in the aviation workforce and specifically in the procurement arena, organisations are seeking ways to address requirements and meet their respective shareholder return. "Specifically, when reviewing MRO



David Purfurst – Global Pre-Sales Director at Rusada



Nauman Saeed, COO at SkySelect

software solutions, one area to consider is the implementation timeline and the resource requirement to complete such tasks," Saeed continues.

There are legacy solutions in the parts procurement area that are highly complex and time-consuming, taking six to 12 months of implementation and resource bandwidth, hence diminishing the customer value proposition. However, Saeed cites new disruptive technologies that are available "on-demand," meaning the setup is easy without significant implementation expenses and only takes a few hours to see the cost and process efficiency gains.

"This is achieved through AI-based technology, and a backend service infrastructure providing sourcing, procurement and order management on-demand," Saeed explains.

At specialist aviation software consulting firm, CordobaQ, their MRO clients are looking for support in three main areas. Firstly, the automation of different parts of the business to streamline processes and improve efficiency. Jason Cordoba, CEO at CordobaQ Consulting says this is key as a considerable amount of time is saved through automation of labour-intensive

“Today, more so than ever before, technology is getting more affordable and easier to scale, while enabling current human capital to focus on strategic tasks of the organisation.”

Nauman Saeed, SkySelect

tasks, freeing up personnel to focus on other, more value-added tasks.

"Secondly, it's important to review all manual process flows to ensure that current staff are fully trained and have not created time consuming workarounds due to lack of knowledge. The third key area is the use of data to analyse business performance. The creation of dashboards that track TAT performance, for example, can easily highlight any bottlenecks in the process flow and identify if there are too many team members working in one area of the business, versus a shortage of staff in another," Cordoba explains.

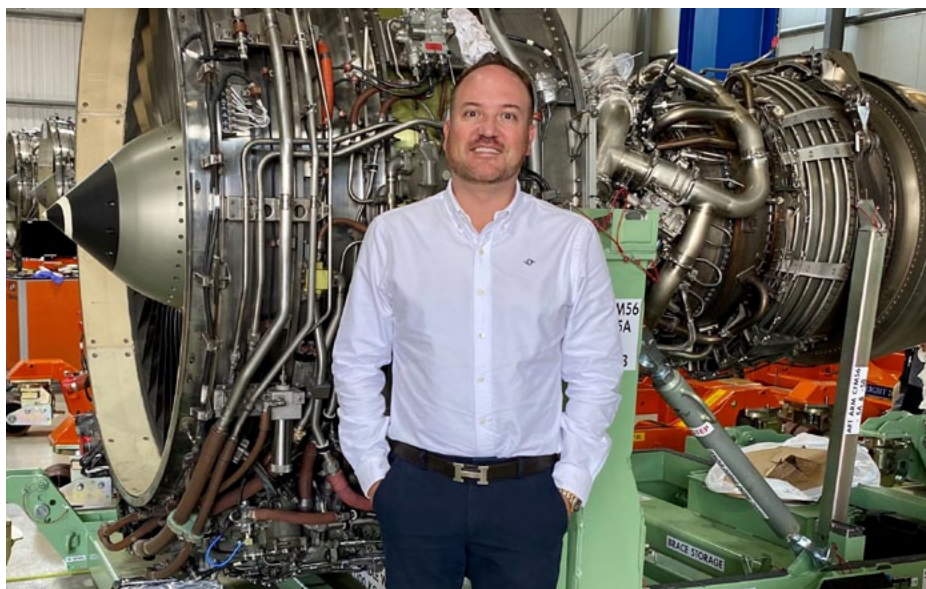
MRO software in a next-gen world

Post pandemic, the industry is seeing an uptick in next-gen aircraft orders and deliveries as older fleets are retired. Earlier this year, Boeing predicted 41,000 new commercial passenger and freighter aircraft over the next two decade while

Airbus sees a need for around 39,490.

Melendez says the growing move toward next-gen aircraft, rapid data integration for operators' fleet induction is a baseline expectation. "With digital data available from OEMs it has become easier and quicker to upload documents, maintenance plans, software, installed component information, and so on. Operators need the flexibility to rapidly ramp up or down their fleet size since the post-pandemic market is still vulnerable to ups and downs in utilisation and demand."

Technologically advanced MRO software is essential for gaining efficiency in both new fleet induction and existing fleet utilisation. In recognition of the transition toward next-gen aircraft deliveries, TRAX eMRO software has enhanced its functionalities for fleet management and the integration and easy access of digital data. For example, Melendez, indicates the system now has a web-based dashboard



Jason Cordoba, CEO - CordobaQ

application – eContent Control – that facilitates easy access to technical records to manage aircraft. The portal also includes controlled access for lessors.

"The app allows aircraft re-delivery records to be assembled in a digital, paperless way, thus providing substantial savings in cost and time for the successful return of leased aircraft, engines, APUs and landing gear," Melendez adds.

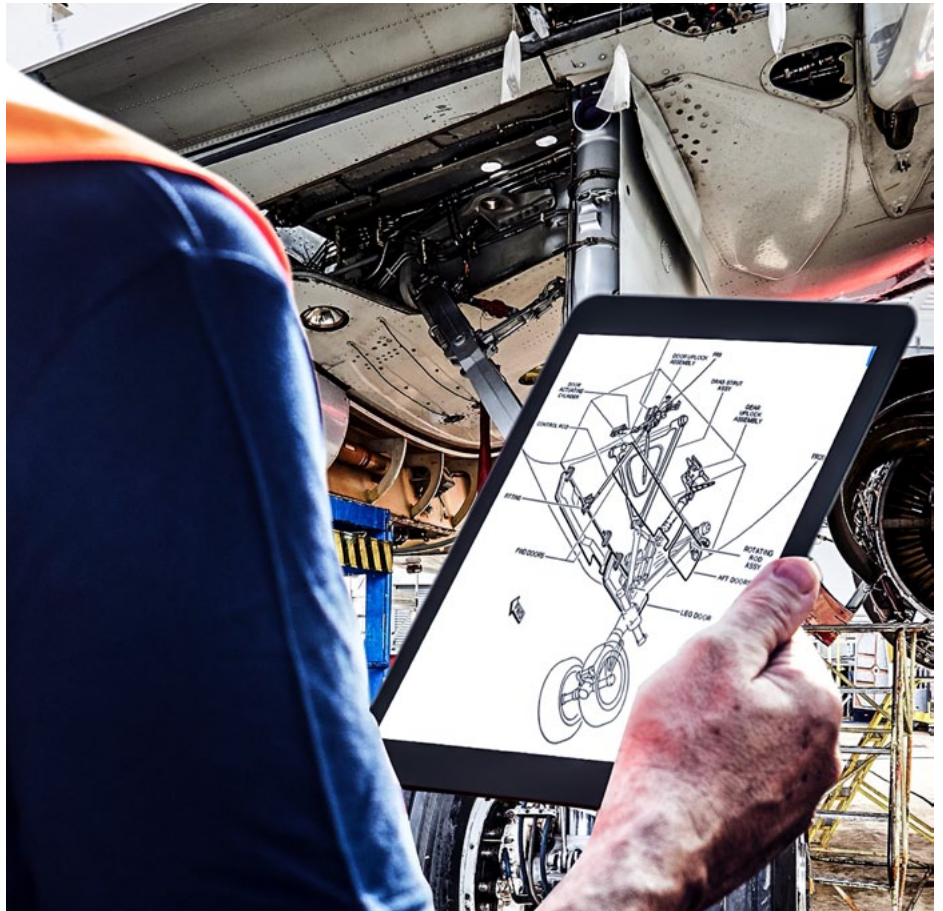
Meanwhile, at Rusada, Mr Purfurst highlights that intelligent maintenance solutions, like the ENVISION software, can closely track all the time and costs spent maintaining a fleet. "Having all this data makes it easy to compare the cost of operating an older fleet versus a newer one. Many operators now have access to these systems and can determine the long-term saving to be made from new generation aircraft."

Another key driver for operators, as Purfurst points out, is being able to take advantage of the health monitoring technology on components in next-gen aircraft. The ability to integrate the data from these aircraft with MRO software will allow operators to transition to a predictive maintenance model for even more cost savings.

Dealing with supply chain conundrums

The MRO sector is facing significant supply chain disruptions but if anything, TRAX has found that the current global supply chain difficulties affecting the aviation industry has served to increase the demand for MRO software that includes exceptional materials management functionality.

Melendez notes that operators and MROs cannot afford to have large stores of inventory on hand. "With such long lead times, bottlenecks, and unexpected shortages, it is a challenge to forecast maintenance and schedule hangars, labour, and parts requirements. Having a robust inventory system that efficiently and accurately controls the acquisition and use of components is a necessity. Such a system requires oversight for ordering, shipping, warehousing, parts picking, inventory counts, and financial tracking,"



The eMobility task control App.

Photo: TRAX

he says.

TRAX has focused on enhancing its materials functionality within the enterprise eMRO system and the suite of eMobility apps. For example, the company has rolled out a new EzStock app which allows users to perform inventory transactions through mobile devices and radio frequency (RFID) scanners. Users can complete transactions at the point of use on their wireless device which results in real-time transaction processing, improved data accuracy, and increased productivity.

Purfurst from Rusada believes the best way to combat the current supply chain issues is with more informed decisions. He says organisations need better insight into potential shortages so that they can plan accordingly to avoid disruptions. "The more data they have at their disposal the easier this becomes. This is yet another reason people are moving towards more modern MRO software solutions, which

keep a record of all inventory transactions and utilisation, rather than legacy systems or spreadsheets that do not correctly capture this vital information," he states.

Airlines say they are increasingly on the lookout for technologies that allow them to connect MRO solutions connected to the rest of their operation, and at and CordobaQ, they already see a growing interest in integration between MROs and airlines – a definite growth area. "Usually it's the MRO side of the industry that contacts us, but we are starting to see airlines driving this change. I have recently had enquiries from a number of airlines inviting me to visit their facility for this very reason," Cordoba reveals.

He recently reviewed software connectivity possibilities with an African airline in which his company will engage to develop a project implementation plan.

"We expect to see more of this type of work in the future," Cordoba anticipates.



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says CEO Swiss AviationSoftware Ltd

DRF Luftrettung goes for AMOS, the world-class M&E software solution.

DRF Luftrettung, one of Europe's major air rescue companies providing rapid assistance to emergency patients, joins the fast-growing AMOS helicopter user-group. AMOS complies with the special requirements of helicopter maintenance by providing dedicated functions only relevant for helicopters, such as vibration monitoring, engineering requirements, dynamic counter options to optimise maintenance control and performance, mission logic or in-depth effectivity rule logic to track fleet uniformity or customer preference.

Many of the MROs in the region are full to capacity.
Photo: American

North America has the second largest commercial fleet (~ 8,560 aircraft) behind the Asia-Pacific region (~ 9,250 aircraft), according to data from Jonathan Berger, Managing Director at Alton Aviation Consultancy. During the pandemic, a significant portion of the fleet was parked in short-term storage, given the lack of travel demand. In order to conserve cash, airlines strategically rotated their aircraft in and out of storage to avoid costly airframe and engine shop visits. "Now that the green time has been burned off, a significant amount of the aircraft and engines now require scheduled maintenance. In turn, this has created significant demand for limited hangar and shop slots, which is putting pressure on heavy maintenance facilities.



Jonathan Berger MD Alton Aviation Consultancy

Alton Aviation has seen some air carriers looking outside the US for maintenance services.

There are several heavy maintenance trends coming out of North American MRO suppliers – "Virtually all North American MRO suppliers are at capacity and are turning away work," said Berger. He explains that the reasons are three-fold; firstly, pent up demand from airlines that deferred maintenance visits during the pandemic. Secondly, a significant labour shortage as many technicians and

Capacity constraints grip North American MRO suppliers

North American MRO suppliers are operating at capacity as carriers return to scheduled maintenance activities. However, labour issues and other demand pressures are causing challenges in supporting base maintenance.

By Keith Mwanalushi

“These modification programmes demand a slightly different mix of talent and when we can combine those upgrades with heavy checks we can create value for our customers.”

Brian Sartain, AAR Corp



Labour shortages have exacerbated the capacity issues.
Photo: Ascent Aviation

engineers left the workforce and finally, supply chain challenges and material shortages caused by the pandemic.

“As a result, airframe heavy maintenance and engine shop visit TATs are significantly longer, impacting the revenue growth capabilities for both airlines and MROs.” Berger feels the combination of labour shortages, supply chain challenges, and long TAT’s all stand to further exacerbate the capacity issues.

Brian Sartain, SVP, Repair and Engineering at AAR Corp said the rapid recovery of air traffic in North America created a very steep ramp in demand and most commercial narrowbody facilities in the US were operating at capacity in early 2021 but he argues that this capacity was largely limited by the availability of

skilled aircraft maintenance technicians as opposed to hangar space.

“AAR has been fortunate to have base-load customers in our network that we have worked closely with during this recovery to insure we can deliver them maximum lift. The career pathway programmes we invested in pre-COVID have really paid off,” he stated.

Besides the continuing demand for narrowbody airframe MRO, Sartain observes that several airlines have returned to competing on customer experience and this has led to significant interior upgrade projects and opportunity in the market. “These modification programmes demand a slightly different mix of talent and when we can combine those upgrades with heavy checks we can create value for our



Brian Sartain, SVP Repair and Engineering at AAR Corp

customers. On the regional front, the pilot shortage has caused some of that fleet to go back into storage regimes which create different demands on the system of MROs in the US."

Bill Collins, President MRO Services at HAECO comments saying the shortage of skilled workers and certified airframe and powerplant mechanics have been exacerbated by the wave of early retirements and people leaving the industry during the pandemic. "This problem is prevalent at independent MROs and North American airlines as well. And it is not just an MRO issue, as we have seen well publicised shortages of other airlines staff such as pilots, flight attendants, and ground staff. U.S. airline employment has finally exceeded the levels seen in 2019, which is encouraging, but the industry must get creative in attracting and retaining talents."

HAECO has grown its capabilities to support the increasingly popular passenger-to-freighter sector and the company has also broadened service offerings to include capabilities such as paint. "I think we will see airlines trying to make their maintenance visits more efficient by accomplishing things like interior modifications and paint during the same maintenance visit rather than accomplishing these tasks individually," says Collins.

Slot availability is definitely difficult to manage, as there was little heavy maintenance done during the pandemic and everyone is now looking to catchup, indicates Scott Butler Chief Commercial Officer at Ascent Aviation Services. "Flexibility is key right now as many projects are changing scope and schedule. This is due to changing flight demand and spares and rotatable availability," he notes.



Bill Collins, President
MRO Services, HAECO

New technologies supporting heavy checks

North America tends to lead in investing and integrating new technologies but as Butler reminded, aviation tends to lag behind in technology adaptation, but he says the new aircraft technologies have made avionics and health monitoring systems interesting in flowing out the entire maintenance visits. "Also, I am excited to finally go paperless as digital records and truly digital workplaces begin to take hold.

"Also, the merger of tech and aviation is finally coming to fruition. Drone inspection and dent mapping development by our partners at Rizse, Inc is extremely exciting and ready to be adopted," states Butler.

Berger from Alton observes several emerging technologies being integrated at North American MRO suppliers. "In an effort to combat the labour shortages and

capacity constraints, many airframe heavy maintenance suppliers are investing in more sophisticated production control and planning software to improve productivity." Additionally, he says MROs are increasingly adopting new data analysis tools to better forecast their material demand and minimise unscheduled maintenance.

Historically, AAR has invested in developing their own proprietary systems, like StAAR, an MRO solution or AIRvolution a repair-cycle management solution. In that tradition AAR has continued to invest in cutting edge solutions like drone inspections, Augmented Reality (AR) solutions for engineering and technician interfaces as well as a paperless upgrade to StAAR that will allow the company to interface with the customer's paperless solutions and enhance the efficiency of technicians – "As the largest Independent heavy maintenance provider in North America, we must interface with many different customer systems and that creates a level of complexity that demands a custom solution," says Sartain.

HAECO has inducted new technology to complete inspections electronically using tablets. Collins explains that this saves time, improves efficiency, and reduces the amount of time inspectors spend moving

“Virtually all North American MRO suppliers are at capacity and turning away work. Airframe heavy maintenance and engine shop visit TATs are significantly longer, impacting the revenue growth capabilities for both airlines and MROs.”

Jonathan Berger, Alton Aviation Consultancy



Slot availability is a challenge in the current environment.
Photo: Ascent Aviation

to and from workstations and aircraft. "This also eliminates paper from the equation, improving sustainability. We are exploring where we can use technology to improve efficiency to offset human capital challenges," he adds.

Tackling aftermarket supply challenges

The aviation aftermarket is facing a lot of supply chain disruptions which can trickle down to affecting base maintenance operations. For HAECO, the supply chain is an issue, but the supply of skilled labour is a greater focus. "We are growing our training capabilities internally as well as partnering with technical schools to address this, and other MROs and airlines have also taken on this strategy," Collins comments.

Butler from Ascent Aviation sees a two-pronged effect. Firstly, this is increasing looking ahead and planning for all shop and maintenance visits. Secondly, an increase in PMA and USM being adopted across many operators.

At AAR, they have seen certain airframes delayed in the process due to varying part shortages and in many instances that force's part swaps between multiple aircraft in maintenance. Sartain says: "This eventually turns into a real

shortage and that is problematic for everyone. Given the depth of some of these shortages we have seen, especially in the component side of the business, recovery appears to be 12 to 18 months out for many component OEM's."

Premium Aerospace Centre (PAC) plans to hire upward of 30 employees with plans for future investments exceeding \$120 million, over the next few years, and a total job creation of between 450 to 600 employees. PAC will locate its international headquarters at the Oklahoma Air and Space Port complex in Burns Flat, Oklahoma. PAC will invest several million dollars to renovate and expand two existing hangars and build a third hangar at the facility.

"Seeing this project come to fruition has been a goal of mine since we met with Premium Aerospace in Mexico last fall," Oklahoma Governor Kevin Stitt stated during a signing ceremony in October. "The investments we are making in this site, and several others, will make Oklahoma a prime target for foreign investment and high-quality jobs. This announcement from PAC further solidifies Oklahoma as the aerospace MRO Capital of the World."

As indicated previously, the aviation



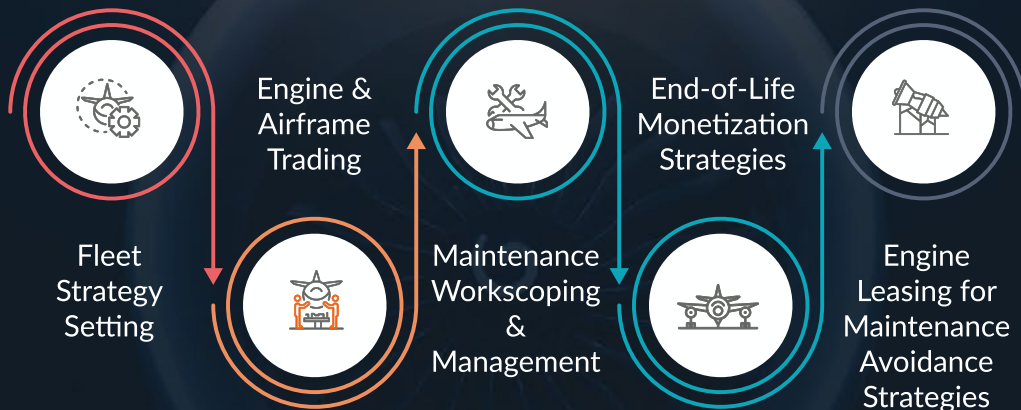
Scott Butler, Chief Commercial Officer, Ascent Aviation Services

material supply chain disruptions are a major contributor to increased aircraft and engine shop visit turn-around-times. Berger concludes saying this is driving major capacity constraints at MRO facilities and causing airlines to have a greater percentage of their fleets grounded for maintenance in lieu of flying where they can generate passenger and cargo revenue.

"Going forward, we are confident the supply chain challenges will dissipate, but in the near term, they are causing a direct negative impact to airline and MRO bottom lines."

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The MRO Europe event in London in October.
Photo: Informa Markets

London sets the tone for resilience and opportunities in MRO

The MRO and aftermarket industries met in London recently to discuss the challenges and opportunities in the European market. *AviTrader MRO* was there and caught up with some of the experts.

The MRO Europe event in London in October brought back the key stakeholders in MRO at a crucial moment when airlines are ramping up capacity amidst a backdrop of rising fuel costs, supply chain problems, labour shortages and geo-political issues in the region.

Despite the challenges in the market, MRO Europe was also a platform to speak about new opportunities and celebrate milestones and new frontiers. Willis Lease Finance Corporation (WLFC) for instance, unveiled its new brand identity that unites its multiple WLFC businesses to demonstrate the extent of its combined offerings.

"The response to our branding has been overwhelmingly positive," declares



Garry Failler, SVP, Materials & Services and Chief Technical Officer at Willis Lease

Garry Failler, SVP, Materials and Services and Chief Technical Officer at WLFC. "We chose to unveil it at MRO Europe so that we could share our expanded service offerings with our valued customers first hand." Failler reports that WLFC has experienced significant interest in the growing areas of the business, and in the brief time since the conference, the company has already hosted site visits from keen customers at its operations in Teesside, UK – "Being able to clearly articulate our growing services through our branding has led to many discussions with customers about their current and future needs," he says.

The key message from London at WLFC was that the company is more than just an engine leasing company, Failler notes.



AJW signs a component agreement with JOB AIR Technic.

Photo: AJW

"It is still surprising when customers are not aware of all that we do, though it is clear to see that is rapidly changing. What our new branding helps to convey is the breadth and depth of our organisation."

WLFC leases large and regional spare commercial aircraft engines, auxiliary power units and aircraft to airlines, aircraft engine manufacturers and maintenance, repair and overhaul providers in 120 countries. These leasing activities are integrated with engine and aircraft trading, engine lease pools and asset management services supported by innovative technology through the

subsidiary, Willis Asset Management Limited, as well as various end-of-life solutions for engines and aviation materials provided through another subsidiary, Willis Aeronautical Services, Inc.

With business units Willis Engine Repair Centre US/UK and Jet Centre by Willis, as well as subsidiary Willis Aviation Services Limited, the service offerings also include Part 145 engine maintenance, aircraft line and base maintenance, aircraft disassembly, parking and storage, airport FBO and ground handling services.

WLFC is pushing the message that it is a multifaceted aerospace business while

keeping a close eye on the European markets when developing these business sectors. Failler feels upbeat to see Europe strong and flying again - "In fact, we are nearing pre-pandemic travel levels. With planes flying, comes the need for our varied services, be it engine or aircraft maintenance, aircraft storage or teardown, Willis Asset consulting services or engine lease support programmes and with a sizable percentage of our customers in Europe, we think the impact will be significant," he states.

Meanwhile, AJW is celebrating its 80 years in business in 2022 so MRO Europe was certainly one of the highlights of the year and proved to be a highly successful one for AJW Group. "Looking back at the event, we recall the hive of activity at our stand, the back-to-back meetings with suppliers, customers, and partners, and opportunities that were created for growing our business going forward," says Louis Mallette, SVP Operations at AJW Technique, Montreal.

AJW signed a handful of agreements in London including a new component repair agreement with JOB AIR Technic. The agreement supports JOB AIR with a closed-loop PBH support contract for the supply and repair of components including logistic services and a support pool of components.

Looking ahead, the driving focus at AJW is to continue the journey of developing digital transformation strategies to improve business operational efficiency to enable the company to reinforce customer service delivery. "This is happening across all sectors of our business, from warehouses and workshops right through to administration and customer management. As industry leaders, we must move with the times, so digitisation is not a choice right now, it is a necessity. By transforming the way, we work, and by continuing our agile approach to business we will make our operations more effective."

Mallette says the focus is not only on continuing to bring digital transformation into AJW systems and operations but also on working with the aviation industry, OEMs, and airlines, in the development



Louis Mallette, SVP Operations at AJW Technique

and implementation of predictive maintenance. "We hope to see all stakeholders in the industry collaborate on this going forward, for the good of the industry which has recently experienced a general downturn and lack of trust from the public," he observes.

By pooling the vast sea of industry knowledge and gathering digital data that innovative technology provides, Mallette believes the industry can achieve connectivity across all areas of aviation and work towards reducing operational costs for the airlines – "In so doing, we all work toward the common goal of a more sustainable industry that will grow and strengthen going forward," he adds.

With its bright purple colour palette, the Magnetic Group certainly stood out with its modern-designed pavilion. The stand had digital screens with capacity to have up to sixteen meetings for various business units at the same time. "During the drinks' reception time, our booth became a hot spot – a lot of aviation professionals came by to chat and get to know each other. It was especially pleasant to see our customers and partners after a tough time with the pandemic and be able to meet and greet everyone in person without any restrictions," mentions Stella Täht Marketing Lead at Magnetic Group.

Magnetic brought a strong team of over 20 employees to London this year, thus representing all business units – base and line maintenance, painting, CAMO and engineering, spare parts trading, interior solutions, assets trading, and engine repairs. Considering the variety of exhibitors and attendees, the company was able to meet long-term partners and present itself as an innovative total provider of aviation services for new customers.

The focus at the Magnetic Group was on networking with customers, discussing the market situation, and sharing the experience post-Covid – "It's not over, but thankfully, the future looks brighter than a year or two ago," Täht says, candidly.

Aero Norway was awarded a contract at MRO Europe from an undisclosed operator to provide engine MRO for the next seven years - more revelations about the deal are expected soon. Meanwhile, the key



Magnetic Group represented all of its business units.

Photo: Keith Mwanalushi

note from London is that Aero Norway has sustained full production CFM56 engine MRO capacity over the past couple of years and kept all its technicians and engineers employed through Covid and post-pandemic.

"We have invested in people and training, maintaining continuous improvement across all processes," says Ramon Peters, Global Sales and Marketing Director at Aero Norway. "There has been a very positive market response to this

and as a result we see market demand increasing too." However, he notes that the lead-time for slot availability is increasing accordingly.

On the current supply chain issues in Europe in particular, Peters doesn't see a return to consistency to support engine repairs and MRO quite yet – "However, we do see a slow and steady improvement which should lead to normal support being fully resumed within 2023," he indicates.



Setna iO, an aftermarket aircraft part supplier at MRO Europe.



Tom Boulcott,
Managing Director, and Partner, Setna iO

Setna iO, an aftermarket aircraft part supplier had perhaps the most creative stand at the event and brought around 20 team members from seven countries to attend MRO Europe. The company proactively invests in assets and repairs to build up large inventories, as well in house capabilities at its FAA/EASA certified repair shop, Setnix.

Interestingly, Setna iO just announced the acquisition of an 11-year-old CFM56-5B6/3 powered A319-100 (MSN 4713). It's reported to be the youngest non-incident related narrowbody Airbus to be disassembled yet.

The company scours the globe for

asset acquisitions to process through Setnix and other repair shops with an aim to build the world's largest "in stock, ready to go" inventory. "This inventory supports the high demand global fleet, which is grappling with significant supply chain disruptions for parts," states Tom Boulcott, Managing Director and Partner. He adds that there is consistently high demand, with consistent supply chain issues. "We do not see supply chain issues clearing up any time soon," he suggests.

Speaking further on supply chain issues, Mallette from AJW says the supply chain within the commercial aviation market has gone, and continues to go, through the most challenging and distressing of scenarios possible. "Operators have gone through two years of hardship, falling margins and mounting losses, and many within the supply chain have had to reorganise themselves for the prospect of enduring lower aviation related volumes."

Pre-pandemic, OEMs were reacting to 'just-in-time' inventory strategies. Mallette explains that this was about moving parts quickly, "which was fine when supply chains were replete with components. However, when persistent shortages arose – as was the case with semiconductors –

this rhythm was interrupted."

He feels there has been an extended and continued deterioration in the OEM and supplier performance environment concerning shop processing time. "Driven by the higher cost of raw materials and labour costs, we have seen double-digit annual escalation increases, and skills and staff shortages besiege the sector. In short, the lack of raw materials, qualified human resource shortage, the Russia-Ukraine conflict, and the impact of climate change, have been a melting pot that has fractured the logistic chain," Mallette stresses.

AJW Group is working to collaborate with partners to adapt to the new normal by utilising innovative technology, maximising, and empowering existing human resources, while also drawing new talent into the industry, to minimise disruption.

"By embracing and adapting to what is happening around us, we are confident that over the coming year we will see a steady return to a more consistent supply chain in the MRO and aftermarket sectors. Through embracing technology, having an agile approach to change, and collaboration within aviation industry stakeholders, we will see a definite recovery in the industry," Mallette concludes.

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Q & A

In the hot seat...

John McKirdy,
Senior Vice President,
Kellstrom Technical Services
Group [KTSG]

What attracted you to this industry?

Some might say that I was born into it. My father joined Air Canada a couple of years after I was born. I ended up joining Air Canada as a 21-year-old after I left university as a cleaner and then transferred over to become a mechanic. My older brother had joined two years prior to me, and my younger brother joined about six years after me. We had very good careers in the company, and I was blessed with some great leadership that gave me an opportunity and inspired me to work hard and to bring everything I had to the job at hand every day. I have extended family in the industry as well and it has provided each of us a very good life. Throughout my aviation career I have focused on the aftermarket technical services area where I learned about the tremendous science and technology that supported aircraft in flight. I was always inspired by the great people around me whether they were fellow mechanics or engineers or other leaders and how they brought their intelligence, dedication, and their integrity to collaborate with them every day. One special thing about the aviation industry is the realisation of the significance of what we do every day and how important it is to "get it right" and as leaders, to set up training, tooling, and processes to enable all our employees to accomplish safe, high-quality work every day.

What does a typical day involve in your role?

As the leader of the Kellstrom Technical Services Group [KTSG], I can work with our engine hospital shop and field services organisation, Vortex Aviation, our technical advisory company The Aircraft Group, and the Technical Engine Asset Management organisation that supports third party engine aircraft management services. Focusing on Vortex



John McKirdy
Senior Vice President, Kellstrom
Technical Services Group [KTSG]



The focus for Vortex Aviation is maintaining commercial aircraft engines.
All photos: KTSG

Aviation, I have the responsibility of the daily oversight of the Fort Lauderdale facility and working with the VP Technical, General Manager, Anthony Kinsella, in Ireland we oversee the three facilities and support the technical and quality requirements for our customers. A typical day focuses on the five main organisational pillars of quality, delivery, safety, facilities / equipment, and customer satisfaction. The first meetings of the morning focus on the production and materials services requirements to meet our plan, followed by commercial reviews either for sales or customer communications.

Briefly, tell us about the key capabilities and solutions at Vortex Aviation.

The focus for vortex aviation is maintaining commercial aircraft engines either in the field or in our purpose-built hospital shop visit management facilities. We focus on the CFM56 series of engines as well as the CF6-80, PW4000, CF34, and V2500. Recently we have added capabilities on GTF and LEAP series of engines as well as APU's. Our greatest value is in surgical strike maintenance management to fix aircraft engines and return them to operation with a

fast turnaround time at the lowest possible maintenance expense. Our customers are generally looking for capabilities on module swaps, top and bottom cases, borobleshooting, engine removals and installations, and focused lease return worksopes with a commitment to reduce downtime and maximise revenue generation.

What demand trends are you seeing for quick turn repairs as airlines rebuild their flying schedules?

Continued congestion within the supply chain is significantly impacting major engine overhaul MROs. It is now becoming common place to see engine overhauls with 100+ days in the shop. With asset owners and operators targeting to maximise every available option to create value with their fleet of engines airlines, they are increasing their focus and assigning even greater value to hospital shop workscope management services and solutions that Vortex Aviation provides. By minimising downtime and cost per event, hospital shop visit management is now a key engine management strategy which is proving valuable to squeeze out every revenue generating opportunity cycles from each engine. It further enhances the

engine spare situation within airlines as the major overhauls look to rebound from significant delays in turn-around-time.

Are you seeing a push towards more engine lease returns inspections in the current environment?

Vortex aviation does not see it as a "more" situation but as a better performance situation on lease returns. Due to the need to move assets quickly and to ensure that the paperwork that accompanies these assets are of the highest quality, Vortex Aviation is seeing increased demand in the services we offer related to lease return activity. We have been fortunate to have some of the industry's top lessors engage with us across our three global facilities in supporting lease return activity. As such, that increase in repeat business has enabled us to establish dedicated lease return production lines and secure our internal resources to support these contractual relationships. Our staff is industry-leading in our technical and quality ability to consistently deliver to our customers lease return workscope paperwork and quality inspection requirements. Through our commercial management activity, we keep our customers

aware of the status of each engine and our progress in completing the lease return actions as well as affecting the necessary repairs in a cost effective and time effective manner. As an added benefit to the aviation community, Vortex Aviation's 130,000 square foot of facilities is climate controlled and well positioned globally to store these assets for certain periods of time to allow for the asset to be placed with the next operator.

The industry is facing supply chain challenges. How is this impacting your engine repairs?

It certainly is challenging and one that needs a lot of focus and attention. At Vortex Aviation we are working hard at ensuring that we have the right consumable, expendable and rotatable materials on the shelf at the right time, as well as structuring key strategic supplier agreements with material supply companies and engine component repair companies to fulfill our customer requirements. There is a continuing level of pressure on technical staff availability and on qualified repair station support to support the demand that exists. In our line of work, we need to count on our internal supply

chain organisations and our production team to work in concert with our customers to ensure that we minimise any predictable delays. Part of our effort is to use our Kellstrom Aerospace network for material supply where possible and to ensure that we keep our material supply performance high while minimising the cost impact and turnaround time impact to our customers.

How is your new engine maintenance facility performing?

We have three Vortex Aviation facilities, two of which are somewhat new. Just prior to the pandemic we established our Dublin facility which is a 50,000 square foot facility on the airport grounds in Dublin to complement our existing Irish facility that was established in Shannon Ireland. In total, we now have approximately 75,000 square feet in Ireland. Similarly, during the pandemic in Fort Lauderdale, we moved to a new location and have constructed a purpose-built facility to support our hospital shop and field service activities. These three operations are all world-class facilities and the staff that support this business, are highly qualified and dedicated to their craft. Each of our

Vortex Aviation facilities have seen an increase in volume and an increase in repeat business from key strategic customers allowing us to grow responsibly and to improve the opportunities that we can provide to our employees and our owners.

What is next in the pipeline at Vortex?

We will continue to focus on our core engine model capabilities as we believe each of these engines have significant remaining runway in the upcoming years and we will make every effort to increase our activity on our recently added capabilities on the LEAP, GTF and APUs. Our additional focus is to continue to add the right technical and support staff skill sets to strengthen our growth trajectory due to our recent new customers contractual signings and our continued organic growth with our existing customer base. We believe the future for engine hospital shop worksopes and field service support is extremely positive and we are continuing to look at inviting industry personnel to join us and help us achieve these growth goals that our customers are committing to us.



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