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DECEMBER 2021 • VOLUME 23 • ISSUE 6

MRO

Management



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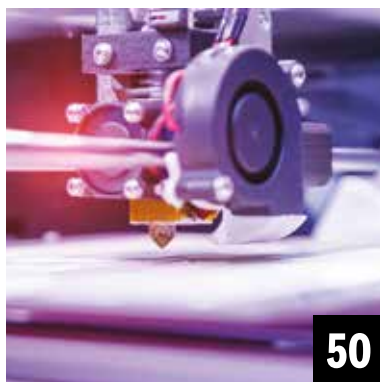
MRO
Management

Published by
Real.
RESPONSE MEDIA

Unit 4D, Cally Yard,
445 Caledonian Road,
London, N7 9BG

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additive manufacturing

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Editor's Letter

As we approach the end of another year, it is a time to both reflect on the previous 12 months and focus on those ahead. Did 2021 go as the MRO industry hoped, given the conditions? And what will 2022 – and beyond – look like?

Those are some of the questions we asked a selection of industry players for our cover story, which provides a global outlook for the year ahead. We canvassed the views of 12 MRO houses, manufacturers, service providers and analysts for this special report to assess their general mood, feelings about the MRO recovery, strategies for the year ahead, and the technologies that will enable them to increase efficiency.

A general feeling of cautious optimism prevails, but also a recognition of the impact the Covid-19 crisis could still have on the sector, and aviation in general. Indeed, as we were putting the finishing touches to this issue the emergence of the Omicron variant threatened to throw out all forecasts for 2022. Although still being studied, if early indications prove correct then, while it may spread more easily, the symptoms are milder, so there may be less reason to panic about the more important statistics of hospitalisations and deaths.



Only time will tell how governments, and people, will react.

No matter what happens, the MRO industry has proved itself to be resilient and innovative, and that will not change in 2022. As two of our commentators note in the MRO global outlook, based on their experiences at recent trade shows and other conversations they have had, the industry is “hungry to drive out of the current situation” and has “a very positive vibe and energy” right now.

Elsewhere in the issue, we get some expert advice on how to perfect spare parts inventory management and put the spotlight on regional airliner MRO. We also present our regular array of interviews, news analysis and thought leadership articles. Our ‘Industry voices’

section, for example, features fascinating insights on different aspects of the industry – Pratt & Whitney on technological advancements; Fokker Services on supporting complex power generation components; and EirTrade Aviation on aircraft disassembly and recycling.

I hope you find the MRO global outlook special report

useful, and enjoy the varied content on offer in this issue. The team at MRO Management would like to wish you a joyous festive season and we will see you in the new year.

Jason Holland
EDITOR

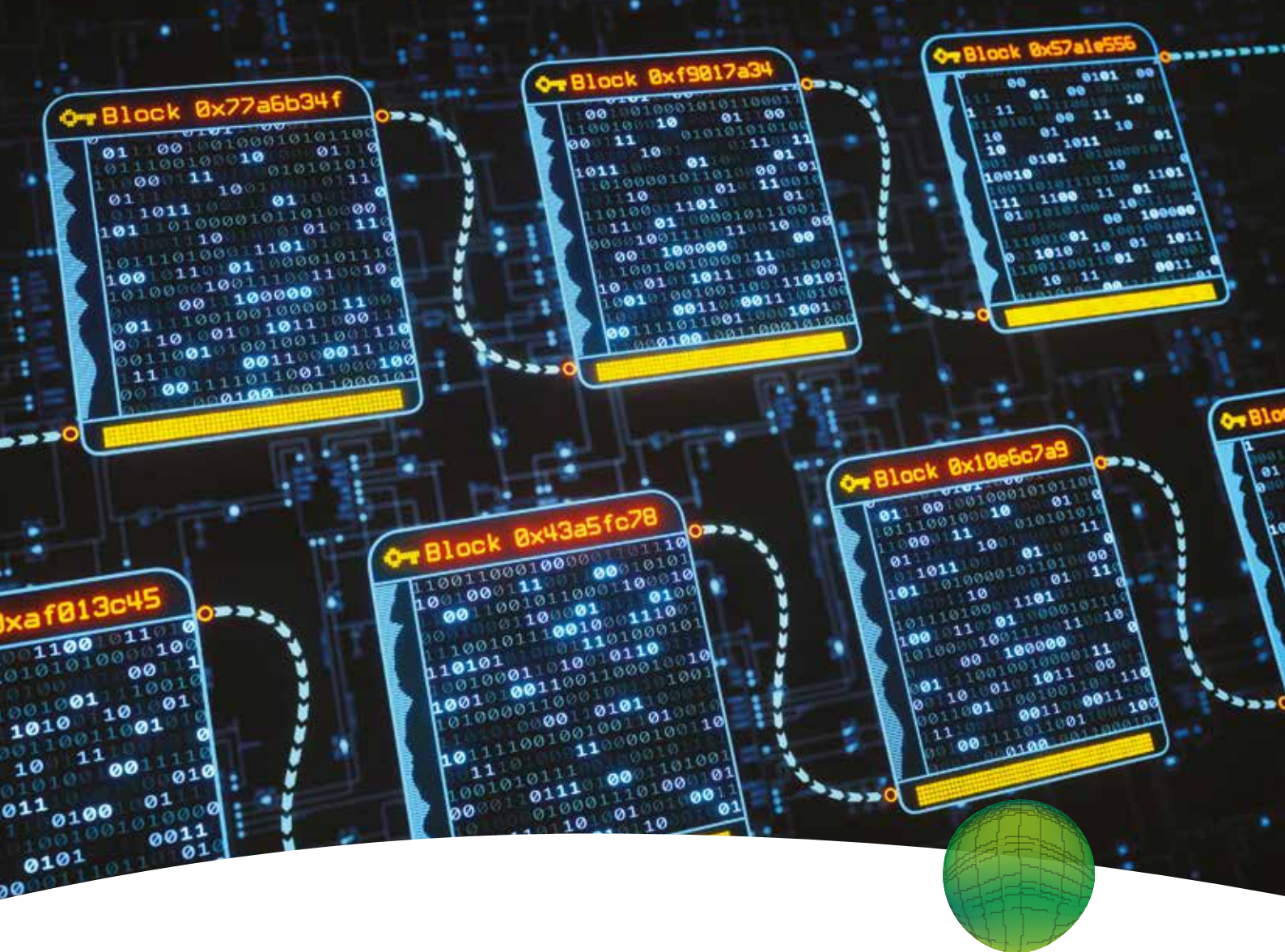
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SITA

News from across the industry

HANGAR *talk*



ENGINES

Understanding and flexibility key to Gulf Air and AFI KLM E&M deal

Gulf Air has awarded Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) a support contract covering the CFM56-5B engines powering its A320ceo fleet. A component support contract for the Kingdom of Bahrain national carrier's A320 fleet is already in place between the two companies.

The latest agreement includes shop visits, fleet engineering, condition monitoring, spare support and other additional services. AFI KLM E&M said Gulf Air would also benefit from its 'PROGNOS' predictive maintenance tool.

AFI KLM E&M and Gulf Air have been working together for more than ten years, initially with an engine support contract for the airline's A320s and A340s.

"It is very valuable to be able to work on a long-term basis with a player who

has a deep knowledge of its products, from both a maintenance point of view and as an operator of the fleets concerned," said Gulf Air's acting chief executive officer Captain Waleed Abdulhameed Al Alawi. "It is this understanding of airline-MRO, combined with true flexibility in the offerings and support that continues to convince us in furthering our relationship with AFI KLM E&M."

AFI KLM E&M's SVP commercial Pierre Teboul commented: "Gulf Air is a historical customer since 2008 and we are very proud to maintain this long-term partnership. It is a powerful signal of our ambition to expand in the Middle East and Africa across the full array of our MRO services and in particular our engine support services, enabling us to respond quickly to demand in an appropriate manner."



AIRCRAFT

FL Technics wins Wizz Air contract

Wizz Air has awarded FL Technics a four-year heavy maintenance contract covering its Airbus A320/A321 neo and neo fleet. Services to be provided include both planned heavy maintenance checks as well as short-heavy maintenance visits, with the contract commencing in July 2022. An option to extend the contract is included in the agreement. FL Technics already provides line maintenance services for Wizz Air in a long-term cooperation.

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17%



Pratt & Whitney says its new 'GTF Advantage' engine decreases CO₂ emissions by 17 per cent compared to prior-generation engines

10



Safran Aircraft Engines has awarded SIAEC a 10-year MRO contract for engine test services on CFM LEAP-1A and -1B engines



- Etihad Airways has selected OEMServices to provide component support on its fleet of A320/A321 family aircraft in a five-year contract. OEMServices will deliver 24/7 component support with spare parts available locally in the UAE, as well as transport and repair services for the A320/A321 family aircraft.

- Ryanair has extended its maintenance agreement with Joramco, which was first signed in 2019. The Amman-based MRO provider will perform heavy checks on more aircraft from Ryanair's fleet of Boeing 737-800s.

- ST Engineering has been awarded a five-year component maintenance-by-the-hour contract by Virgin Australia Airlines. The MRO company will provide full, integrated component support to the airline's 737NG fleet. Services will include repair management, pool access and provision of consignment stock in Australia.

- Vietjet Air has signed a memorandum of understanding with SR Technics for MRO services on the airline's CFM56-5B engine fleet installed on its A320 and A321 aircraft. As part of the US\$150 million contract, SR Technics will provide engine maintenance, technical and training services, component requirements and repair at its facilities at Zurich Airport in Switzerland.



AIRCRAFT

Etihad Engineering wins Virgin Australia heavy maintenance contract

Etihad Engineering has been awarded a heavy maintenance contract by Virgin Australia for the airline's Boeing 737 fleet. The contract covers heavy maintenance and modifications on more than 30 nose to tail aircraft.

"We are pleased to welcome another valued customer from Australia to our facility in Abu Dhabi," said Etihad Engineering's chief executive officer Abdul Khaliq Saeed.

"With Australian borders reopening and international flights resuming, we are all geared up to support the Virgin Australia team ensuring its Boeing 737 fleet continue to take to the skies in top shape as they meet the projected increase in passenger demand."

Virgin Australia's chief operations officer Stuart Aggs commented: "As domestic and international flying ramps up from an Australian perspective,

30



The contract covers heavy maintenance and modifications on more than 30 nose to tail aircraft

Virgin Australia is as focused as ever on safety and on ensuring our aircraft operate at, and are maintained to, the highest possible standard."

Etihad Engineering's maintenance facility is located in Abu Dhabi, adjacent to Abu Dhabi International Airport, over an area of 500,000sq m with 140,000sq m dedicated to aircraft parking and

preservation. Aircraft hangars at the facility cover approximately 66,000sq m, including 10,000sq m of aircraft painting facilities.

Trend watch.

New launches, partnerships and techniques are driving innovation in the MRO industry, reports **Luke Chamberlain**



01

Driving efficiency

ITP Aero has designed and manufactured the tail bearing housing for the first Rolls-Royce UltraFan demonstrator engine using additive technology. Also known as 3D printing, the company said the technology enables a better use of energy and raw materials in the manufacturing of the engine component compared to current generation processes.

The new generation UltraFan engine is expected to be 25 per cent more fuel efficient than the original Trent 700 and to be able to run on 100 per cent sustainable aviation fuel.



05

Opening up

Aircraft maintenance licences issued by authorities in China, Hong Kong and Macao will now be recognised in each of the territories under a new agreement. The Joint Maintenance Management Cooperation Arrangement will allow licence holders to be able to work in aircraft maintenance organisations located throughout the Chinese Mainland, the Hong Kong SAR and the Macao SAR.

HAECO Group welcomed the new arrangement, saying it would facilitate the flow of aircraft maintenance licence holders throughout the Chinese Mainland and enable HAECO to “tap into a wider pool of aircraft maintenance professionals in increasing employment opportunities across the region”. The company added: “HAECO Group is pleased to see closer cooperation amongst the authorities, boosting development of the local aviation industry.”

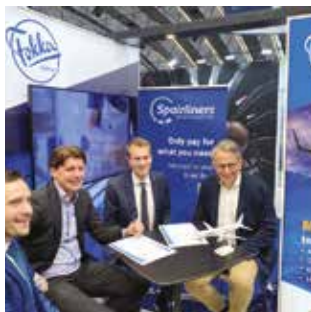
02

A shared mission

Spairliners and Fokker Services have finalised a long-term agreement for MRO component support. Fokker Services will perform MRO services for a variety of line replaceable units related to power generation, bleed air valves, starters and avionics for the Embraer E-Jet family. All units will be repaired in-house at Fokker Services’ facilities in the Netherlands and the US.

“Fokker Services and Spairliners have a shared mission: to provide highly reliable aftermarket services for customers worldwide,” said Menzo van der Beek, CEO of Fokker Services.

“With decades of repairs expertise, the team at Spairliners can count on our support for this range of critical components.”



04

Reducing waste

Emirates has awarded a “first-of-its-kind” contract to UAE-based company Falcon Aircraft Recycling to recycle and upcycle the airline’s fleet of retired A380 aircraft. Partnering with Wings Craft, another UAE-based firm, Falcon will design and manufacture collectibles and retail items from the materials and parts removed from the aircraft, with environmental impact thus reduced.

03

Under one roof

Dublin Aerospace has opened a new landing gear facility in Ashbourne, County Meath, Republic of Ireland. The 70,000sq ft site, which will specialise in Airbus A320 and Boeing 737 landing gear overhaul, has the capacity to perform up to 350 overhauls per year.

With four new electro-plating lines, light and heavy machine shops, dedicated inspection and an NDT centre, DAL said the unit can accomplish the tasks required for a complete overhaul under one roof.

The facility was financed by a €12 million investment supported by the Irish government through state development agency Enterprise Ireland, and was officially opened on 27 October by Tánaiste and Minister for Enterprise, Trade and Employment Leo Varadkar.



08

Customer support

Safran Landing Systems is launching a single brand that “promotes and clarifies” its range of customer support services for landing gear, wheels, brakes and associated systems. All services will be grouped in a “user-friendly” customer portal called ‘Landing Life’, designed around three main objectives: to keep planes flying; to reduce the total cost of ownership; and to foster the sharing of expertise. It is aimed at operators, maintenance centres and leasing companies.

Safran Landing Systems’ chief executive officer Cédric Goubet commented: “Landing Life delivers a slate of services developed jointly with our customers. Along with our role as OEM, which covers the entire lifecycle of landing and braking systems, that enables us to provide solutions tailored to the operational needs of our customers, while also continuously improving their user experience.”



10

Cutting costs

MTU Maintenance has launched ‘CORTEX’ – a new fleet management software – with customer LATAM Airlines.

The maintenance cost and planning tool accommodates financial, technical, operational, environmental and market considerations to generate engine planning scenarios, MTU said.

“Our new service reduces maintenance costs and increases dispatch reliability for airlines,” noted MTU’s senior vice president Martin Friis-Petersen. “It is completely customisable, immediate and proactive. Such a tool is not currently available on the market today – airlines need a tool like CORTEX.”

“Our new service reduces maintenance costs and increases dispatch reliability for airlines”

06

Meeting demand

ExecuJet MRO Services has announced plans to develop a purpose-built MRO facility at Sultan Abdul Aziz Shah Airport in Subang, Malaysia. The Dassault Aviation-owned company has signed a land lease with state-owned Malaysia Airport Holdings, the operator of Subang Airport.

24

Construction of the new ExecuJet MRO facility will take approximately 18 to 24 months



09

First time check

Air Astana has carried out C-check maintenance for the first time at Nursultan Nazarbayev International Airport in Kazakhstan. Performed on an A321, the aircraft will return to revenue service following a verification flight. The airline’s next C-check will be performed at its modern engineering centre in Kazakhstan in December, followed by a further six in 2022.

07

Truly global

Improving efficiency in the aviation sector is the main aim of a new digital records platform which TrustFlight, Boeing, RaceRocks and The University of British Columbia are collaborating to create. Their Digital Aviation Record System (DARS) will be the “world’s first truly global” web-based component and airworthiness records platform, connecting data across the supply chain, the partners said. “DARS will enhance their functionality by enabling seamless transfer of accurate aircraft information, removing the need for manual data entry and delivering significant efficiency improvements,” the companies explained.



ExecuJet

CURIOSITY CONQUERS COMPLEXITY

Technological advancements from predictive maintenance to robotics are pushing the aviation industry forward, says Pratt & Whitney's vice president of aftermarket global operations **Joe Sylvestro**



“To us, it’s about transporting people reliably to their destinations and it’s about providing the care and intelligence to service aircraft engines expertly”

↑
Joe Sylvestro is vice president of aftermarket global operations at Pratt & Whitney

Awe-inspiring complexity is behind the engines that take you and me, our heroes and cargo to the sky. Fortunately, we have masterminds who understand the intricacies of engines and who strive to ensure the dependability of these machines that get us where we need to go.

In a typical jet engine, 15,000 parts come together. Similarly, in aviation, technology, product and process innovation must merge with sustainability advancements to keep the industry moving forward.

For the past six years and counting, I have served as vice president of aftermarket global operations at Pratt & Whitney. As the pace of change quickens, our passion for technological advancement deepens.

A world leader in the design, manufacture and service of aircraft engines for nearly a century, Pratt & Whitney remains a leader in innovation – advancing preventative maintenance for customers, inserting technology and implementing ‘Industry 4.0’ initiatives in our shops – all the while focusing on sustainable aviation.

Predictive maintenance

Engines have been generating data for years. As the amount of unlocked data grew, we began to more efficiently project trends and pinpoint potential issues before they occurred. Our GTF (geared turbofan) engines, which generate 40 per cent more data than the V2500 engine, generate about four million data points over an average two-hour flight.

Through our ‘EngineWise’ aftermarket solutions, we work to maximise each customer’s specific engine performance and engine time on-wing, while maintaining predictable MRO spend.



5

MILLION

↑
The GTF engine is estimated to have avoided more than five million metric tonnes of carbon emissions since 2016

Industry 4.0 and technology insertion

As part of our digital transformation, we launched ‘Connected Factory’ pilots, which we expect to improve order fulfilment time by up to 30 per cent, reduce machine idle time by up to 30 per cent and reduce energy consumption by up to 10 per cent. Technology insertion has already resulted in enhanced operational effectiveness:

- Our Component Aerospace Singapore business successfully deployed the first-in-MRO application of 3D printing for aero engine component details, while pioneering robotics in the MRO sector, including the development of an automated system to replace manual fixtures for tube repair.

1. A GTF overhaul at Pratt & Whitney's Eagle Service Asia facility in Singapore
2. The engine maker's Advanced Diagnostics & Engine Management (ADEM) tool manages real-time health data of thousands of commercial engines, spotting trends and MRO issues early

“There are many uses for smart glasses, from training to troubleshooting”

• Engineers at our Singapore engine centre have been developing a robot that will assist technicians on our shop floors. Ultimately, it will help them free up time to focus on more substantive work.

Here are some additional ways we are driving performance in our shops

• Industrial simulation is a software package that creates a ‘Digital Twin’ of a factory. The simulation shows movement of product, people, process steps and inventory, allowing for analysis of cycle times, turnaround times, cost, quality signature, and overall equipment effectiveness with the press of a button. It was recently piloted at one of our Singapore facilities, where we optimised floor space and increased productivity.

• Smart glasses or wearable technologies have an integrated camera, screen and audio enabling hands-free communication. There are many uses for smart glasses, from training to troubleshooting and equipment qualification. Given the pandemic and travel restrictions, we recently used a pair to conduct a Federal Aviation Administration (FAA) audit on an engine at our Christchurch Engine Centre in New Zealand.

Sustainable aviation

Aside from our flagship environmentally friendly engine – the GTF, which has saved airlines more than 0.5 billion gallons of fuel and avoided more than five million metric tonnes of carbon emissions since entering service in 2016 – our MRO sites have also been re-imagining operations

and pursuing greener practices.

Our Arkansas site has made tremendous strides thanks to its rainwater harvesting system, solar field and many other sustainability projects. Since 2010, water consumption has improved by 32 per cent and annual greenhouse gas emissions have reduced by 400 metric tonnes.

Employees at our Dallas site developed an environmentally friendly laser for cleaning engine parts. The laser – as opposed to conventional abrasive grit blasting and powerful water-jet stripping – vaporizes grit, dust and rust from components, reducing material consumption, emissions and industrial waste.

At Pratt & Whitney, we view advancements in sustainable aviation as both a societal imperative and a business

opportunity, and so we continue to invest in the geared architecture, hybrid-electric propulsion, alternative fuel compatibility, and more. Our recently named chief sustainability officer, Graham Webb, will guide our progress in supporting the industry's goal of net zero carbon emissions by 2050.

Closing

While the complexities may sound daunting, our employees rise to the challenge each day, innovating to move the industry forward. To us, it's about transporting people reliably to their destinations. It's about providing the care and intelligence to service aircraft engines expertly. Ultimately, it's about engineering a new and exciting sustainable future for aviation. 



POWER GENERATION REPAIRS

It is a big operation to support complex power generation components, says Fokker Services' director operations EMEA **Dirk Hanenberg**, who shares here the key ingredient that has allowed the company's maintenance shop to evolve into one of the biggest in Europe in this area



“If we see an opportunity, we take it. If a unique solution is needed, we explore the possibilities. We know how to nurture great ideas, it's part of our DNA”

↑
Dirk Hanenberg is
director operations
EMEA at Fokker Services

Our power generation MRO journey started 25 years ago. It was 1996, the year Fokker Aircraft closed its doors and Fokker Services was established. With this change, we transitioned from aircraft manufacturer to a total services company. It was a new era, but of course our OEM knowledge and various pieces of technology remained.

One particular piece of equipment was a test stand that was originally used to run power switch simulations and tests for Fokker 100 prototypes. A couple of years later, our teams saw this test stand with a fresh perspective: how can we repurpose this technology? How can we innovate? This wave of inspiration was the first step in developing in-house maintenance capabilities for power generation components at our facility in Amsterdam Airport Schiphol in the Netherlands.

The team started small. Two colleagues took on cross-functional roles as technicians, testers, researchers and capability developers to explore the possibilities. We started off by providing support

for Fokker aircraft as part of our 'ABACUS' exchange programme. In 2000, a new test stand arrived at our shop, and from there our in-house capabilities continued to grow and evolve. We branched out in 2008 with the first non-Fokker capability with Airbus A320 classic integrated drive generators (IDGs). Next up were IDGs for the Boeing 737NG.

Our big break came in 2014, when we started to provide IDG MRO support for a particularly large commercial operator. This was the catalyst for more investment, more technology and more space for our technicians.

Fast-forward to today and our dedicated power generation facility is one of the largest independent shops in Europe. Our capabilities cover a range of major commercial and defence platforms, such as

Airbus, Boeing, Embraer, Mitsubishi Heavy Industries, McDonnell Douglas, Lockheed Martin and, of course, Fokker. With in-house capabilities for IDGs, constant speed drives (CSDs), starters and generators, and more, our technicians now provide component maintenance support to more than 200 operators.

To provide highly reliable solutions, leveraging the latest technology



↑
Fokker Services
currently has over 100
certificates and
approvals, and four
facilities worldwide



1

is crucial. That's why we brought equipment in-house and invested in two generator test stands, which offer uninterrupted testing and quality that goes beyond CMM requirements, as well as a fully automated electric test stand, which reduces the touch time so we can quickly share the best repair recommendation.

Improving availability and turnaround times is our on-site OEM consignment stock, large inventory of pool parts and forward exchanges. Needless to say, it's our highly skilled technicians who deliver the best repairs to our customers, and specialise in each individual MRO service.

As we look to the future and how we will approach power generation repairs, we first need to examine how Covid-19 impacted our industry. When aircraft were parked during the height of the pandemic, many airlines interchanged components across their fleet. This meant using their grounded fleet as

a source for 'back up' units, installing components that were in the best condition onto the limited aircraft still in operation. However, borders are now reopening and there is an increase in air traffic. We all see progress and signs of recovery, and components in parked aircraft will need MRO support again. We are preparing for this increased demand for serviceable units by stocking up on additional pool parts, such as rotors, and optimising processes to improve turnaround times. Our aim is to preserve our on-time, high-quality deliveries.

In addition, we know that IDGs have always been a major cost driver. These are complex products that require special repairs. Covid-19 hasn't changed this fact, but now more than ever our focus is on ensuring our pricing is right for customers while maintaining top reliability. Our in-house capabilities, used serviceable parts and fully approved minor repairs all help to

provide options at different costs, but we need to continue to listen to our customers so we can provide tailor-made solutions that perfectly fit their needs. Each operator has different concerns and goals, so keeping transparent lines of communication open is crucial.

It's been an incredible journey so far with our power generation repairs. As we move forward, we will always search for new



2

1. An inspection is carried out on a 737NG IDG

2. Providing IDG MRO support for a large operator gave Fokker Services a big break

3. The company's dedicated power generation facility is one of the largest independent shops in Europe

“Components in parked aircraft will need MRO support again and we are preparing for this”

ways to go the extra mile, from improving our capabilities and investing in new technology to ultimately increasing the quality of our services. For example, we are currently in the process of adding new technology that will improve line replaceable unit (LRU) reliability and reduce the potential for human error.

However, it's the way that we achieve our goals that defines us. It's the key ingredient to our success that will never change: our curiosity. If we see an opportunity, we take it. If a customer approaches us with a specific challenge, we investigate the root cause. If a unique solution is needed, we explore the possibilities. We know how to nurture great ideas, it's part of our DNA and it's how we have built our well-established power generation shop over the past 25 years. Let's see what the next 25 years bring but, whatever we are faced with, we are ready to adapt, innovate and embrace change. 



3





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DISASSEMBLY AND RECYCLING

As the aviation industry concentrates on environmental issues and aircraft recycling, EirTrade Aviation's VP asset management **Lee Carey** considers this shift and its wider impact on aircraft disassembly



“Demand for aircraft disassembly will grow steadily as older aircraft are retired to make room for the delivery of newer technology aircraft”

↑
Lee Carey is VP asset management at EirTrade Aviation

Aircraft disassembly provides aircraft owners and financiers with an alternative retirement strategy that can increase the realisable value of the aircraft through the sale of the harvested components.

By ensuring that the components used to support the operation of other aircraft and materials are recycled, aircraft disassembly specialists can support the sustainability of the industry long term. Not only does this help the environment, but owners and operators also benefit from a reduction in maintenance cost in comparison to the use of new components. Used serviceable material (USM) can be more sustainable not only from a financial perspective, but from an environmental perspective too. Each USM part which returns to operation reduces the need for the production of new components and, therefore, mitigates the carbon output associated with this production.

In the short- to medium-term, EirTrade Aviation forecasts that the demand for aircraft disassembly will grow steadily as older aircraft are retired to make room for the delivery

of newer technology aircraft. We anticipate that a large proportion of these retirees will include A320ceo family and 737-700s as airlines continue to take delivery of A320neo and 737 MAX aircraft. Furthermore, it is inevitable that there will be a significant amount of less efficient widebody aircraft retirements, including A330 and 777 types.

Aircraft disassembly facilities must operate in compliance with any local authority and government environmental regulations, and EirTrade was awarded its Aircraft Fleet Recycling Association (AFRA) accreditation earlier this year. With this, we can ensure that the operation

of the disassembly facility is in accordance with AFRA best management practices. Prior to attaining the accreditation, we had always ensured that each aircraft disassembly at our facility in Ireland West Airport Knock was undertaken to the standards set out by AFRA, delivering maximum efficiency and quality for our airline, asset management and lessor customers, while taking the necessary precautions to ensure that the process is

environmentally friendly and does not have any negative impact on the local ecosystem.

Almost 50 per cent of the global leased fleet is managed by Irish companies (*Grant Thornton, 2021*) and EirTrade's location offers strategic advantages to lessors and asset management companies. Furthermore, these advantages are particularly pertinent to disassembly activities for



↑
EirTrade is recycling over 95 per cent of each aircraft and is exploring ways to further increase this



1

European companies post-Brexit as many teardown facilities are based in the UK, and Ireland is still part of the EU.

The importance of recycling will only increase. To complement our aircraft teardown activities in Knock, and further strengthen disassembly and recycling services in Ireland, EirTrade will open an engine disassembly facility in Dublin before the end of 2021. This will first cater for CFM56-5A/5B/7B engines before expanding into other engine types in the future. The disassembly facilities will work in tandem, enabling asset owners to mitigate any delays in timing and any cost inefficiencies associated with logistical issues. The aim is to become a single source solution for aircraft owners and management companies.

Currently, EirTrade is recycling over 95 per cent of each aircraft and exploring ways to further increase this.

Turnaround times are important to maximise efficiency gains and minimise energy across the process.

Focusing purely on the airframe of the aircraft, EirTrade has noticed a strong demand for hard time components which require replacement or overhaul based upon certain time intervals, regardless of whether the aircraft is flying or parked. Some of these items include the landing gear, escape slides and rafts. Much of this pent-up demand can be attributed to maintenance deferrals during the pandemic, end-of-life (EOL) redelivery conditions, re-entry to service, and corrosion issues on certain components during aircraft storage.

To further enhance the efficiency of our aircraft disassembly activities, we have designed, developed and invested in a unique fuselage support cradle. The device allows our team to remove the

3

landing gear from the aircraft immediately after induction for disassembly.

In addition to this, once all the components have been harvested, we can then move the fuselage of the aircraft out of the hangar and to another location at the facility. The design and production of this innovative piece of equipment has been brought about by necessity, namely considering a problem and finding a solution for it.



2

1. EirTrade has a specialist aircraft disassembly facility at Ireland West Airport Knock
2. The company was awarded an AFRA accreditation in August 2021
3. Regional and commercial aircraft from ATR72s to A380s have been disassembled in Knock

“Aviation is now very much looking at ways to be more environmentally conscious”

During the disassembly of an aircraft, a considerable amount of the residual value can be contained within the value of the landing gear, so the ability to remove an aircraft's landing gear at the beginning of a project enables the gear to be sent for overhaul or repair sooner.

Improving the removal speed of such assets can increase the internal return rate (IRR) for the investor or facilitate utilisation within the same fleet on another aircraft in a shorter period of time. Once the landing gears have been removed from the aircraft, the fuselage will then remain within the cradle device until the teardown has been completed.

Aviation is now very much looking at ways to be more environmentally conscious and focus on sustainable solutions. The disassembly and recycling of aircraft assets is, therefore, very much a key component to the sustainability of the industry. 



Entering into an authorised MRO agreement

PART 2 - COSTS AND BENEFITS

In the second of a multi-part series, Washington Aviation Group president **Jason Dickstein** highlights more factors to consider before signing an 'authorised network' agreement

Over the years, I've had an opportunity to review and advise on a wide variety of agreements, including authorised MRO agreements. I've recognised the importance of taking some time to review the agreement and ensure that the relationship will serve the long-term interests of both partners.

Companies with 'authorised network' relationships can include authorised MROs, authorised distributors and even authorised replacement parts manufacturers. Here, I will refer to each of these as an 'authorised facility relationship' to help clarify that the relationships might include a number of different types of functions, and that the guidance in this article may be useful for many different types of agreements.

Any of these authorised facility relationships represent an opportunity for both sides to work together for mutual benefit. They should be viewed in this context. At the end of the day, if you do not see benefit in the relationship then you may want to pass on the opportunity. This article provides highlights of some of the factors that you ought to be considering as part of this analysis.

Identify the agreement benefits

Look carefully at what you are getting. Examples of benefits you may be getting from an authorised facility relationship could include the right to use the partner's name in advertising; a partner obligation to refer business to you; discounts on material; preferred avenues of supply; access to data that is not



Look at costs during the relationship *and* at the end

required to be shared; and early access to data required to be shared.

Calculate the financial benefit you estimate from each of these. Try to assign a value. Think about whether there are other mechanisms by which you might obtain the same benefits and what the costs of them might be.

Identify the agreement costs

After identifying the expected benefits, consider the costs to your business. Examples of costs you could incur from an authorised facility relationship might include:

- Lack of price competition if you agree to purchase exclusively from the partner (or from the partner's network)
- Lack of availability or long lead times if you agree to purchase exclusively from the partner (some partners do not always keep inventory on the shelves)
- Lack of opportunity to the extent the relationship forecloses alternative choices
- Inability to provide customers with a range of options that could result in cost savings if alternative parts or repairs are excluded by the agreement (this can impair your competitiveness)
- Royalties or annual fees
- Costs of training, tooling, etc. if the partner reflects a new product line
- Costs of marketing your services relative to the new partner's product line

Weigh the costs and benefits

If you can calculate a value for the costs and the expected benefits, then you can compare them to ensure that the proposed relationship offers a positive return in exchange for your participation. If you can identify the alternatives (including sources for expected benefits) then you may be able to compare your cost-benefit analysis to the baseline in which you do not consummate the relationship. This should provide you with an objective view of the relative value offered by the proposed agreement.

Often there are certain expectations of exclusivity in an authorised facility agreement. You should consider the costs of exclusivity, especially in a worst-case scenario. As long as the partner can supply parts on a reasonable lead time, at expected quality and anticipated price, this exclusivity may be appropriate but if



that would be enforced is a separate question.

Second, when the PMA parts are the competitor, you ought to have a way to purchase those competitive parts when it becomes necessary or you may find yourself unable to compete (for example, when the 'OEM' parts have a long lead time, but the FAA-PMA parts are being

the partner's price, availability (lead time) or quality do not meet your expectations then you may be dead in the water if you cannot buy the competitor's articles to support your repairs.

An example may be helpful: I have seen numerous agreements with a 'no PMA' clause in them. Such a prohibition can significantly limit business opportunities and the ability of a repair station to provide value to customers. First, PMAs are the FAA's normal way of approving parts. Many so-called 'OEM' parts are actually produced under FAA-PMA. A 'no PMA' clause may technically exclude the very parts that are intended to be supplied! Whether

actively produced and are available for immediate delivery). In previous contracts I have established conditions when my client is permitted to go to other vendors, such as in a condition when the partner cannot support the contract on a timely basis, or where the price difference makes the repair station's proposals unable to compete with those of its competitors, who, by using PMA in repairs, may be able to pass cost savings on to their customer making their repair quotes more attractive.

Third, we are seeing more third-party PMAs that offer safety and reliability improvements desired by the customers. If your customer is disappointed by a

type certificate holder's original design, and the customer knows that a PMA part corrects a perceived reliability issue, then the customer may be specifically looking for that reliability improvement. It would be a shame if your contract precluded you from providing it.

Look at both the costs during the relationship and at the end. I have seen agreements where the harsh ending conditions make it impossible for the business to continue as a going concern.

Authorised facility agreements can be an important part of your relationships with your business partners, but a successful agreement needs to be negotiated so that the benefits outweigh the costs for both sides.

In the next issue, we will examine drafting tips and some language to consider when putting together a balanced authorised facility agreement. ●

Jason Dickstein is a Washington-DC based attorney who has advised aviation businesses on transactions and contracts for almost 30 years.

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ADDING BUSINESS VALUE

On 1 November 2021, **Matt Caswell** was officially made CEO of 2Excel Engineering having previously served as COO and head of maintenance. Here, he outlines his vision for the company's future

Q How do you see the state of 2Excel Engineering as you take over as CEO?

A The MRO industry is a difficult industry to be in. The way that the industry operates is very cut-throat and you don't make massive money – you're effectively at the end of a supply chain. The fact that we are still here and that we've survived given where we've been over the last 18 months, and especially through Covid, says a lot for the state of the company.

Despite going through a reconfiguration and the Covid restrictions, we managed to land flat last year financially and for us, especially in a very competitive market, that's a huge success story. That reflects on the control we had over the business throughout the period and also on the staff; they've played a huge part in getting us to where we are today. The business is more stable now than it has been over the past five years. We're now starting to see customers coming back. It's now for me to look at growth.



1



The key is forming new relationships, strengthening existing ones and looking for growth opportunities

Q What will your six-month action plan look like?

A It would be easy to announce grand plans but we've got to be mindful of what's going on still; we are out of the darkness of Covid but we might not be ever fully out of it because customers have changed their habits on how they buy, and we are a product to them.

The key thing now is forming new relationships, strengthening existing ones and looking for growth opportunities – adding value to the business. In the first six months we must stabilise, fill the pipeline so we know we've got work, and look for niche opportunities.

During Covid we didn't form any new relationships, but we're now starting to. We've signed a deal with a new lessor company for us, which is going to bring in heavy maintenance and C-checks. We are strengthening existing partnerships, with easyJet for example. We were doing end-of-lease work for them, but we've now got a line of in-service C-checks. That's a positive story as we've been able to adapt to their needs and they obviously like what we do. We're also seeing existing or old customers come back.

One of the key things we've learnt is the need to adapt. Where 18 months ago we were a heavy maintenance organisation that effectively sold hours, we have now adapted the business to customer needs, whether that means end-of-lease work, storage work or small inputs to keep aircraft flying for certain periods of time.

Q How has 2022 planning been affected?

A Six months ago, we had a 3-4 week pipeline. What we're now seeing is a pipeline for five months – that's a huge game change from where we were. Planning-wise, the difficult thing for us now is having the capacity to meet customer demand. It's almost a fight to the death for who gets slots. It's completely flipped on its head; where before we were trying to bring in whatever work we could to sustain our workforce, we're now having to look at what work we bring in to make sure there's a balance to our capacity.

It's difficult to plan because you don't know what the best work to bring in is; what we don't want to do is over-commit and under-deliver. It's about using our experience to balance what we know we can do with what we actually have.



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1. 2Excel Engineering's new CEO, Matt Caswell
2. Existing or old customers are now returning
3. Adapting the business to customer needs has been a key strategy during the Covid-19 crisis
4. An aerial view of 2Excel Engineering's base at Lasham Airfield in Hampshire, England

Q Do you have any plans to add capabilities?

A To grow the business, we've got to be relevant. By Q1 2022 we will have A320neo capability, which we've been working on for the last 6-12 months. That's our next big step in capabilities and has been done to be relevant to the market. Looking at existing partnerships that we have – easyJet, Jet2, lessors – the neo is a big market and fits our skillset and capabilities.

We're also reinstating our C rating so will have our C-rated workshops back up and running by the end of 2021. That's also about being relevant, and bringing the customer's risk in-house and de-risking their inputs, which is another key selling point. Within an MRO environment people pick on price, quality and risk mitigation. It's a big thing when you can do 90 per cent of the work in-house without needing to farm it all out. You can really dictate how a check is planned and run.

It's also looking for other niches, and we are looking at cargo conversions and expanding our light aircraft side. The aim is to bring all of 2Excel Aviation's fleet in-house, while seeking third-party customers. We won't stop there and will also look at line maintenance and other things in the market that fit in with our current business model. The long-term vision is to grow the business sustainably and add value to the business.


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 ↑
 2Excel Engineering currently has a five-month work pipeline – a big shift from six months ago

market went. People don't want to part with their money, and cash is king.

The MRO industry is picking up, you can see that in the enquiries we are getting. Six months ago we were effectively a goalkeeper, waiting for people to phone. Now, we are actively out there selling and managing inputs rather than accommodating everything.

Q How do you assess the state of the MRO sector as a whole?

A It's still in a bit of a state of shock because it went from long-term partnerships, relationships and pipelines to effectively nothing. When Covid struck, our turnover halved, and that's a big indicator on where the

It could be a false picture at the moment though. While everyone wants to get their aircraft back flying, there will be a peak and we need to realise when that peak is, which could be next year. There will be a dip again, and then we need to see what the stable level is in the industry, and that will be the key point. We're now starting to recruit for the first time since reconfiguring the business, which shows that there's growth, but also that we are doing it in a sustainable way.

Q What are the major challenges you must overcome?

A One of the biggest is the exodus of skills from the industry. Now the business is starting to pick up, trying to get contract staff in is very difficult, and trying to get permanent staff in is proving more difficult than it was pre-pandemic. In order to grow the business we need to have the right people.

Q What are the future plans for 2Excel's apprenticeship schemes?

A We've taken on engineering apprenticeships this year; we didn't last year because of Covid. For the first time since becoming 2Excel we have taken on a facilities apprenticeship and an NDT apprenticeship. Going forward, the best way for us to keep and attract people is to grow people. I'm looking at other apprenticeships within the business such as support functions, whether that's planning, commercial or stores. The business is wider than just the engineering side of it. Apprenticeships form a huge part of our plans. **M**

INTERVIEW





GLOBAL MARKET
OUTLOOK 2022:

A NEW ERA FOR MRO?

How will the MRO industry fare in 2022? Which regions will recover quickest from the pandemic? And what are the innovations to watch? **Jason Holland** spoke to a selection of the sector's biggest names to get the answers



“THE WAY IN WHICH MROS WILL HAVE TO DELIVER THEIR SERVICES FROM THIS POINT ONWARD WILL NEED TO EVOLVE”



autiously optimistic. That's how the general mood of MRO suppliers can be described going into 2022, according to Alton Aviation Consultancy's global MRO advisory practice lead and managing director Jonathan Berger.

The negative impact of the Covid-19 crisis, with fears over new variants still high

(the so-called 'Omicron' variant is being assessed by scientists as we go to press), will continue well into 2022, he says. "Clearly this will have a direct impact on international travel, with low widebody utilisation and associated MRO demand," Berger states. "That said, domestic markets in virtually every region continue to come back strong which is driving up demand for narrowbody and regional jet MRO.

"This increase in MRO demand is actually growing faster than supply as airlines and MROs are not able to hire fast enough to keep up with demand, so expect major delays at airports and limited slots for airframe C-checks and engine shop visits."

In 2022, the recovery from the Covid-19 crisis will vary by country, and by individual company. It is therefore extremely difficult to put together a consensus outlook for the year, but it is possible to gather the opinions and expectations of a range of companies from across the globe, to assess their unique challenges and opportunities, and paint a broader picture of what next year could look like for the industry.

To achieve this, we asked a selection of industry players for their assessment of the state of the MRO industry in general going into 2022, strategies for the year ahead, and their thoughts on the key innovations and technologies that will help them through it.

Status and strategy

In general, the companies interviewed for this article agree with Berger's assessment that the MRO industry is on a recovery path, with regional variation. Lufthansa Technik, with operations around the world, is well placed to report. "The American market is currently recovering the fastest, followed by Europe and Asia. Therefore, America is a sneak preview into the future for Europe and Asia," says head of corporate foresight & market intelligence Sven Taubert. "On the one hand, we see economical sustainable business opportunities. On the



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1. AAR sees a strengthening in component markets “even as we speak”

2. During Covid-19, ST Engineering has supported customers with flexible maintenance and payment schedules

other hand, we hear from everywhere in the industry about the shortage of skilled labour. We expect that we will have a significant advantage here, as we were able to keep our resources above average.”

ST Engineering, Singapore-headquartered but with a global network, believes that the market has bottomed out and that it will be on a steady recovery trajectory as more borders open up and international flights increase.

“Going into 2022, we expect to find an even more competitive landscape than the pre-pandemic days as many MRO solutions providers are now hungry for jobs,” says its president of commercial aerospace Jeffrey Lam. “This is where productivity and value-adding services will set [companies] apart from the rest. Airlines will also want to turn to trusted service providers which have a track record in providing strong and reliable support as they embark on recovery.”

Lam notes that many MRO companies such as ST Engineering supported their customers through the most challenging period of the Covid-19 crisis when flying activities were at their lowest “with flexible maintenance and even payment schedules, and we stand ready to support them now in ramping up their operations”.

In anticipation of strong demand in the years to come, ST Engineering has



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The 2020 MRO market was down ~35 per cent (Source: Naveo Consultancy)

commenced expansion work at its current airframe MRO facility in Pensacola in the US, which Lam says “will add around 1.5 million labour hours to our annual capacity when completed”.

A few hours north by air is Illinois-based aftermarket services company AAR, which similarly reports that the domestic US airframe market is strong and at capacity while in Europe and Asia a surge in demand is just

hitting as many countries look to allow international travel.

The company’s senior vice president repair & engineering Brian Sartain adds that in component markets, including landing gear, “airlines still appear to be

“We expect an even more competitive landscape as MRO solutions providers are hungry for jobs”

utilising assets from retirement and so component shops are still struggling with the effects of the Covid-19 pandemic”.

However, AAR sees a strengthening in component markets “even as we speak” and that over the coming year capacity “may become an issue”.

“In all of these markets we are starting to see labour scarcity and we have been driving strategies to retain and attract talent as well as utilise automation and augmented reality tools to deliver

performance within the turn time that our customers need,” Sartain says. “In addition, during the downturn, AAR invested significantly in new technologies and capabilities in our component shops to ensure we can grow with the recovery.”

Another of the industry’s global players, Air France Industries KLM Engineering & Maintenance (AFI KLM E&M), believes that



2



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“WE ARE STARTING TO SEE LABOUR SCARCITY AND HAVE BEEN DRIVING STRATEGIES TO ATTRACT TALENT”

maintaining a competitive edge will be one of the major short-term challenges for the MRO market. “Pressure on maintenance costs is even greater than before, due to the fact that – now more than ever – airlines need to keep costs under control if they are to manage the heavy debts incurred during the crisis,” states AFI KLM E&M’s SVP business development Johann Panier.

“Yet at the same time, they must pursue their investments in more recent aircraft with lower fuel consumption and CO₂ emissions levels. Airlines are being pulled in opposite directions by the need to continue modernising their fleets while simultaneously keeping their cash flow and budgets under tight control.

“In this context, we expect to see the proportion of leased aircraft within fleets continue to increase, and along with it the importance of redelivery worksopes within maintenance cycles.

“In any case, the MRO market will need to strike a new balance between prices and service levels.”

Post-crisis supply difficulties and the inflation that this could generate should put all players in the aeronautics business on alert, he says. “Only a reasoned recovery and fair competition can avoid a crisis within the crisis. For MRO suppliers, the challenge will be to adapt not only with the right prices, but more importantly with enough financial and operational flexibility to meet their customers’ needs, as these customers still face uncertainties and potential setbacks in terms of the opening and closing of borders.”

In these conditions, the ‘return to normal’ for airlines and their MROs



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1. HAECO Group expects “quite a squeeze” in hangar capacity for airframe maintenance over the next six months
2. The company’s chief commercial officer Richard Kendall
3. An engine disassembly performed by AFI KLM E&M

new situation] anyway,” he says. “There’s going to be a lot of return to service throughout 2022, as there are still quite a few aircraft parked.”

He thinks adaptability will continue to be the key ingredient for success in 2022. “We are working very hard to be as flexible and reactive as we can, to meet ever-changing customer requirements. They are looking for more solution-orientated services rather than ‘one-size-fits-all’. We’re putting a lot of focus on customer support and experience.”

Dupont says Etihad Engineering has a “fairly bullish” outlook for 2022. “We will most likely close 2021 pretty much at

“A lot of short-term activity exists around bringing aircraft out of storage and re-starting cabin upgrade projects that were put on hold over the past 18 months,” he reports, “and we are seeing increasing involvement from leasing companies in demand for MRO services as aircraft come off and go onto new leases. This means that there is quite a squeeze in hangar capacity for airframe maintenance over the next six months, but the prospects beyond that are less clear. Engine maintenance impact has been lagging that for airframe, but we can see an increasing trajectory for that sector later in the coming year.”

Etihad Engineering, too, adapted significantly during the pandemic, and continues to do so. “The make-up of the business today is slightly different to what we had pre-pandemic – we used to be predominantly widebody-focused but today we have significantly

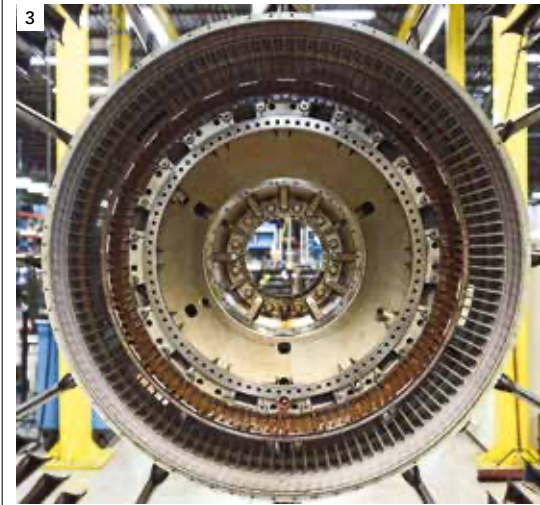
will have to wait until after 2022, Panier thinks. “That said, the sector’s underlying trends do not show cause for re-think. Our customers’ needs remain the same. What will need to evolve is the way in which MROs will have to deliver their services from this point onward: we are seeing an even stronger global demand for proximity and adaptability than we were before the crisis.”

Changing priorities

Indeed, the keyword for Hong Kong-based HAECO Group (along with many other MRO companies) during the recovery phase is ‘flexibility’, according to its chief commercial officer Richard Kendall.



bigger content on the narrowbody end,” explains VP of technical sales Frederic Dupont. “We have had to adjust our pricing strategies; and operational and tactical plans.” Although narrowbody work will lead the way, Dupont notes that especially in the Middle East there will be a pick-up in widebody MRO activity in 2022 as the big players there operate more flights. “That’s good news for us but we adapted [to the

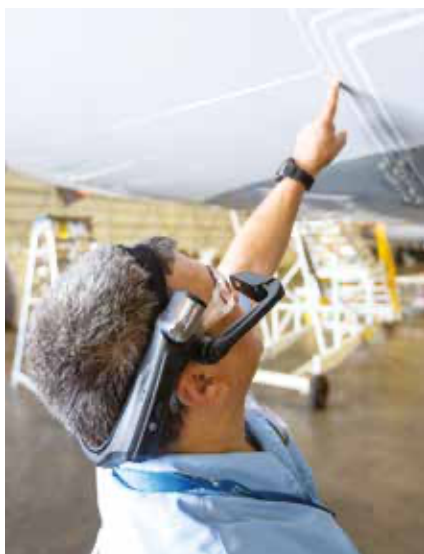


pre-pandemic levels. We have secured a lot of new customers and benefited from the recovery of the industry, and we are in a situation where we are completely full today,” says Dupont. “I don’t see this changing in 2022 [subject to Covid-19 developments], although there might be a plateau next year simply because we are going through a surge right now.”

It is a similar picture for Jordan-headquartered Joramco, a part of the wider aviation services company Dubai Aerospace Enterprise (DAE). “Strategically we are focused on our customers and reacting to their increasing demand, and this will come through more efficiencies in the operation and



1. AAR is utilising augmented reality tools to deliver performance “within the turn time that our customers need”



strategic expansion of hangar slots,” says Joramco’s CEO Fraser Currie. “In terms of expectations we see a strong 2022 with some unseasonal upside still driven by the rate at which airlines return their fleets to service.”

Louis Philippe Mallette, senior vice president operations at AJW Technique, sees flexibility as one of the company’s main strengths as an independent player, along with choice and customisation.

“The future for the MRO aftermarket is looking strong, and we are setting ourselves up for success,” he says, referencing the fact that AJW Technique has been expanded into a franchise. Its original facility in Montreal, Canada, has now been followed by a European centre of operations near London Gatwick Airport.

“Throughout the year, we have seen volumes recover progressively as borders reopened in the Americas, Europe and

across the globe,” he says. “Volumes have picked up exponentially over the last few months, nearing 2019 levels for some airlines.

“Our key customers are sharing with us their forecasted flight plans for 2022, and with industry experts predicting MRO spend to return to pre-

pandemic levels by 2023, we have a very confident outlook for the coming year.”

Mallette notes a shift in the repairs market with more mechanical units than avionics work. “Most airlines have their own in-house repair services on a subset of capabilities. The pandemic has caused rapid divestitures of some parts of each business, especially where there is heavy leasing and labour expenses,” he says. “We see a greater share of airlines outsourcing their maintenance in the hopes of reducing their internal cost structure, especially as MROs have become even more cost competitive now that there are fewer that survived the pandemic. AJW Technique, for one, continues to build strategic partnerships and acquisitions of MROs globally to ensure we can provide a full head-to-tail maintenance experience.”

That view is echoed by another company that has been growing throughout the Covid-19 crisis, and has ambitious expansion plans for the future – aircraft painting and exterior coatings specialists MAAS Aviation. “It is evident that the MRO industry is finding new ways to build partnerships with customers, OEMs, and each other, to manage the continued impact of Covid-19,” says director customer services, marketing & sales Europe Richard Marston.

MAAS Aviation is therefore among those companies in the MRO industry focused on developing these strategic relationships and globally located hubs of expertise, in its case for aircraft painting aligned to base maintenance facilities. Marston adds: “We established a blueprint for this with our new facility in Kaunas, Lithuania that opened in February 2021. This is sited adjacent to FL Technics’ maintenance hangar and the close proximity has enabled us to

“We have had to adjust our pricing strategies as well as operational and tactical plans”



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1. International Aero Engines' president Earl Exum expects the MRO recovery trend to continue into 2022



build a streamlined centre of excellence for aircraft transitions where aircraft painting flows seamlessly into the mix. Airline and lessor customers alike find the cost savings, improved turnaround times, and overall reduction in complex logistics that is provided by this partnership to be extremely worthwhile."

Turning our attention to aero engine manufacturers and maintenance providers, International Aero Engines' (IAE) president Earl Exum says that the recent recovery of air travel has led to an increase in MRO activity during the second half of 2021. "We expect that trend to continue into 2022, which would result in significant growth over the 2021 numbers, particularly for the narrowbody market," he says. "MRO providers need to bring back capacity, including overhaul, repair, vendors, spare parts, and other required support, at the



Naveo Consultancy expects increasing retirements of ageing aircraft that would need heavy airframe checks or third/fourth engine shop visits

right pace to ensure they are ready to support this growth."

IAE is a multinational aero engine consortium comprised of Pratt & Whitney, Pratt & Whitney Aero Engines International, Japanese Aero Engines Corporation and MTU Aero Engines, so knows well the benefits of collaboration and cooperation. It is no surprise to learn that IAG has "worked closely with service providers to ensure they understand our forecasting signals and that they are developing the appropriate capacity to support potential 2022

growth", as Exum reports.

Assessing MTU Aero Engines' current individual performance as "above average in terms of workload", the company's SVP MRO programs Martin Friis-Petersen says its shops "are full again". "According to current guidance, we expect to have mid-teen percentage

growth in the commercial maintenance business compared to 2020," he says. "As such, we are optimistic going into 2022 and expect to see a further growth in this business segment in the mid-to-high twenty



per cent range in the commercial maintenance business segment."

Friis-Petersen attributes this stability to MTU's product mix and broad portfolio. "For instance, narrowbody engines are tending to be reactivated earlier than widebodies, and we serve the popular V2500 and CFM56 engine families. Furthermore, newer generation engines are also being reactivated first, and we are well set up here with our participation in the PW1100G-JM OEM networks as well as serving LEAP engines at our facility MTU Maintenance Zhuhai. In addition, cargo operations have been strong throughout and we've seen great demand for services on engines such as the GE90, PW2000 and CF6-80C2."

MTU has put a premium on being adaptable, too. "This means adjusting shop capacities to a highly dynamic engine mix and different workscope

"We are focused on our customers and reacting to their increasing demand"

Illustration: Phil Couzens



1. Joramco is looking for more efficiencies in the operation and strategic expansion of hangar slots in 2022
2. Alton Aviation Consultancy's global MRO advisory practice lead and managing director Jonathan Berger
3. Drones could become a more regular sight at MRO hangars around the globe

1

pattern," states Friis-Petersen. "For instance, some customers are focusing on reduced expenditure and services such as on-wing worksopes to prolong on-wing times or rotating green-time engines within their fleet. Others are preparing for ramp-up and sending engines in for full shop visits. We are in constant dialogue with our customers to ensure we are responding to and meeting their needs."

Innovations and technologies

Throughout the Covid-19 crisis, MRO companies have in many cases turned to new innovations, technologies or ways of working which have helped them increase efficiencies. So which of these will remain relevant in 2022, and are there any other new developments on the horizon?

The 'boring' answer to these questions is of course simply 'digitalisation', as Lufthansa Technik's Taubert points out. "Boring, as it is a topic that has been around quite some time," he clarifies.

"Nevertheless, it is a gigantic challenge, especially in an industry with such high safety requirements.

"The MRO industry is known for accurately fulfilling complex tasks. Due to this complexity, digitalisation will help us to further optimise and stabilise our in-house processes while reducing cost and enhancing the customer experience."

Alton Aviation Consultancy's Berger reports that many MROs have leveraged the low demand caused by the pandemic to accelerate implementation of their paperless MRO process re-engineering efforts. He says: "We see tremendous



2

"Volumes have picked up exponentially over the last few months"

it possible to predict a future breakdown or to schedule a maintenance operation beforehand, according to Panier.

Predictive maintenance offers a number of potential benefits, including reduced costs, shorter turnaround times thanks to the reduction of

unforeseen issues throughout the MRO chain, and less AOG time – which means enhanced quality of service overall for airlines and passengers.

ST Engineering, too, recently introduced its own on-wing component health and reliability management programme, with Japan Airlines among the first customers to adopt it. "We have been working on leveraging digital technologies to derive valuable insights for MRO work even before the pandemic started, and the programme is the product of that and our effort to develop more customised and value-added MRO solutions," reports Lam.

benefits, particularly in the airframe heavy maintenance business, derived from transfer of electronic workpacks from airline to MRO, digital non-routine cards, and transfer of record packs from MRO to airline. In addition, electronic task cards and signatures not only improve efficiency, but greatly enhance quality and compliance."

Going even further are digital MRO platforms that provide a variety of services and utilise aircraft data to provide real-world benefits. Lufthansa Technik's 'AVIATAR' programme is one example.

Another is AFI KLM E&M's 'PROGNOS' suite, which similarly makes



3



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1. AJW Technique's senior vice president operations Louis Philippe Mallette
2. HAECO Group sees an "increasing trajectory" for the engine maintenance sector "later in the coming year"



Etihad Engineering's Dupont is also pragmatic. "We are committed to a digitalisation roadmap but had to reshuffle and put a bit of a hold on it as we managed the pandemic," he says. "Anything related to technology is fairly time-consuming, and has cost implications. So it is about finding the right balance; we have a surge of work now so perhaps not the resources for long-term projects currently. But we have a strategic steering committee that meets on a regular basis where we get to look at a lot of potential technologies."

Nevertheless, there is much companies can do currently to speed the process of digitalisation. At the beginning of the pandemic, AJW Technique did exactly that by building digital tools and dashboards to closely monitor fleet recoveries by customer and by platform to ensure its operations were synchronised with flying patterns.

The company also invested in tools to enable a digital shop floor, with the aim of maximising technicians' component touch-time. Examples include productivity trackers, automated payables and receivables, credit control automation, turnaround time gaming systems, performance management dashboards, piece parts provisioning models, and dynamic pricing algorithms.

"We have also tested asset location tracking using RFID and Bluetooth technology as a proof of concept. This allows technicians to have a full view of high value assets at their

"Customers are preparing for sending engines in for full shop visits"

"We are currently trying to expand the programme to more customers, and have plans to also use it in our engine MRO programmes. As more airlines and operators get onboard and participate in the programme, its analytics model will only get better and more robust, and in turn drive greater efficiencies in maintenance work scheduling and costs."

Another recent launch has been MTU's fleet management software 'CORTEX', which Friis-Petersen says combines the company's "experience and technical expertise with data, for example from engine trend monitoring, shop workscoping history and market understanding, with algorithms and artificial intelligence to create fleet management scenarios for customers".

He adds: "CORTEX is a revolutionary and intelligent maintenance costing and planning tool. It accommodates multiple financial, technical, operational, environmental and market considerations and generates accurate engine planning scenarios, including worksopes down to modular level across engine lifetime, at the click of a mouse. These scenarios are then reviewed by MTU's engine experts and discussed with the customer to decide the best course of action for their fleet."



The new service aims to reduce maintenance and operating cost for airlines, and is completely customisable, immediate and proactive, according to Friis-Petersen. "Such a tool is not currently available on the market today. Furthermore, due to the recent pandemic, engine fleet planning is even more fluid than usual and variables are changing on a daily basis. Using our tool, airlines can assess various scenarios and maximise the use of existing assets, for

instance in a restart scenario, but also avoid unnecessary spend."

While all these developments are exciting, HAECO's Kendall cautions that while there are a lot of opportunities around optimising maintenance practices through data analytics and the use of predictive maintenance tools to anticipate maintenance visits, the industry must move "at a pace that is accepted by regulators as we put these tools into practice".



1. Etihad Engineering's VP of technical sales Frederic Dupont
2. The company is currently experiencing a surge of work, but maintains focus on new technologies and its digitalisation roadmap

Taking a forward-thinking view of technology, AFI KLM E&M's Panier notes that industrial operations are proving a fertile ground for innovation. "With tablet devices, augmented reality/virtual reality headsets, drones and exoskeletons, the man-machine collaboration is moving forward at pace, and promises to make the work of a mechanic faster, safer and more efficient," he says. The future also appears bright for additive manufacturing, he thinks. "Although currently restricted to certain cabin components, in the future this process could be applied to many other aircraft systems, and potentially revolutionise the supply chain by making it possible to carry out many more on-site repairs."

No going back

There is a general feeling among those interviewed for this forecast that many of the changes brought about by the Covid-19 crisis will be permanent and put the sector on a different path – leading to "a new era for MRO and the industry as a whole", as Joramco's Currie puts it. "We have all learnt lessons since the start of the pandemic and have again been reminded of the boom and bust factor," he says. Currie cites the positive atmosphere at recent major trade shows such as MRO Europe (in Amsterdam) and the Dubai Airshow as a reason for industry optimism. "We are all used to the cyclic nature of the industry, and I am seeing a resilient industry that is hungry to drive out of the current situation." Dupont, too, says expectations were far exceeded at these shows – "there was a very positive vibe and energy, which is extremely exciting".

With the flexible and creative approaches that have been taken by many companies, along with the innovations and technologies that have been introduced, there is little doubt that the MRO industry will return to full force – and beyond. Until the current extraordinary external uncertainties disappear though, the question of when still remains. In predicting timeframes, as Dupont puts it, "your crystal ball is as good as mine". **M**



2 fingertips facilitating traceability and workflow management," Mallette says. "We predict that more aviation businesses, MROs, OEMs, airlines and brokers alike will come together to develop more digital products that fix some core industry issues as opposed to creating siloed solutions that solve bits of their four walls. Most part sales businesses have gone fully digital as well."

For IAE, much of the digital focus during the Covid-19 crisis was on investing in "more efficient and effective" collaborative tools, says Exum. "These have greatly improved our connectivity with not only our employees, but also our customers, suppliers, joint venture partners and MRO providers," he says.

"These digital tools allow us to be better connected than ever before, share more information in real time, create efficiencies and speed related to planning,

workspace management, reacting to changes in repair yield, and ultimately reduce cost and turnaround time. While there is no substitute for face-to-face interactions, we will continue to leverage the benefits of these new tools in 2022 and beyond."

"We work with service providers to ensure they understand our forecasting signals"

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PERFECTING PARTS INVENTORY PRACTICE

How can airlines ensure that their spares inventory is not costing them too much, either by not having too much sitting on the shelf or by not being short when a problem arises?

Bernie Baldwin listens to some expert advice

Within the general grouping of aircraft spare parts, there are those which the regulations say are 'mission critical', and those that are not. If something happens to one of the latter, a flight can still go ahead and a fix can be implemented later. If one of the former fails though, then the airline is left with an AOG (aircraft on ground) situation and the costs can immediately begin to stack up.

Obviously if an aircraft is at its home base or at an outstation where there is a store of spare parts, those AOG costs can be minimised – as long as the necessary replacement part is in stock. Otherwise, an aircraft not earning revenue, plus the added expense of locating a replacement, having it transported and the paying for additional repair work can take considerable sums of money. Should it happen a few times, there may well be some serious pressure on the balance sheet. Thus smart management of the spare parts inventory is a vital and valuable discipline.

There are many elements to managing the parts inventory. Benjamin Moreau, VP sales key accounts for Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) offers his company's thoughts on what these elements are, beginning with



parent airlines' need for predictive maintenance too. "Prognos allows Air France, KLM and our other customers to anticipate unscheduled maintenance items and to minimise [the amount of] inventory without affecting dispatch performance," Moreau states.

APOC Aviation says its mission is "to keep aircraft fully operational by sourcing and delivering

used aviation products of only the highest quality". Such a service allows operators to successfully manage their parts inventory, without having to pay for new replacement parts.

Assessing the key components of successful parts inventory management, APOC's sales manager-components, Florent Michel, believes that "a robust IT program that works for the user" is vital, pushing information to the user when to replenish stock, and detailing which parts are in demand in the market.

According to Michel, the program needs to enable the user to access crucial

data quickly (through reporting) and extract it from the system. "Data is key – whether past transaction data, market demand or technical data relating to the unit," he declares. "The more data you have, the easier it is to extract value from your inventory. If you do not know what you have on the shelf in terms

of value and where the demand is, you will not be able to sell effectively."

Meanwhile APOC's inventory management programme today is specifically tailored to parts trading. "In the medium to longer term, we plan to evolve the

1. The smart management of spare parts inventory is a vital and valuable discipline
2. Costs associated with an AOG situation will go down the quicker a spare part can be made available
3. APOC's sales manager-components Florent Michel advocates for a robust IT program



scope of our programme to encompass maintenance," Michel says.

This is recognition that there can be a variety of ways in which third-party components providers can assist airlines with their parts management strategy. Examples include the pros and cons of carriers keeping and managing their in-house stock completely and also how inventory levels need to vary across rotables and consumables.

"In some cases, airlines do not have the time or the resources to truly focus on sourcing so they rely on third-party component providers like APOC," Michel observes. "The goal of the airline is to guarantee that their aircraft are flying; they do not want to worry about always having the desired unit on the shelf. They pass on that burden/risk to the third-party component provider whose role is always to make sure that there is – at any given time – a unit on the shelf to support the airline."

There are pros for keeping inventory management completely in-house. "With in-house stock, airlines have better access to the unit and can meet their requirements more quickly/easily," Michel remarks, before noting the cons. "It takes

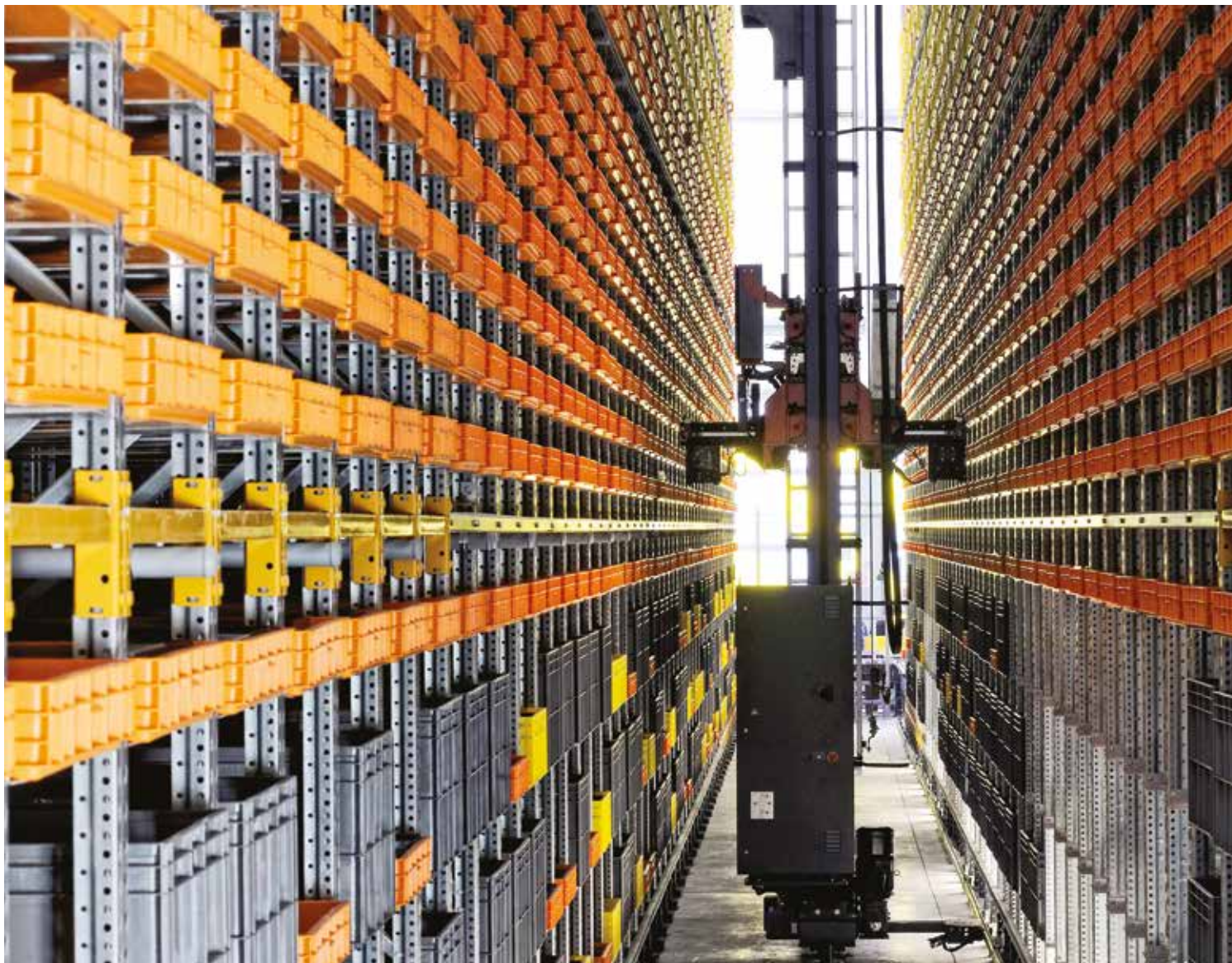
the relationships with each customer. "Over time, we have built longstanding partnerships with our customers based on reliability, innovation and transparency, the quality of our maintenance work, and our proven availability concepts," he says.

"The key element then for managing parts inventory is to have reliable predictions of demand," Moreau continues, pointing out that IT has a role, but that it is not the only solution. "A maintenance software program can only predict parts needed for planned tasks. The operator's experience is key to build reliable predictions on most critical inventory needs that are not related to planned maintenance. Such experience has been capitalised on in our predictive maintenance tool, 'Prognos'."

Although it has third-party customers, AFI KLM E&M and its subsidiaries do of course serve their



"DATA IS KEY – THE MORE DATA YOU HAVE, THE EASIER IT IS TO EXTRACT VALUE FROM YOUR INVENTORY"



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“IT STARTS WITH AIRCRAFT FLEETS, TREND ANALYSIS, AIRCRAFT LIFECYCLE AND GENERAL MARKET DYNAMICS”

significant investment and experienced resources to manage in-house stock.

“Many airlines want to pass those costs to specialist component suppliers. They would rather pay a bit extra in terms of securing a third-party service rather than having to deal with the stock themselves. Of course it depends on the strategy of the airline and the cash flow they have. This is particularly applicable to rotables.”

AFI KLM E&M's Moreau suggests that when assessing the amount of stock to keep, it helps to have a lengthy background in the field. “This is a process based on experience, starting years ahead of the entry into service of a new fleet. Having an operator's

expertise here is also key to making the appropriate assessments for the benefit of Air France and KLM passengers and MRO customers,” he comments.

“Airframers and engine manufacturers' recommendations are challenged via a detailed review of all maintenance tasks. The minimum necessary stock to achieve a certain performance in terms of dispatch reliability is the result of an analysis optimising the combination of part reliability, supply chain performance, dispatch tolerances and cost. The nature of the part – rotatables or expendable – affects the supply chain more than the quantity of stock needed.”

DBK Aero is a new company set up to trade aircraft spare parts and aims to thrive “on consignments helping others make profit on their stock”. According to its CEO Delphine Kennedy, this is to be done “with a conscious mind that



we need to evolve and try to be more sustainable". The company has already received full ASA-100 accreditation from the Aviation Suppliers Association.

Taking an external view on how a supplier would go about assessing stock requirements, Kennedy begins with the reminder that operators need to understand and appreciate just how complex an industry aviation is, and that time taken to look at the market can be valuable. "There are now more and more tools which enable both the suppliers and the airlines to make decisions on stock inventory. Through advanced data analytics, we can now make the right decisions," she comments. Certainly, software solutions to aid matters should be incorporated into the process.



2



"Everything starts with aircraft fleets, trend analysis, aircraft lifecycle and the general market dynamics, such as behavioural passenger and fleet forecasting," adds Kennedy.

For spares sourcing, airlines and their MRO departments (whether in-house or outsourced) also have available to them the comprehensive support packages increasingly offered by airframers and engine manufacturers. So how much do

they benefit the task of inventory control?

"More than benefitting the control of inventory, they actually give a clearer picture for the airline's finances and forecasting. This is key on a long-term basis. It offers peace of mind and specific outgoings," Kennedy says, although she adds a caveat. "These

support packages often have loopholes and do not necessarily cover 100 per cent of the airframes and engines. This is where smaller spare parts providers, such as DBK Aero, can offer better flexibility, offering a wide range of spares with no limitations and real on-time delivery."

Loopholes or not, these support packages have been garnering a significant number of contracts from airlines. APOC's Michel offers an explanation for their popularity. "They have shifted the 'stress' behind inventory management away from the airline," he declares. "Additionally, they have made the stock more lean as the stock is

1. AFI KLM E&M believes that operational knowledge is essential to optimise inventory
2. APOC's inventory management programme today is specifically tailored to parts trading
3. A third-party component provider should take on the burden of having units on the shelf

calculated strictly based on flight hours/usage. No excess stock is needed if you customise your inventory to your usage."

Michel notes another reason why the OEMs' packages are well-liked. "They ensure that your inventory is rotating a lot and hence renewing itself in terms of repair tags," he explains.

While he acknowledges the OEMs' presence in the aftermarket, AFI KLM E&M's Moreau advocates a different approach. "Of course, aircraft and engine manufacturers are willing to offer comprehensive packages, but as an airline-MRO we strongly believe that

3



operational knowledge is essential to optimise inventory. It is this experience which allows us to increase performance, adapt operator inventories and thus reduce operating costs," he elaborates.

"We operate the same fleets as our customers, so we know how recommendations not based on this operational experience can easily result in unsustainable rates for an airline. Ensuring impartiality, our job as a maintenance operator is to optimise dispatch reliability, not to sell parts, so our recommendations are truly focused on the needs of the airlines."

Each operator must make its own choice, of course, but the variety of options available when optimising inventory mean that a solution can be reached to fit almost any requirement. 

HARD FOUGHT GAINS

Much smaller in dollar terms than the MRO markets for mainline single-aisle and widebody jets, regional airliner MRO nevertheless involves thousands of aircraft, dozens of providers internationally and similar challenges, reports **Chris Kjelgaard**



MRO spend on regional aircraft appears likely to rise to around \$11 billion in 2031

Compared with the MRO markets for mainline single-aisle and widebody jets, the MRO market for regional aircraft is small. Oliver Wyman's 'Global Fleet and MRO Market Forecast 2021-2031',

published in January 2021, estimated that regional jets and turboprops represented 21 per cent of the total global fleet of air transport aircraft for the year. However, regional aircraft accounted for a much smaller share than that of the overall 2021 commercial aircraft MRO market, according to Oliver Wyman: just 11 per cent of the approximate US\$70 billion total engine, component, line and airframe heavy maintenance spend.

By 2030, regional aircraft will account for an even lower proportion of what by then will be a much larger commercial aircraft fleet, Oliver Wyman predicts. Estimating that by 2030 the total fleet

size will increase to more than 36,000 aircraft, the consulting firm forecasts regional turboprops will represent just seven per cent of the overall fleet – compared with



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1. Ascent Aviation Services is a US-based provider of heavy airframe MRO for regional aircraft and has two large MRO facilities in Arizona. Photo: Ascent Aviation Services

Supply chains for regional aircraft parts and components “are usually quite different”

just under 10 per cent in 2021, when some 2,500 regional turboprops were in service. While there will be about 600 more regional jets in service by 2031 than the approximately 3,000 flying in 2021, the proportion of the overall commercial aircraft fleet regional jets represent is likely to fall from a little under 12 per cent in 2021 to about 10 per cent a decade later.

The picture is similar for regional airliners in terms of the proportion of the 2031 MRO spend they will require. While the 2031 MRO spend for all commercial aircraft will be much greater than the 2021 spend, rising to somewhere between \$103 and \$116 billion, regional airliners will account for less than 11 per cent of the overall amount – and possibly less than 10 per cent. However, the absolute MRO spend on regional aircraft appears likely to rise from a little under \$8 billion in 2021 to around \$11 billion in 2031.

The relatively small proportions of total commercial aircraft fleet size and MRO spend accounted for by regional aircraft tend to disguise the fact that the regional aircraft MRO business is still a sizeable business. The market will generate \$8 billion or more a

year from now through 2031. It is also highly fought over. The same engine and component MRO specialists that handle the repair and overhaul work on larger commercial jets also handle much of the work on regional aircraft. But regional aircraft line maintenance and heavy airframe maintenance are

very competitive markets, with many smaller MRO shops able to compete with larger facilities on a more or less equal basis. At the same time, some of the regional aircraft manufacturers and various operators are deeply involved

in providing MRO for the aircraft they make or operate.

The Canadian, US and European markets

Take the Canadian market as an example. Chorus Aviation – which owns Jazz LP, the company that operates all the aircraft in the Air Canada Express regional network – also owns two MRO companies, Jazz Technical Services in Halifax, Nova Scotia and Voyageur Airways in North Bay, Ontario. There the company handles the MRO for all of the Dash 8s and CRJs in the Jazz and Voyageur fleets, and it has now begun taking on MRO work for third-party customers, according to JC Tewfik, VP marketing, sales and services for Premier Aviation Québec, an independent company based at Québec City Jean Lesage International Airport which specialises in regional aircraft heavy airframe MRO.

Several other Canadian operators also perform MRO on their aircraft,

according to Tewfik. Not to be forgotten as a major MRO provider for all of North America for the former Bombardier CRJ family is Mitsubishi itself – renamed the SpaceJet family following Mitsubishi Heavy Industries’ purchase of all of Bombardier’s CRJ production and MRO assets – which operates the former Bombardier MRO service centres for CRJs in Tucson, Arizona and Bridgeport, West Virginia.

Similarly, Embraer operates a large MRO facility at Nashville International Airport for ERJ-family and E-Jet-family aircraft flown by operators throughout

North America. Air Canada and AAR handle heavy Embraer E-Jet airframe MRO, while Mirabel-based Avianova has established a cooperation with Air Canada and is building a large new facility in which to perform airframe MRO on that airline’s new Airbus A220 jets. In the USA, Delta TechOps and Lufthansa Technik both handle E-Jet MRO and Delta handles MRO for its A220s.

At present, Premier Aviation Québec (PAQ) is primarily handling heavy airframe MRO for ATR

and Dash 8 turboprops, as well as the Embraer ERJ family, according to Tewfik. In addition to the competitors already identified, Tewfik names at least four other independent Canadian MRO providers which compete for regional aircraft airframe heavy check business: JD Aero Technical, KF Aerospace, Skyservice and Springer Aerospace.

Various facilities and regional aircraft operators in the USA also compete for the North American and Latin American markets which are PAQ’s primary sources

8

BILLION



The regional MRO market will generate \$8 billion a year from now until 2031



1. The regional MRO sector is bouncing back from Covid (Photos 1, 3 & 4: Ascent Aviation Services)
2. Premier Aviation Québec is primarily handling heavy airframe MRO for ATR (pictured) and Dash 8 turboprops, as well as the Embraer ERJ family
3. Ascent Aviation Services was able to retain most of its mechanics during the Covid-19 crisis
4. Large North American regional airlines are tending to outsource their heavy airframe maintenance rather than perform it in-house

Aircraft Maintenance Services in Poland; Magnetic MRO in Tallinn, Estonia and in Poland; Sabena technics in France; SAMCO Aircraft Maintenance in the Netherlands; and Skyways Technics in Denmark.

While the regional aircraft MRO sector suffered substantially from the effects of the Covid-19 crisis on air travel, the sector has largely bounced back and short-term capacity is becoming tight to

of MRO business. One very important one is Skywest, Inc, the largest regional airline company in the world which operates no fewer than 13 maintenance bases in the USA, the largest of which located in its home state Utah. Other competitors include Empire Aerospace in Coeur d'Alene, Idaho and Mountain Air Cargo – which also operates 26 Cessna 208s and 17 ATR turboprops as freighters, many under contract to FedEx Express – in Kinston, North Carolina.

Another increasingly important US-based provider of heavy airframe MRO for regional aircraft is Ascent Aviation Services, which has two large MRO facilities in Arizona – one at Tucson International Airport and another nearby at Pinal Airpark, where its 'Marana' aircraft storage site and disassembly operation is situated. Ascent also handles widebody airframe heavy MRO.

The company performs airframe MRO on single-aisle jets and regional jets at its Tucson facility, primarily focusing on CRJ900 and CRJ700 airframe maintenance and interiors work. Ascent also performs "some specialised work" on Embraer 190s and 175s, but hasn't made

a major MRO commitment to the E-Jet family yet because of the "investment in tooling and training" that would require, says Scott Butler, Ascent Aviation Services' chief commercial officer.

Butler says Ascent first ventured into regional aircraft MRO three years ago and the work now represents "a pretty good-sized" and expanding part of its business. The supply chains for regional aircraft parts and components "are usually quite different" to those for mainline commercial aircraft and are "quite challenging", being "pretty stressed for different aircraft types" for heavy-check parts requisitioning.

Europe is no less competitive a market for regional aircraft MRO than is North America, according to Malcolm Chandler, head of commercial and marketing for Vallair. In addition to its aircraft leasing and

other businesses, Vallair handles airframe MRO for ATR turboprops at its facility at Montpellier in France and has acquired a large hangar at Chateauroux in which it will perform heavy maintenance on Airbus A330 family widebodies.

Chandler says there are at least eight competitors to Vallair in Europe for ATR airframe MRO business: BinterTechnic in the Canary Islands; Czech Airlines Technics in Prague; Exeter Aerospace (formerly Flybe) in southwest England; LOT

13

↑
Skywest, Inc is the largest regional airline company in the world and the company operates no fewer than 13 maintenance bases throughout the USA, the largest of which is located in its home state of Utah

non-existent. One reason for the early recovery of the regional airline sector, particularly in the USA, was that major airlines preferentially stored their larger single-aisle and twin-aisle aircraft to reduce capacity but kept in service many of the regional aircraft operated by their regional airline partners, according to Richard Brown, managing director of Naveo Consultancy.

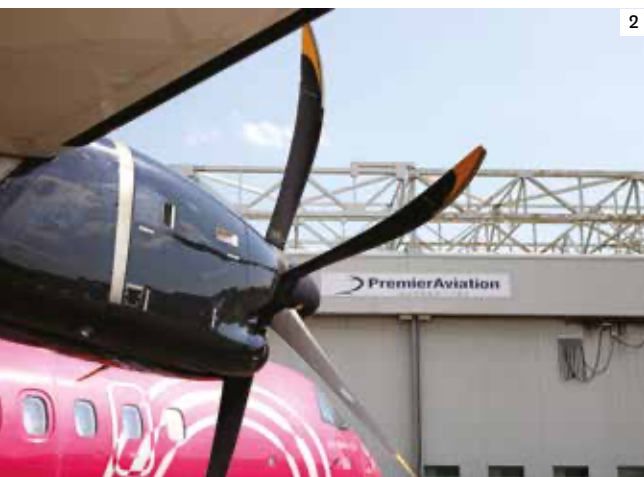
This was particularly true for 60-70-seat regional jets such as the Embraer 175 and CRJ700, and for the Dash 8-400 and the ATR 72 large turboprops. The rebound in utilisation of these aircraft is demonstrated in Naveo

Consultancy's 'Air Transport Traffic, Fleet & MRO Update' of November 2021.

The report shows that after the slump produced by the onset of the pandemic, utilisation of the CF34-8 engine type powering the Embraer 170/175 and the CRJ700, and the PW100 turboprop engine powering the Dash 8-400 and the ATR 72, grew back much more quickly and strongly than did utilisation of the CF34-10, the CF34-3 and the AE3007. Those engines respectively power the Embraer 190/195 and CRJ900; the CRJ100 and CRJ200; and the Embraer ERJ family.

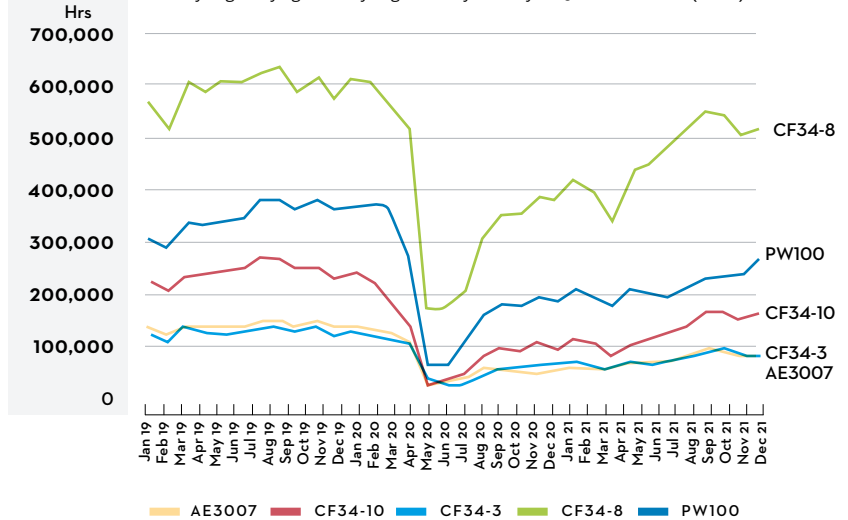
MRO capacity crunch

Tewfik says that today all of PAQ's regional aircraft heavy MRO capacity is booked "almost until 2024", where until



Engine utilisation recovery

Monthly engine flying hours by engine family January 2019 - October 2021 (hours)



September 2020 its capacity was usually fully booked only for about six months ahead. A major reason for this is that after about ten years of Tewfik pursuing a particular potential customer for business, the customer agreed a contract with PAQ and immediately booked slots for 15 aircraft. That's a big win considering that PAQ's entire annual induction capacity is in the 40-50 aircraft range.

Tewfik also discerns a growing trend among large North American regional airlines to outsource their heavy airframe maintenance rather than perform it in-house, as they used to do. This is making capacity tighter at big regional aircraft MRO facilities. For instance, "Embraer at Nashville is full until 2025", he says.

The regional airline sector in Europe is also emerging again (depending on country), says Vallair's Chandler. Regional aviation in the UK has seen a fair amount of recovery, "led by Emerald Airways and the resurrection of Flybe", in part because of the relative inefficiency of the UK's privatised railway system and the high costs for passengers of travelling domestically by rail.

However, the French Government's climate-conscious decision to ban domestic flights on all inter-city routes which the nation's TGV high-speed trains can cover within two and a half hours has adversely affected the operations of some French regional carriers, such

as Air France subsidiary Hop. The rule effectively pushed domestic air service out of the centre of France, leaving only routes between cities in northern and southern France and between cities in western and eastern France.

That said, ATR MRO business "is looking up" for Vallair, according to Chandler. The company has been

the increasing amounts of MRO work required following the quick rebound in regional aircraft utilisation – particularly in the USA. This is a highly important consideration for PAQ, which obtains about 70 per cent of its business from US customers, according to Tewfik.

Even though PAQ has its own training school and employs every apprentice

who graduates from it, the company is reluctant to expand. "What scares me the most is manpower," says Tewfik. Although its capacity is fully booked for the next two years and PAQ knows that in today's market it could obtain ample new business, expansion would require it to

hire about 100 more mechanics and "they are not available in Québec", he says. Without an adequate supply of skilled mechanics, the C\$40 million investment he reckons PAQ would need to make to build a large new maintenance hangar and tool it completely would effectively be money thrown away.

To expand, PAQ would need to hire experienced mechanics from other countries; however, unlike the FAA, Transport Canada doesn't recognise the certifications and accumulated type experience of mechanics from other countries, he says. So any highly experienced A&P mechanics moving to Canada from, say, Europe would have to begin work as apprentices again and would take years to obtain Canadian certification as A&P mechanics. "The only way for us to come out of the nightmare in Canada is for Transport

Regional aircraft tend to be simpler to maintain and "more mechanical" than newer mainline jets

performing freighter conversions on a number of ATR turboprop aircraft and has carried out heavy airframe MRO on various other ATR aircraft, including some repossessed from carriers in the Far

East and due to be re-deployed by regional carriers operating services across the Mediterranean between Southern European and North African destinations.

Mechanics shortfall

The Covid-19 crisis has also created a staffing problem for various MRO providers, according to Tewfik. Many long-term A&P mechanics chose to retire permanently when they were laid off in response to the crisis and are no longer available to service



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Canada to recognise [immigrant mechanics'] talent and recognise their equivalencies," says Tewfik.

Butler says Ascent Aviation Services was able to "maintain and retain a significant percentage of its mechanics" – it has about 200 overall – because of its aircraft storage and aircraft recycling businesses. Both surged as a result of the travel slump wrought by Covid-19. Ascent works closely with aviation schools in Arizona to continue developing its local workforce, an important activity both because of the struggle to retain employees when the major airlines come calling and because Ascent is intent upon expansion in the relatively near future.

Butler says Ascent's MRO capacity is "booked ahead quite fully for the next six to 12 months", and as a result "we're always hiring and trying to improve"

the company's competitive position and offer. The company has expansion plans and is simultaneously "seeing [MRO] capacity getting tighter and tighter in the rest of the world". This is important to Ascent, because in addition to its regional jet and mainline narrowbody MRO work, the company is heavily involved in widebody airframe MRO and has customers from all six continents, says Butler.

Working differences

As a diversified airframe MRO company, Ascent Aviation Services is in a

particularly good position to know what the key differences are between MRO for regional airliners and MRO for mainline commercial jets. As one might expect, when comparing working on regional

Far fewer mechanics can work on a regional jet at the same time than on a widebody

aircraft and working on mainline jets, the "scale, service and scope [of MRO work] play into how you do things and also how you flow the aircraft" through a heavy check, says Butler. One obvious difference is that far fewer mechanics can work

on a regional jet at the same time than on a widebody. Only one mechanic can get into the electronics bay of a CRJ at a time, for instance, and because its interior is so much narrower than that of a widebody, sizeable numbers of mechanics can't work on a regional jet's interior simultaneously.

Another important difference between MRO for regional aircraft and MRO for mainline jets is that "most airlines operating regional jets don't veer too far from

1. Premier Aviation Québec's regional aircraft heavy MRO capacity is booked "almost until 2024". Photo: Premier Aviation Québec

2. Ascent first ventured into regional aircraft MRO three years ago and has steadily expanded. Photo: Ascent Aviation Services

the [OEM's] manual, but major airlines can have a very different maintenance programme" to that recommended by the OEM, says Butler. "It's not a difference in approach per se, but getting used to the [mainline jet] operators' programmes themselves takes a bit of getting used to," he notes. That makes regional jet MRO planning and workflow "a little bit easier" than following different mainline operators' customised maintenance programmes, when working on different aircraft of the same type.

Tewfik says that while in most aspects performing regional aircraft MRO is just like performing MRO on larger aircraft,

maintenance planning, methodology and workflow is different for regional aircraft, at least in terms of scale and resources required. Often, too, "it is more difficult to get parts on some [regional] aircraft", though they tend to be simpler and "more mechanical" than newer

mainline jets. Another difference between regional airliner MRO and mainline jet MRO is that the build quality of some regional aircraft, particularly slightly older ones, is not always as good as it should be, according to Chandler. Doors sometimes don't fit well and on occasion it has been known for parts corrections to be required for airframe deviations. Additionally, interchangeability of parts between airframes of the same aircraft type is not always ideal.

Of course, MRO task and planning differences exist between different regional aircraft types. The most important difference, according to Tewfik, is that different regional types have different C-check intervals. "Every OEM has its own recipe for the C-check," he says. "Some are time-based, some are cycle-based. The number of hours for a Saab [340] is 3,000. For an ATR, it's 5,000. For an ERJ, it's 6,000." ■



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THINKING IN 3D

Recent innovations around the globe suggest there is a bright future in additive manufacturing – which is good news for sustainability in the MRO industry, as **Luke Chamberlain** reports

Steps to drive innovation in additive manufacturing (AM), also known as 3D printing, have gathered momentum in recent months. In November, ST Engineering partnered with the Singapore

Institute of Manufacturing Technology (SIMTech) to co-develop AM processes for applications in MRO. The three-year programme will aim to enhance the end-to-end AM process in manufacturing aerospace parts and components.

The two companies will initially focus on research and development in feedstock material management and qualification, process improvement and qualification, and post-process enhancement to AM products, with a long-term view of extending the enhancements to other industries.

In the same month, engine manufacturer GE Aviation announced that its Singapore AM centre had become the first MRO facility in the world to implement AM technology for the repair of commercial jet airfoil components. The company plans to hire 300 new staff in 2022 to grow its talents in several areas, including AM.

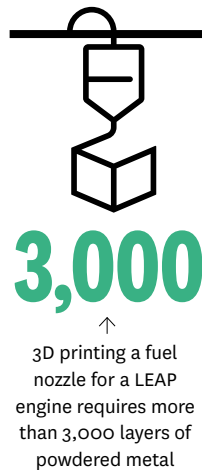
In October, ITP Aero announced the company had designed and manufactured the tail bearing housing for the first Rolls-Royce UltraFan demonstrator engine using additive technology. Using AM, the company said, will

enable a better use of energy and raw materials in the manufacture of the engine component compared to current generation processes.

These developments will come as promising news across the MRO industry. AM has the potential to not only unlock

a zero-waste manufacturing process that produces parts that are lighter, stronger and more enduring than traditional methods, but also help solve the sector's parts supply chain issues.

According to AFI KLM E&M's SVP business development Johann Panier, "the future appears bright for additive manufacturing". He adds: "Although currently restricted to certain cabin components, in the future this process could be applied to many other aircraft systems, and potentially revolutionise



Additive manufacturing has the potential to solve parts supply chain issues

the supply chain by making it possible to carry out many more on-site repairs."

However, widespread use of AM in the industry is still some way off. In a statement, SIMTech said: "Additive manufacturing is a highly automated manufacturing process with rich technology content, suitable for managing high-mix, low-volume production with a lean setup." However, "technical challenges such as expensive feedstock materials, inefficient printing

processes, qualification of the AM process and lack of cost-effective post-processing solutions impede not only widespread adoption, but also serve as barriers to entry".

Considerable roadblocks lay ahead before AM enhances the existing production of aircraft parts, but with innovation in the area gathering pace, developments look to be leading to a more sustainable future. **M**



A large, vibrant rainbow arc curves across the background of the advertisement. Along the path of the rainbow, several small, stylized airplane icons are scattered, each in a different color matching the rainbow's bands. The background is a light blue gradient.

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