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Holding the line

How the Covid-19 crisis has impacted MRO operations

To the MAX

Will the 737 MAX grounding affect future MRO?

Industry voices

18 predictions for 2021 – and other reasons for hope

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Printed in the United Kingdom by Micropress.

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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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EDITOR'S LETTER

Hold the line. Love isn't always on time. So opined Toto in the classic rock song. MRO providers around the world have indeed had to hold the line over the last year as they adapt to new realities brought about by the Covid-19 crisis.

That might be in the metaphorical sense of keeping operations steady in difficult times in preparation for better days ahead. Or it might be in the sense of holding line maintenance operations as the requirement for them sharply dropped. Like the love Toto sang about, many scheduled, proposed or anticipated MRO events have not occurred on time.

Our cover story explores how MRO companies have adapted their line maintenance activities in light of Covid-19 and ponders what the future might hold as aircraft begin to return to service. Despite the challenges they have faced, many providers have shared stories of positive actions, initiatives and developments, and there appears to be renewed hope for a bright future.

In our new Industry voices section, MRO leaders and subject matter experts are given a platform to share their views on a range of topics. This time, Alton Aviation Consultancy's Jonathan Berger offers 18 "not-so-bold" but nevertheless fascinating

MRO predictions for 2021, while Aviation Logistics Network's Ralph Perkins takes inspiration from Charles Dickens to demonstrate that out of something bad such as the Covid-19 crisis, ultimately something good has to emerge.

This issue also features insights into how the grounding of Boeing's 737 MAX might affect the commercial aviation MRO business in years to come. And with CFM's LEAP engines powering these aircraft (and others) we offer an update on the MRO services in place for the programme.

We are also excited to bring you a pair of interviews with Skyways Technics' CEO Benjamin Nielsen, who is ready for any challenge, and JSSI Solutions' president Joy Nebel, who offers a compelling vision of the digital future of the industry.

I hope you enjoy reading this issue and welcome your thoughts or comments on it, as we all hold the line for a little longer as life starts to get back to normal.

Jason Holland

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HANGAR *talk*



ANALYSIS

Global fleet and MRO growth limited by pandemic

By 2031, the global aviation fleet will be smaller than once projected because of the impact of Covid-19, a new forecast has predicted.

According to Oliver Wyman's Global Fleet & Maintenance, Repair, and Overhaul (MRO) Forecast 2021-2031, a decade of smaller fleets will also mean constrained growth and consolidation. It claims airlines will not return to 2019 levels of operations until at least 2022, with recovery in parts of the aerospace market lagging by a year or two.

At its lowest point during the pandemic, the global fleet had about 13,000 aircraft in service, less than half the number flying in January 2020. The 2021 fleet is up to more than 23,700 aircraft. By 2031, the report forecasts that the fleet will number more

AFTERMARKET PROVIDERS WILL BEGIN TO SEE CONSISTENT GROWTH OVER THE MID- AND LONG-TERM

than 36,500. But it is still a far cry from pre-Covid projections, which put the 2021 global fleet at 28,800 and the 2030 fleet at more than 39,000.

Wyman predicts that the impact on the MRO market will also be significant. Short term, demand in 2020 and 2021 is expected to be 33 per cent, or US\$60 billion, below pre-Covid projections for the combined two years. Over the next 10 years, the industry will lose more than US\$95 billion in revenue compared with pre-Covid expectations.

Despite the challenges, there are some hopeful signs, the report notes. Deliveries of narrowbody aircraft are expected to hold up, with cumulative deliveries approximately 90 per cent of pre-Covid expectations over the 10 years.

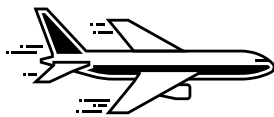
In contrast, widebody aircraft deliveries and production could be as much as 40 per cent below what had been predicted. This is due to falloff in international and business travel driven by changing corporate travel policies and government restrictions.

Despite significant short-term losses, the long-term outlook for MRO is bright. Aftermarket providers will begin to see consistent growth over the mid- and long-term, as the size of the fleet expands and the overall age increases, driving interest from private equity and other investors.



2022

the year operations are predicted to return to 2019 levels



36,500

the predicted global fleet by 2031, according to the Wyman forecast



95bn

predicted loss in MRO revenue compared to pre-Covid expectations



ENGINES

StandardAero acquires ERO business

StandardAero has entered into a definitive agreement to acquire Signature Aviation's Engine Repair and Overhaul (ERO) business. The transaction is expected to close in mid-2021, subject to regulatory approvals and other closing conditions.

Dallas, Texas-headquartered ERO provides engine MRO primarily for business jet and rotorcraft platforms and consists of five entities: Dallas Airmotive, H&S Aviation, W.H. Barrett Turbine Engine Company, International Governor Services (IGS) and International Turbine Service (ITS). ERO has two overhaul facilities (in Dallas and Portsmouth, England), ten regional turbine centres, one component MRO site and two parts/distribution facilities. Services include

MRO for the majority of turbine engine models powering fixed and rotary wing aircraft used for business aviation, and many of the engines used in government, military and commercial applications.

"ERO is a terrific and complementary fit for StandardAero, expanding our portfolio with more volume of the engines we support today, while also growing our service base with a significant number of new engine platforms and customers," said StandardAero chairman and CEO Russell Ford. "ERO is OEM-aligned and has a long history of outstanding service and customer satisfaction. With this acquisition, StandardAero will achieve significant cost and operational efficiencies and will continue on pace to become one of the pre-eminent MRO companies in the world."



ENGINES

Uganda Airlines signs agreement with Rolls-Royce

Rolls-Royce has signed a 'TotalCare' engine maintenance agreement with Uganda Airlines for the Trent 7000 engines powering its two new Airbus A330neo aircraft.

Uganda Airlines, which received the first A330neo in December 2020 and the second in January 2021, is a new customer for Rolls-Royce.

"Our Trent 7000 engines will be maintained to world-leading levels of service"

Rolls-Royce said the 'TotalCare' agreement would give Uganda Airlines a "secured cost" of operating and maintaining its Trent 7000 engines.

This will be achieved through a dollar-per-flying-hour payment mechanism. Rolls-Royce will also provide "enhanced aircraft availability as a result of our in-depth engine knowledge that only we can provide".

Uganda Airlines' CEO Cornwell Muleya commented: "This agreement will ensure our Trent 7000 engines will be maintained to world-leading levels of service."

HANGAR *talk* In brief



● Magnetic Engines has performed its first combustion chamber replacement on a CFM56-7B engine. The service was added to the Magnetic MRO subsidiary's capabilities list after the purchase of new tooling last year. It is one of the first projects undertaken since the launch of the Magnetic Engines brand.

● ● ATR has appointed Tiziana Masullo as managing director and president of its subsidiary ATR Americas. She took on the role in December, succeeding Jurgen Lebacs, and becomes the first woman to lead one of ATR's subsidiaries. Masullo previously served as vice president of services sales and contracts.

● ● ● SAS has selected CFM International LEAP-1A engines to power its new fleet of 35 A320neo family aircraft, with eight spare engines included. The airline has also signed a long-term rate-per-flight-hour (RPFH) support agreement with CFM to cover the engine fleet, including spares.



APU

Pratt & Whitney APUs added to Revima deal

Revima and Pratt & Whitney are to renew and expand an authorised repair facility agreement on a worldwide basis for a variety of APU models – APS500, APS1000, APS2000 and APS2100.

Under the terms of the agreement, Revima will expand its customer coverage and existing capabilities to include most of Pratt & Whitney's radial APUs, with aircraft applications such as the 717, Dash 7, Dash 8 series, Embraer 135/145, Fokker 50, as well as military applications.

Revima said the addition of these product lines gave it the capability of repairing virtually the entire line of Pratt & Whitney radial APUs.

Pratt & Whitney will support Revima in training engineers and technicians, transferring inventory, tooling and performing test cell calibrations at Revima's APU center of excellence in Normandy, France.

Following the transition period, Revima will manage APU radial overhaul services work previously completed at Pratt & Whitney's West Palm Beach facility.



AIRCRAFT

Finnair recycles A319 at Helsinki Airport

Finnair is to dismantle and recycle an Airbus A319 aircraft which has reached the end of its economic lifecycle at 21 years. The dismantling will begin at Helsinki Airport for the first time, where Finnair's mechanics will remove parts that can be used elsewhere in the fleet.

Until now, Finnair's aircraft have been recycled elsewhere in Europe when they have reached the end of their lifecycle. Most companies

Recyclability of the aircraft and its parts is considered at the design phase

that carry out this type of work are located in dry zones, where the climate is favourable for long-term storage of aircraft.

The airline says it is an unusual project for Finnair, as it is different from the company's normal maintenance work, especially when it comes to planning and project management.

Aircraft have a pre-determined maximum service goal. Recyclability of the aircraft and its parts is considered at the design phase. With older aircraft, such as the A319, about 90 per cent can be reused.



€30m

The amount Mesa invested in a new hangar at the civil terminal in Portugal's Beja Airport



01

Delta TechOps has completed the first engine maintenance visit of a Rolls-Royce Trent 7000 engine

AMOS. AGAIN.



"We are convinced that AMOS is the perfect match for DRF Luftrettung. The fact that the very first AMOS customer was also an air rescue company - who still relies on AMOS after almost 30 years - reflects the versatility of AMOS to cater for the unique needs of rotary wing as well as fixed wing aircraft."

says CEO Swiss AviationSoftware Ltd

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

DRF Luftrettung, one of Europe's major air rescue companies providing rapid assistance to emergency patients, joins the fast-growing AMOS helicopter user-group.

AMOS complies with the special requirements of helicopter maintenance by providing dedicated functions only relevant for helicopters, such as vibration monitoring, engineering requirements, dynamic counter options to optimise maintenance control and performance, mission logic or in-depth effectivity rule logic to track fleet uniformity or customer preference.



COMPONENTS

SR Technics sets up new component services unit STRADE

SR Technics has launched new component services brand STRADE. It will operate as an independent unit inside the wider group.

STRADE provides component sale, lease, loan and exchange services on all major aircraft platforms.

SR Technics said the new unit would benefit from the wider group's "legacy in aircraft know-how and product reliability to offer 24/7 quality rotatable services to customers worldwide".

"SR Technics shows its resilience and innovative spirit in challenging times"

Introducing the new brand, SR Technics' CEO Jean-Marc Lenz said: "With this launch, SR Technics shows its resilience and innovative spirit in challenging times for our industry. STRADE leverages the strength of our company with its entrepreneurial and agile setup."

Strade general manager Stephen Fer commented: "We respond to a clear market demand for a more flexible and dynamic approach to component support."

"We also see how SR Technics' quality products will continue creating value through our renewed digitalised operating model." STRADE has component warehouses in London, Miami and Kuala Lumpur.



COMPONENTS

Honeywell, Satair in aftermarket partnership

Honeywell and Satair have signed a multi-year commercial agreement covering mechanical and air thermal components.

Satair becomes the exclusive worldwide distributor for the components on Airbus A320, A330, A340 and A380 aircraft. The distribution agreement also covers the A350 platform on a non-exclusive basis.

The deal expands an existing business relationship between the companies but represents the first joint advancement into the global commercial aviation aftermarket.

"With this new programme, we enhance our commitment toward continuous customer satisfaction through fulfilment of on-time delivery for Airbus operators and maintenance providers worldwide," said Satair's chief executive officer Bart Reijnen. Satair's head of business development, global distribution Matt Jessee said that following the

agreement, the company was "scaling its business to meet global demands".

Honeywell's range of electronic and electro-pneumatic systems for air and thermal management monitor and control cabin temperature and air flow in the cockpit, passenger and cargo areas and provide cooling for avionics. They also manage the aircraft's engine bleed air systems and pneumatic de-icing systems.

"Honeywell's appointment of Satair is an expansion of our existing strong relationship," said Honeywell Aerospace's vice president,

IT IS THE COMPANIES' FIRST JOINT ADVANCEMENT INTO THE GLOBAL COMMERCIAL AVIATION AFTERMARKET

EMEI Anthony Florian. "We already have two other agreements with Satair - a distributor agreement for the ADSB-Out Upgrade Pilot Program, and a non-exclusive worldwide distributor agreement for Honeywell's JetWave satellite communications products. This partnership will serve to further strengthen our relationship."

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capability



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modification
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01

01 Workshop expansion

Skyways Technics Asia has extended its structural repair workshops and warehousing facilities in Subang, Malaysia to cover an area of more than 3,000sq m. The workshops' surface area has tripled, while additional shops for sheet metal and composite works have been introduced.

The Subang warehouse has also doubled in size, increasing the space for both owned and consigned structural components that are available for loan, exchange and outright sale. Skyways Technics Asia is now able to release structural repairs for all ATR interior, fuselage, wing, nacelle and door items.

02

02 Adding colour

MAAS Aviation has opened a new purpose-built paint shop at Kaunas Airport in Lithuania.

Described by the company as the first of its kind in the country, the facility expands its global footprint to eleven paint shops and increases its overall MRO capacity in Europe by 40 per cent.

The twin-bay narrowbody paint shop can accommodate up to two A321 sized aircraft simultaneously and was constructed following a "multi-million Euro" investment.

The facility features a range of new technologies, MAAS said, including systems to ensure safe and secure operations and to manage the environmental impact of its activities.

03

03 AJW opens warehouse to support easyJet

AJW Group has opened a 35,000sq ft warehouse in Milan, Italy. The facility, located adjacent to Malpensa airport, will primarily support EasyJet's EU operations as part of a recently signed supply chain solution contract.

It will hold inventory of more than 10,000 lines of stock across 3,000 part numbers of rotatable, repairable and C&E items.

The facility will deliver a 24/7/365 operation with 30 staff, operating under EasyJet's Part 145 approval. A bespoke logistics service will also be offered.



Trend watch.

New openings, ventures and innovations are being put in place to keep the industry moving in 2021, as **Melissa Moody** discovers

02



03



04



05



06



07

04 A new space

American Airlines subsidiary Envoy is to expand its aircraft maintenance operations in Springfield, Missouri, US by moving into a new and bigger facility.

The company said the move would enable it to maintain more modern aircraft such as the Embraer E-175, which will create more jobs in the Springfield region, with additional potential for enhancements to air service.

The facility offers space to house three aircraft inside, with additional room for more aircraft outside, dedicated areas for parts storage, training, employee parking and administration.

05 Seeking surplus

AvAir is to acquire Sabena technics' surplus inventory, including both consumables and expendables in new condition.

The agreement between the parts supplier and MRO covers both airframe and component surplus materials used for heavy maintenance on various Airbus family, ATR and C130 aircrafts.

AvAir noted the need for many aircraft to undergo maintenance checks to go back into service after being parked due to the Covid-19 pandemic. Sabena technics said the sale of the surplus materials was intended to optimise its inventory.

06 Taking stock

Magnetic MRO has performed its first virtual stock-taking. Working with a team of auditors from PwC and the company's co-owners Guangzhou Hangxin Aviation Technology, Magnetic trialled the unconventional method as a result of restrictions imposed in response to the Covid-19 crisis.

Stock-taking would usually involve visiting the hangar and performing checks on the existing inventory. Both teams of auditors sampled certain inventory articles.

The process took approximately four hours and was conducted and recorded for reference via Microsoft Teams.

07 Training time

AirBaltic has announced it has established a new maintenance training organisation in Latvia providing training and certification for aircraft technicians. The organisation will be part of the AirBaltic training centre.

The Latvian airline is also planning to build a new aircraft hangar at Riga Airport by the end of 2023. The airline's maintenance training organisation will be divided in two categories, providing basic training for professionals without previous aviation experience and aircraft type-related training focusing on the Airbus A220.

Eighteen not-so-bold MRO predictions for 2021

After how 2020 turned out, who would dare predict what 2021 might hold in store for the MRO industry? Step up Alton Aviation Consultancy's managing director **Jonathan Berger**

As the commercial aviation industry begins to transition from survival to recovery mode – with Covid-19 vaccinations providing the glimmer of light and hope at the end of the tunnel that the world has patiently been waiting for – 2021 presents the opportunity to start anew, to be optimistic, complete with the anticipation of tailwinds and blue skies ahead. That said, I offer the following eighteen not-so-bold predictions for the coming year.

For airlines

1. Welcome to the “roaring ‘20s”. Beginning in the summer of 2021, once a majority of the travelling population have been vaccinated, expect passenger demand to recover stronger and faster than conventional wisdom may suggest.
2. The isolation and dislocation caused by the pandemic has pleasantly enabled thoughtful introspection and a re-prioritisation of what is truly important in life. Hence, the passenger sector with the greatest pent-up demand will be visiting friends and family, followed by vacations and leisure, with business travel as the laggard.
3. A new passenger segment called “vaccination tourism” will become a real thing – and will drive international travel with wealthy passengers from emerging markets flying to wealthy countries with excess vaccines.
4. The airport hassle factor will return. As corporate management are typically

much faster decision makers when it comes to employee reductions versus hiring, airlines and airports will struggle to ramp-up staffing fast enough to meet increased passenger demand. This will lead to the return of long wait times at airport check-in and security.

5. After a decade of stagnation for international alliance groups (SkyTeam, OneWorld, Star Alliance), in order to more cost-effectively maintain their global network footprint for their most valuable business travelling customers, airlines will double-down on their commitment to their respective international alliances.

6. There will be numerous additional airline bankruptcies and further consolidation before the year-end.

For OEMs

7. The end of the “roaring teens”. After a decade of historic growth, which included record backlogs, production rates and ever-increasing MRO market share, the era of maximising leverage with airlines and suppliers has come to an end – enter the great OEM humbling.

100%

Several major MRO suppliers will leverage technology to go 100 per cent paperless, predicts Jonathan Berger



8. OEMs will reassess their business model with a back-to-basics theme focused on their core competencies of engineering design and manufacturing.
9. Many recently announced OEM vertical and horizontal growth strategies will be unwound and/or sold-off.
10. OEM new part sales will continue to underperform even the most conservative forecasts as clever surplus parts traders and distributors thrive for the foreseeable future.
11. OEMs will begin to exit many of their airframe and component MRO investments (engine OEMs will continue to dominate the aftermarket).
12. The Airbus A220 (formerly Bombardier CSeries) will be a market winner and will garner several significant airline customer orders this year.
13. Boeing will announce the launch of a new, clean-sheet aircraft in order to (a) better compete with the A321XLR;



Clockwise from left: Engine OEMs will continue to dominate the aftermarket; but OEMs will begin to exit many of their airframe and component MRO investments; Jonathan Berger expects the MRO industry to play a leading role in recovery



2021 presents the opportunity to start anew, to be optimistic

(b) maintain a strong engineering design team; and, perhaps most importantly, (c) restore its confidence/mojo which has been shaken to its core by the 737 MAX debacle.

For MRO suppliers

14. As OEMs pursue their back-to-basics business model, and airlines further accept the value of having maintenance as an outsourced variable cost, at long last independent MRO suppliers will be viewed and respected as critical strategic partners by their airline customers.
15. Given the inevitable growth of the surplus parts market, the highly fragmented parts trading, distribution and on-line B2B platform markets will

see consolidation and increased private equity merger and acquisition interest.
16. At least one major airline will monetise its airline-affiliated MRO and will sell a minority stake to an external investor.

17. Several major MRO suppliers will leverage technology to go 100 per cent paperless, causing a domino effect as airlines begin to require MRO suppliers to integrate paperless technology.

As I enter my third decade in the MRO industry, I believe I can comfortably speak for most colleagues when I say “good riddance” to 2020 and welcome 2021. While no one can know for sure how quickly the global economy will recover, we do know commercial aviation and the MRO industry will play a critical role in the transportation and dissemination of the vaccine. And as I’ve written about in the past, MRO is a team sport. 2021 presents us with a unique opportunity to once again demonstrate that when airlines, OEMs and MRO suppliers work together – with a common mission and sense of purpose – everyone wins.

Accordingly, my eighteenth and final prediction for this year is that our MRO industry will successfully play a leading role in expediting the global economic and aviation industry recovery. **M**

For more information, please visit
altonaviation.com

Power in PLANNING

How can airlines effectively forecast their 2021 MRO needs with reduced budgets and resource?
Aerogility's civil aviation business manager
Phil Cole might have the answer

The 2021 outlook for MRO has changed dramatically since predictions were made last year, or even six months ago.

Today, MROs and airlines are having to operate with reduced team sizes due to forced redundancies and social distancing measures, while facing cuts to MRO budgets and spend for the foreseeable future. If this is the case, how can MRO planners reduce their fleet downtime and improve efficiency when forecasting maintenance needs alongside these restraints?

Plans now need to be even more adaptable to changing circumstances, yet less time and resource is available to prepare forecasts.

This is where technology comes in. There has been much discussion across the aviation industry about the 'digital transformation' taking place during the downtime experienced in recent months. Maintenance planning is no different. One technology that is now coming into its own and seeing more adoption in the face of such uncertainty is model-based AI.

What is model-based AI?

This type of AI involves software models utilising 'intelligent agent' technology. In an aviation setting, the agents represent assets, processes and decision-makers in a holistic model of an airline operation. The model realistically simulates a fleet

of aircraft accruing life, and forecasts the whole commercial lifecycle for each aircraft, including the maintenance and engineering operation.

The benefit of model-based AI is that the simulation process is more transparent and the outputs are completely explicable compared to some data-driven AI. The simulation considers multiple factors; optimising when a scheduled maintenance or inspection should be carried out, introducing modification or upgrade programmes and optimising scheduled maintenance on key subsystems, such as landing gear and engines.

The unprecedented events of 2020 led to cancelled flights and the grounding of aircraft, border closures and restrictions, and significantly reduced capacity demand. These issues are likely to remain during the majority, if not all, of 2021.

In addition, re-entry into service for currently grounded fleets will mean more pressure on MROs, re-prioritisation of servicing and additional cost considerations this year. The use of an intelligent agent model, such as Aerogility, enables planners to quickly adjust operational constraints to assess the impact of these changes and ensure they always have the best possible plan in place.



Illustration: **Phil Couzens**

Clockwise from left: Short-term reactive MRO planning is here to stay; new technology can improve the effectiveness of maintenance planning; Phil Cole says model-based AI is coming into its own in today's uncertain world



and juggle reduced resources. Not only does this technology save huge amounts of time on re-entering data and manually playing out a variety of different scenarios on a spreadsheet, it also allows airlines to make quick and qualified decisions based on new information or government announcements, something that is crucial to the survival of many carriers.

With government restrictions, travel behaviours and capacity levels expected to continuously adjust in 2021, short-term reactive MRO planning is here to stay and, in turn, changing the way airlines have traditionally forecast maintenance needs.

Technologies such as model-based AI that allow scenarios to be immediately played out and strategies decided upon and adapted promptly will put airlines in the best position possible when it comes to adjusting to flight schedules over the coming months, and being prepared for a return to travel. **M**

Phil Cole is the civil aviation business manager at Aerogility. For more information, visit aerogility.com

Utilising technology

So how will technology improve the effectiveness of maintenance planning amid so many unknowns? The past year has been a learning curve in terms of being able to predict and adapt to changing fleet needs. Quick decisions needed to be made following almost daily industry announcements and long-term plans evaluated in accordance with the new circumstances.

During this time, model-based AI has become relied upon as an effective solution to planning cost-effective maintenance schedules, maintain efficiency

Model-based AI has become relied upon as an effective solution

The best of times, the worst of times

Even in the strangest of circumstances, there remain reasons for hope and opportunities for positive action and collaboration, according to Davies Turner Air Cargo director and Aviation Logistics Network co-founder **Ralph Perkins**

"It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of light, it was the season of darkness, it was the spring of hope, it was the winter of despair."

CHARLES DICKENS
A Tale of Two Cities

A lot has changed since 1859 when Dickens penned the above words, and yet 162 years on, his statement could have been written to describe the situation the aviation community finds itself in now in a world dominated by Covid-19, political unrest and financial instability.

But out of something bad ultimately something good has to emerge. Part of that process is the renewed realisation that worldwide trade, movement of goods and people has to continue and the global aviation community plays a critical role in the fabric of keeping nations interconnected and supplied with critical and life-saving products and services. We need aircraft to do that and they need to be safe. And to keep them safe we need the MRO sector more than ever; that can and never will change.

I could defer to reams of facts and figures from varying industry sources.

It is not my intention to inflict that on you. Simply put, everyone involved in the MRO and engineering sector is well aware of how challenging life has become and the pain associated with job losses is acute for many. There are some encouraging signs that, whilst things are still "difficult", through a compelling mixture of innovation and determined focus on cost optimisation, planning and increased understanding between MROs and those involved within the supply chain, many organisations continue to offer services, and will in the longer term emerge leaner, fitter and better able to compete.

The provision of the supply and transportation of AOG and critical parts in support of MRO has been a challenge which has been to a large extent met by the global supply chains of the MRO organisations supported by logistics organisations such as my own. Can it be flown? Can we re-route it or tranship it? Can we truck it? Can we do



an onboard courier? Can we charter? How about custom clearance post-Brexit (for the UK)?

These and many other such logistical questions are typical of the challenges faced for AOG/critical service providers on an almost daily basis which are heightened by a background of flight restructuring and reduced capacity. An inevitable result of such "trial by fire" is that the inherent value in close working relationships between the MRO community and the logistics supply chain on which it depends has become even more crucial and importantly valued. This can only lead to a genuine awareness and reawakening of the trust between all participants in the supply chain and the benefits of collaborative working.

380

An Aviation Logistics Network partner in Ireland recently opened a new storage and transit station for the movement of aircraft engines – another facility in a global network of 380 locations



Clockwise from left:
A Trent 700 Engine delivered to an MRO customer recently; ALN is moving many more engines; Ralph Perkins offers hope for better collaboration between the MRO sector and the logistics supply chain



We need the MRO sector more than ever; that never will change

We have all seen how Microsoft Teams, Zoom and other internet-based technologies have become part of the daily routine of communication. In a post-Covid world, no doubt the natural human need for personal contact will mean that those who have got to know each other well through tough times will have added confidence and trust in each other when we all get back to “normal”.

Meanwhile, many companies such as my own have taken the opportunity to look at what the future demand cycle

from the MRO sector might be for transportation networks. The conclusion in my case has been to look at continuing to improve infrastructure and the introduction of new services.

As an example, our service partner in Ireland has recently opened a new state-of-the-art storage and transit station for the movement of aircraft engines in addition to our facilities worldwide in over 380 locations. We are also looking at drone technology geared to heavier weight shipments, and our green credentials, which this year saw our UK facility approved to ISO 14001.

The process of continuing to improve what we do and how we do it never stops. Delivering that message in a way that adds value to our clients, suppliers and partners will continue to be at the cornerstone of everything we do. Stay safe and here is to better times ahead. 📍

Ralph Perkins FRAeS is director at Davies Turner Air Cargo and co-founder of Aviation Logistics Network, an independent association of international logistics service providers. See 📍 daviesturner.com or 📍 aln.aero

Covid-19 loan relief

With time running out for Covid-impacted US MROs to apply for a government-supported forgivable loan, Washington Aviation Group president **Jason Dickstein** gives the lowdown on the second Payroll Protection Program

If you are running a US MRO that has been adversely affected by Covid-19 (and who hasn't?), then you may be able to apply for a forgivable loan that is supported by the US government.

Most US businesspeople are familiar with the 'Payroll Protection Program', or PPP. On 27 December 2020, the US government authorised a second draw Payroll Protection Program (PPP2). Time is running out to apply for this program, as it expires on 31 March 2021.

Some things will remain the same with this second iteration of the PPP. The maximum amount of the loan will be equal to two-and-a-half months of payroll (for PPP2, this can be based on either 2019 payroll or on the one-year period prior to the loan).

For a lot of businesses, the most important element of this loan is that if you spend the loan on certain authorised expenses during the covered period, like payroll, rent and utilities, then the loan can be forgiven. This means that you do not have to repay the loan, so it becomes like a grant (but with some key differences).

The new law expands the scope of allowable expenditures for PPP2 to also include: (i) certain operations expenditures, such as software that is necessary to facilitate business operation; (ii) uninsured property damage caused



The manner in which you must show “adverse effect” is by comparing your 2020 quarterly gross receipts with those of the corollary 2019 quarter

JASON DICKSTEIN

by vandalism or looting; (iii) payments to suppliers providing essential goods; and (iv) certain worker protection expenses. This expanded scope makes it even more useful to businesses that are struggling during the Covid-19 pandemic.

There will be some key differences in the second PPP. The most important of these is that the second draw PPP will be limited to businesses that can show an adverse effect from Covid-19. Most MROs supporting commercial aviation have been affected by Covid-19.

The manner in which you must show “adverse effect” is by comparing your 2020 quarterly gross receipts with those of the corollary 2019 quarter. If you can demonstrate that your 2020 quarterly gross receipts dropped by 25 per cent or more as compared to the corollary 2019 gross receipts for the same quarter, then you meet this prong of the eligibility test.

We recommend that you simply arrange your 2019 and 2020 gross receipts in a table like the one to the right to assess eligibility.

Other minor changes include a tighter focus on smaller businesses: second draw PPP eligibility will be limited to businesses with fewer than 300 employees.

The first round of PPP had a limit of 500 employees. The maximum loan for the second draw PPP will be limited to US\$2,000,000 which is substantially lower than the first draw limits.

Left and below : US MROs can apply for the second draw of the Payroll Protection Program by 31 March

20%

If your business enjoys 20 per cent or more ownership by a Chinese entity then your business is excluded from the second draw PPP

The new law also clarifies certain payroll costs. It establishes that group life, disability, vision or dental insurance are included as part of payroll costs.

The new law also includes an important clarification about tax ramifications of loan forgiveness. Normally, under US tax law, loan forgiveness is considered to be taxable income. PPP2 loan forgiveness is different. PPP and PPP2 loan forgiveness is not taxed as income; and you can still treat the expenses as normal deductible expenses. This was an issue that was disputed by the IRS, so Congress clarified the tax treatment of PPP and PPP2

loan forgiveness in a way that is quite favourable for taxpayers.

One limitation that may affect some MROs – especially those whose business may include Chinese ownership or management – is a set of PPP2 limits related to China:

- (i) If your business enjoys 20 per cent or more ownership by a Chinese entity then your business is excluded from the second draw PPP;
- (ii) If your business enjoys 20 per cent or more ownership by an entity that has significant operations in China (including Hong Kong) then your business is excluded from the second draw PPP [“significant operations in China” is undefined and likely will be defined in the upcoming regulations]; or,
- (iii) If your business’ board of directors includes a resident of China then your business is excluded from the second draw PPP.

The deadline for second draw PPP application is 31 March. 📅

Visit 🌐 [sba.gov](https://www.sba.gov) for more information from the SBA on PPP2 loans, including a document on how to calculate your maximum loan and a model application form

	2019	2020	Subtract the 2020 quarterly gross receipts from the 2019 quarterly gross receipts and divide by the 2019 quarterly gross receipts. If the resulting number is greater than or equal to 25 per cent (0.25) then you may be eligible for a second draw PPP loan
1st Qtr	Q1 gross receipts	Q1 gross receipts	$(2019Q1 - 2020Q1) / 2019Q1$
2nd Qtr	Q2 gross receipts	Q2 gross receipts	$(2019Q2 - 2020Q2) / 2019Q2$
3rd Qtr	Q3 gross receipts	Q3 gross receipts	$(2019Q3 - 2020Q3) / 2019Q3$
4th Qtr	Q4 gross receipts	Q4 gross receipts	$(2019Q4 - 2020Q4) / 2019Q4$

Reach for *the* Skyways

The impact of Covid-19 has proven Skyways Technics to be the opposite of one of James Bond's Martinis – stirred but not shaken. That's according to CEO Benjamin Nielsen, who spoke to *Melissa Moody*

It would be an understatement to say that the aviation industry has faced unprecedented challenges in the last year. Despite there being a light at the end of the tunnel in the shape of Covid-19 vaccines, those challenges haven't gone away yet, as Skyways Technics has found.

What started as a continuation of the maintenance and spare part activities of the Cimber Sterling Group, Skyways Technics quickly bloomed into a trusted MRO provider specialising in regional aviation and ATR aircraft.

"We honour our past, while still believing in the future of regional aviation, in which our extensive experience and know-how makes a real difference in our support and offerings to customers," says Skyway Technics' CEO Benjamin Nielsen. "We strive to deliver whatever is needed on time and at the highest quality, whether it is a spare part report, overhaul, sale and lease or a complete aircraft base maintenance check."

The company has grown from being a European-based MRO in Denmark to opening workshops, warehouses and sales offices in Kuala Lumpur, Dubai and Miami with a main focus on supporting regional operators, aircraft owners and lessors.

Offering all types of maintenance – whether base, line, modifications, upgrades or conversions – Skyways



**The last 12 months
have taught us a lot.
Our motivation is higher,
our appetite stronger
and our mindset more
determined than ever**

BENJAMIN NIELSEN

makes it clear that its aim is to become a "one-stop-shop" for airlines with regional and ATR aircraft. It is also working on developing and growing a range of repair and overhaul capabilities on flight controls, composites and structural parts, among others.

Nielsen notes: "Our long and wide ATR experience dating back to 1986, combined with our desire to expand and strengthen our professional approach and offerings, has resulted in close co-operation with the manufacturer ATR, other select OEMs and top-quality component MROs."

An uphill climb

As with other MRO businesses globally though, the effects of the Covid-19 pandemic have hit over the past year, and Skyways Technics has faced an uphill climb.

Nielsen says that the biggest change the company, and the industry in general, has faced has been the steep drop in demand.

In April and May 2020, in response to the global grounding of aircraft, Skyways took the decision to react "swiftly and firmly", he explains. "We qualified for some help schemes from the Danish state relative to our activities in Denmark, but these did not at all cover our full expenses if we just continued with the pre-Covid set up as-is, and there was, and still is, a high uncertainty as to the future situation."



Left: Skyways Technics was established in 2012 as a continuation of the maintenance activities in the Cimber Sterling Group. **Below:** Recent investment in its Skyways Technics Asia subsidiary in Malaysia extended structural repair workshops and warehousing facilities

Skyways cut its workforce by 50 per cent in both Denmark and the United States, while all office and staff managers took a temporary voluntary reduction in salary. In Kuala Lumpur and Dubai, the company managed to keep its staff with a temporary salary reduction and unpaid leave. It also looked at reducing all fixed expenses accordingly, and re-evaluated variable costs, in addition to putting even more focus on its cashflow and “to the furthest extent possible” entered into repayment plans with customers for outstanding amounts.

The measures seemed to come at the right time as the company saw sales slow in almost all activities from April to September. From October 2020, sales started to gradually increase in both Asia and the Americas, while Europe continued to hover at a lower level, according to Nielsen.

“When you watch the news you get the feeling that the world is all the same in terms of the effects on travel, flights and the aviation industry,” he notes. “But with our presence in Asia, Middle East and Africa, Europe and the Americas, and our involvement with the regional aviation sector, we see that different levels of restrictions result in different levels of demand. Furthermore, we also feel that the difference in cultures plays a role in how fast aviation demand picks up once travel restrictions are lifted.”

“We honour our past, still believing in the future of regional aviation. Our know-how makes a real difference”

The variance in demand over the world has been unexpected, but not entirely unwelcome, by MRO providers. Extended lockdowns in Europe mean that it is one of the regions with the lowest demand, whereas Asia and the Americas are picking up the fastest.

“Looking back on the past year, relative to our status now in February 2021, we see lower demand in all markets we serve,” says Nielsen. “Europe especially seems to be very low, while in the last three to six months we have seen stabilisation and even some growth in Asia, Middle East and Africa, and the Americas.”

Global expansion

Evidence of demand driving the company’s future can be found at its Skyways Technics Asia subsidiary, with the extension of structural repair workshops and warehousing facilities in Kuala Lumpur, Malaysia.

Tripling the surface area of the workshops to 3,000m², Skyways Technics has been able to install additional shops for sheet metal and composite works.

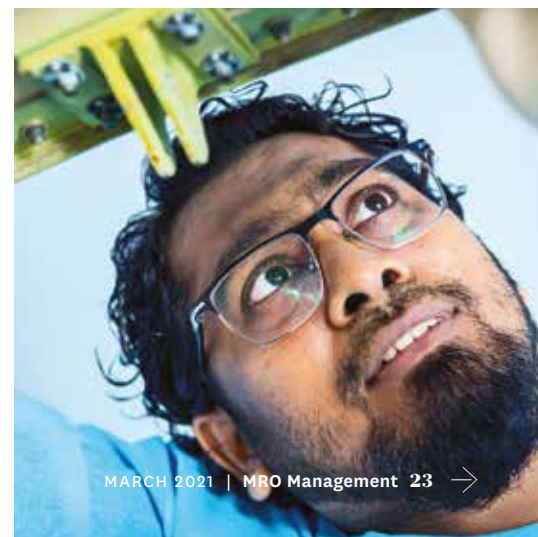
The warehouse has also doubled in size, increasing the space for both owned and consigned components and parts that are available for loan, exchange and sale.

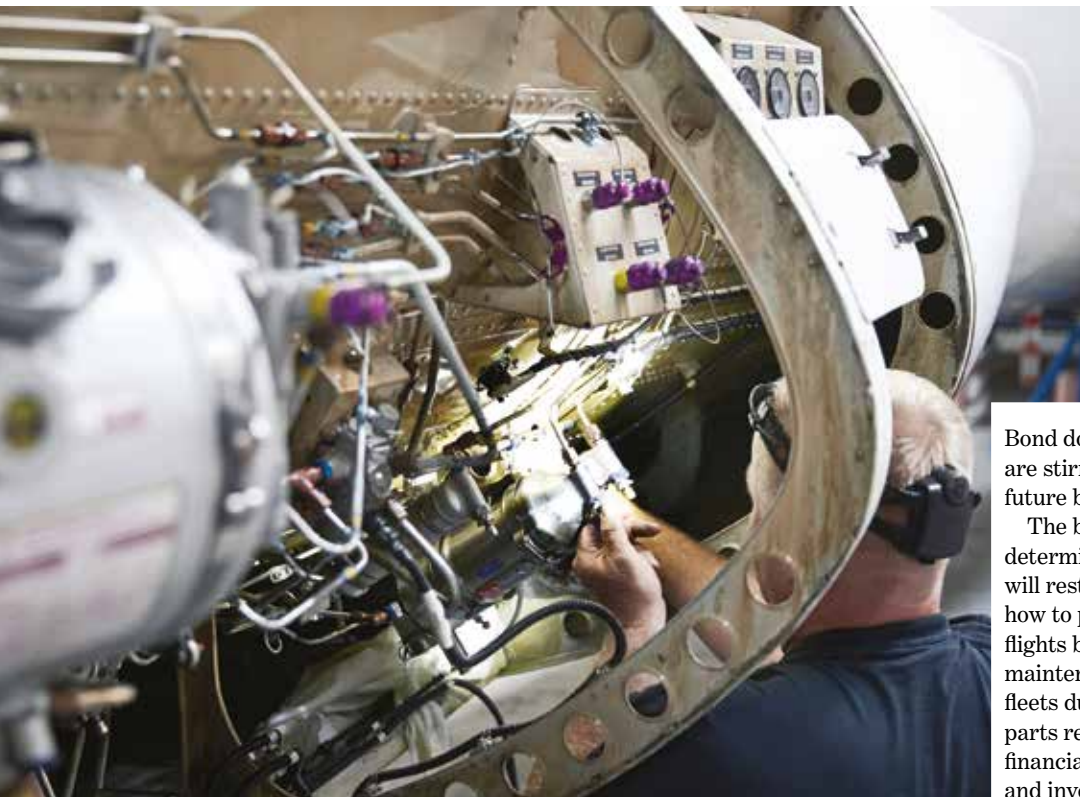
As a result, the provider is now able to complete structural repairs for all ATR interior, fuselage, wing, nacelle and door items with both EASA (European Union Aviation Safety Agency) and CAAM (Civil Aviation Authority of Malaysia) certifications, in addition to “more sensitive” components such as radomes, outboard and inboard flaps, and flight control surfaces such as ailerons, elevators and rudders.

“There was definitely a need for more capabilities to be established in Asia Pacific with a focus on regional aircraft support, which is the reason we invested in this area at this location,” Nielsen explains.

He reiterates that the strong relationship between operators and lessors throughout the Asia Pacific region was a significant factor, with the enhancements “greatly” welcomed throughout the region.

“We are determined to continue to grow our activities in Asia, and we feel we have just started,” Nielsen adds. “The plans for our expansion were already in place pre-Covid and as the pandemic challenged the budget targets we had set out on the individual parts we service, the decision to expand the capabilities to include a wider





Left: Skyways aims to be a “one-stop-shop” for airlines with regional and ATR aircraft
Below: Companies in the Middle East and Africa often use Skyways’ Malaysian facilities for the repair and overhaul of parts

Bond does not fancy his Martinis: we are stirred, but not shaken. Bring on the future because we are ready.”

The biggest challenge now, he says, is determining how and when the industry will restart. Airlines will have to decide how to put things in motion; by getting flights back in the air; ensuring that maintenance is performed on grounded fleets due for calendar-related checks and parts repair, and in getting people and financial entities to trust in aviation again and invest in the future of the industry.

One of the biggest considerations is the availability of resources, in terms of manpower, aircraft equipment, MRO facilities and maintenance slots. Nielsen believes that when things start to pick up again, it won’t be a

slow drip but instead a big boom for the industry. As a result, supply will struggle to meet demand.

“We do not think it is a question of whether the aviation industry will get back to a pre-Covid activity level; we are certain it will,” he explains. “We think the question is not if, but when. Twelve months ago, before the pandemic hit worldwide, there was already a lack of pilots, aircraft mechanics and long lead times for many new aircraft deliveries. Now imagine how that demand will be met in today’s situation with current supplies – that’s a challenge.”

No matter what the next few months bring, Skyways Technics says it is prepared. The company is keenly focused on the next steps and how to keep its business moving even in the most difficult of times. “Zooming out, flying high at 36,000 feet, the biggest challenge today might well be how to make a plan for what to do in six, 12, 36 months and beyond,” concludes Nielsen. “Needless to say, Skyways Technics is ready – challenge accepted.”

“We feel that the difference in cultures plays a role in how fast demand picks up once travel restrictions are lifted”

Next steps

Looking at the year ahead, Nielsen believes there are still challenges facing the industry which will have to be resolved before things start to pick up again. In the coming months, he expects that many airlines and aviation companies will remain in “survival mode”. “The last 12 months have taught us a lot as a company, and as individuals, about how much we love aviation, our industry, the freedom to travel, to meet, to see and to have fun interacting with people,” he says.

Although the company has had to make redundancies, in line with much of the rest of the industry, Nielsen makes it clear that he would like to see staff return when circumstances permit, particularly as Skyways Technics has plans to expand further in Asia, Europe, the Middle East and Africa.

“Our motivation is higher, our appetite stronger and our mindset more determined and focused than ever before,” he says. “If Skyways Technics was a drink, we would be exactly how James



range of parts made even more sense.”

The expansion also benefits the group’s Middle Eastern and African activities. “Customers within this region are just in-between Asia and Europe and often it makes a lot of sense for operators, aircraft owners, lessors and MROs in the Middle East and Africa to use our Malaysian facilities for the repair and overhaul of their parts.”

As part of the expectations for Middle East and Africa use, Skyways Technics has established a logistics network between the region and Europe and Asia, in order to ship between the regions without delay, what Nielsen says offers a further benefit to customers.

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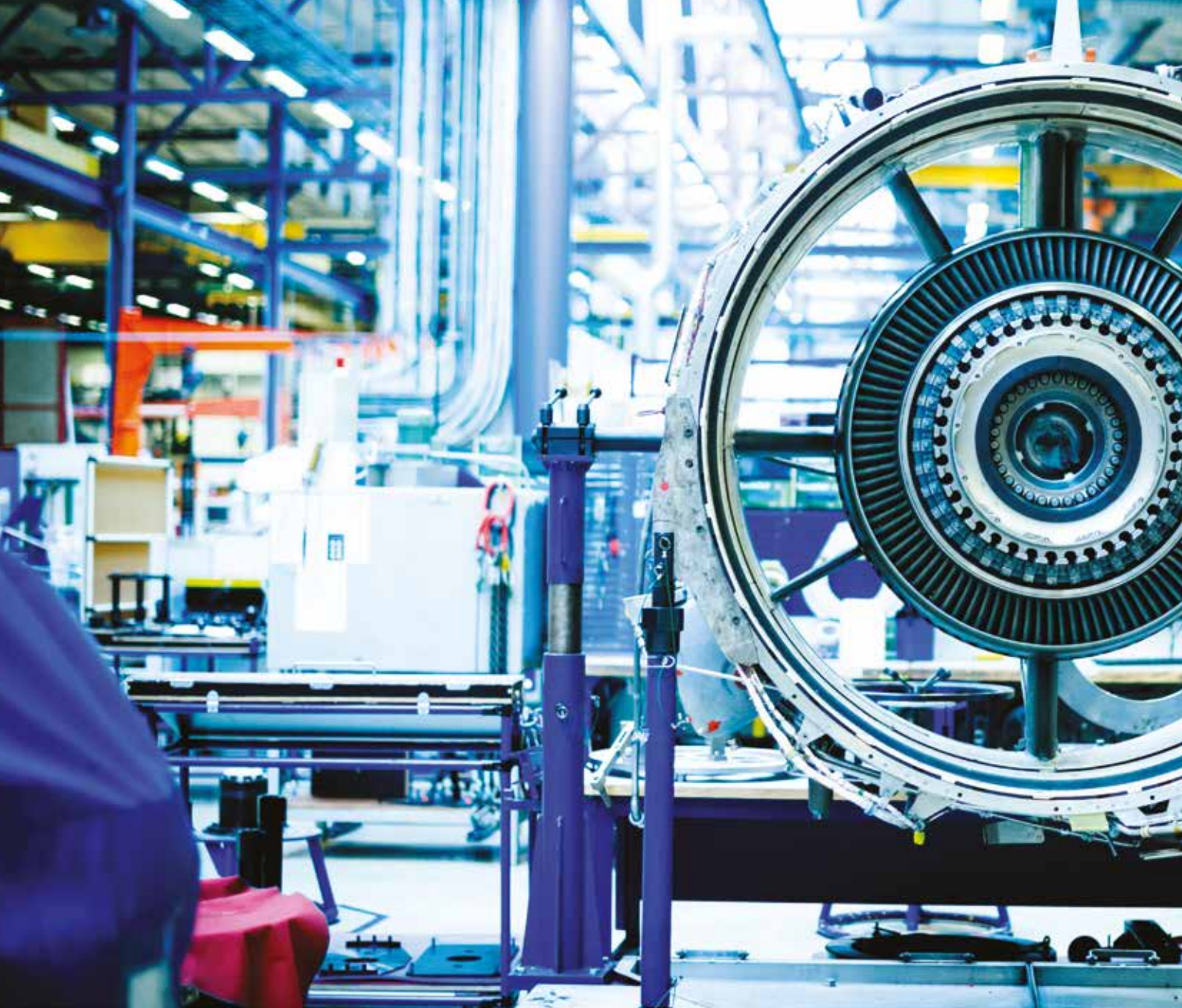
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HOLDING THE LINE

The only certainty of the Covid-19 crisis has been change. **Jason Holland** discovers how MRO companies have adapted their line maintenance activities and ponders what the future might hold as aircraft begin to return to service

25%

An SIA Engineering lean pilot project on 787 A checks has improved turnaround time by 25 per cent

Left: Aero Norway added three 'hospital' repair bays during the pandemic as it adapted to a new mix of heavier and lighter checks
Below: Aero Norway CEO Glenford Marston

It has not been easy for MRO operations to adapt but, according to the proverb, 'when the going gets tough, the tough get going'. There have indeed been many examples of this in the MRO space. However, with the sheer size of some companies, combined with the scale of the restrictions imposed as a result of the pandemic, some difficult actions such as layoffs have had to be taken and activities, plans and strategies have been disrupted.

So how have MRO companies fared during the Covid-19 crisis? What has the impact been on line maintenance especially? Will there be a surge in required maintenance work with aircraft returning to service as restrictions around the world ease? And are MROs still in a position to manage this demand?

Coping in crisis

When Aero Norway CEO Glenford Marston returned home on a flight at the end of February 2020 – when it was largely talk of the coronavirus that was circling the globe and the World Health Organization had yet to declare a pandemic – he realised he was experiencing discomfort at the travel process. "Thoughts of Covid-19 were in the back of my head," he admits. "Nobody checked me when I came into Norway, or asked me where I had come from. So on the Monday morning I came back to work and said 'Guys, we've got to start thinking about what we are going to do here'."

The company immediately restricted visitor entry to its facility in Stavanger and set up Covid-19 protocols. That set the tone for a series of early actions that Marston believes has positioned Aero Norway to cope with the pandemic. The CFM56 engine specialist (covering the -3, -5B and -7B) saw "a lot of commitments getting tentative in April and then

falling over", but in response added three 'hospital' repair bays during the pandemic to the four it already had, enabling it to perform a greater amount of smaller repair work.

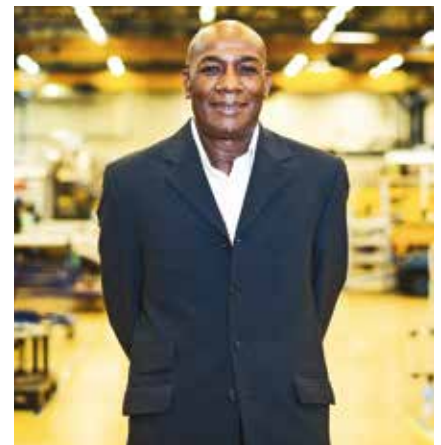
"Initially, we had a fairly healthy backlog, so we were managing okay," he says. "But soon we were roughly 40 people overmanned compared to the number of engines coming in, so we needed to make savings. We wanted to keep all our people so we tabled an unorthodox proposal to the board.

"Every employee took a 20 per cent pay cut, from myself down to the cleaner. All the managers would still work five days a week, as would the commercial department, but would only be paid for four. Mechanics and technicians had a day off per week. That's still running today but we're hoping the market's going to pick up – and there are some positive green shoots – so we'll go back to 100 per cent work from March."

The smaller repairs have kept the company going. "From 8-9 engines per month we went down to 5-6; out of these, four were smaller repairs and only two would have been core performance

Wherever you would usually look up and watch aircraft on their journeys across the sky, it has probably become an increasingly rare sight for nearly a year now as the Covid-19 pandemic has taken hold. There has also been a resultant impact wherever you would have normally seen MRO operations taking place.

With freighters and some passenger aircraft (whether carrying actual passengers or having been converted to carry cargo) still operating, MRO work has carried on, but a shift to line and smaller repair work has taken place as heavier checks have been postponed wherever possible.



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restoration. It's not the US\$5 million shop visit, it's less than US\$1 million in most cases." But the work done now could put Aero Norway in a good position in the future, as many customers who had not used its services before have done so during the pandemic and might return once heavier maintenance work is needed.

While Marston believes Aero Norway's size meant it could take this flexible approach, other MRO companies have had to adapt their line maintenance operations depending on their own set of circumstances.

For one of the industry's powerhouses, Lufthansa Technik, the lack of aircraft movements has meant a sharp decline in its line maintenance business. "Due to the high level of uncertainty in the MRO market, our customers are increasingly turning to parking and storage service offerings," says Andreas Drosdowski, head of Maintenance Europe and CEO of Lufthansa Technik Maintenance International. "As a result, the employment of our staff can only take place on a reduced scale."

Another of the industry's larger players, Singapore's SIA Engineering Company, focused on remaining nimble. "While the volume of flights handled has reduced, we redeployed our staff to other work activities where there is still demand such as aircraft disinfection and preservation maintenance," a spokesperson explains. "For aircraft in parking or storage condition, dedicated teams are assigned to carry out preservation checks as well as to ensure that all pitot probes, engines and air inlets/exhaust are properly covered and protected."

The Covid-19 crisis has had both positive and negative impacts on MRO operations, according to USA-based StandardAero's Glenn Hawley. "On the plus side, we have been kept busy



Our personnel globally put their best effort forward and showed great flexibility to support our customers

JACCO KLERK
MAGNETIC MRO DIRECT
MAINTENANCE GROUP CEO

with supporting operators' requests for aircraft storage preparations, in terms of engine preservation, and more recently a growing number of requests for return to service support," says Hawley, who is director – service center network, StandardAero Airlines & Fleets. "On the negative side, our ability to support customers' line maintenance requests has on occasion been hamstrung by Covid-related travel regulations, both with regards to post-visit quarantines and even with regards to national travel restrictions in some areas."

SAMCO Aircraft Maintenance, an independent MRO based in The Netherlands, saw a reduction in activities

but, as many aircraft were placed in short-term storage at line stations, the company continued to man its stations in the different regions of the world. "This was quite a challenge due to the travel restrictions and lockdown in some countries which lasted for a prolonged period of time," reports CEO Constant van Schaik.

"Our staff have been coping well and have shown a commitment to pull all of us through this period. During the second half of 2020 and into 2021 we have seen a modest increase in activities, but this was dependent upon certain regions in different continents where road or train transportation are not real options and airlines continued operations but at a reduced rate. Besides this we have seen a number of aircraft being returned to the lessors to immediately reduce operational costs for the airlines, which reduced the demand."

In Estonia, the story of disruption to plans and operations is no different to anywhere else. Magnetic MRO attempted to change the challenges into a new set of opportunities to revamp and improve its processes and future development strategy. "We have strongly driven increased co-operation between direct maintenance and Magnetic MRO's line maintenance operation, providing an expanded suite of tailored support to serve our customer base and welcome new customers," says the company's Direct Maintenance Group CEO Jacco Klerk.

"We see in parallel how our personnel globally put their best effort forward and showed great flexibility to support our customers across our stations. Examples of how our teams during the pandemic have gone above and beyond range from a bumpy 2,400km drive across African countries to release an aircraft, to providing aircraft storage in extreme winter conditions, to assembling a mobile repair team for severe lightning strike structure repairs."

Returning to normal?

With the global roll-out of vaccines providing a light at the end of a long tunnel, aircraft that have been parked or stored will begin to return to service so MRO work will be required. According to SIA Engineering, aircraft will undergo de-preservation checks before returning to regular service, after which line maintenance activities such as flight handling, cabin services and A checks will increase with the recovery in flight

LINE MAINTENANCE

volume. “As airlines increase their aircraft utilisation, so will the heavier checks and overhaul requirements evolve in tandem,” the spokesperson states.

StandardAero’s Hawley thinks the most obvious demand for line maintenance will be in “assisting with returning engines from preservation and undertaking precautionary borescope inspections”. He says: “There have already been a number of incidents reported internationally relating to aircraft which have been returned to service, and many operators are therefore being especially careful to ensure that these activities are undertaken with scrutiny.

“As the industry recovers we do also anticipate a wave of heavy engine maintenance events, since some

40%

At least 40 per cent of the assets that are parked or stored in Magnetic MRO’s Tallinn hub are awaiting scheduled maintenance slots from May 2021

operators have been operating in a ‘cash conservation’ mode for the past year, avoiding capital outlays such as engine overhaul events and instead utilising spare engine assets whenever possible. While some older aircraft and engines may eventually be parted out, we do anticipate a significant volume of deferred maintenance events once passenger numbers begin to return to normal.”

Lufthansa Technik’s Drosdowski



StandardAero hopes for a near complete return to 2019 levels of mobile repair activities by end 2022

believes his company is prepared for a possible surge in work, but says that significantly more vaccinations will be needed before it can occur, while there must also be no restrictions or quarantine obligations slowing down travel. “The whole industry, especially in Europe, continues to suffer massively from the pandemic. We don’t know when the vaccines will be distributed to the necessary extent and take effect so that we can talk about something like normality in travel again. From summer onwards, a significant recovery may be possible and with it the demand for line maintenance services.”

The most important factor in transitioning from limited to significant demand is a high degree of flexibility, he notes. “In addition, close networking with flight operations is required in order to be able to react to unexpected route changes. At the same time, it is important to support airlines in optimising their business within the framework of suitable maintenance concepts. Our digital maintenance services support our customers in ensuring aircraft availability and flight schedule stability. And from the point of view of a successful MRO service provider, this is the central issue that ultimately moves us all – stability.”

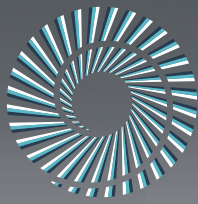
SAMCO’s van Schaik sees several operators restructuring the composition and size of their fleet as they prepare for the future. “This means that the ‘surplus’ aircraft are being returned to the lessors and often placed into extended storage programmes at our base maintenance facilities whereby we provide the CAMO services,” he says. “The remaining aircraft often remain ‘in service’ at a reduced utilisation rather than being placed in storage. We immediately adjust staffing levels up or down following the demand which helps our customers to reduce cost at times when there is less flying.”

Magnetic MRO says it is already preparing for its customers’ aircraft to return to service, starting in mid-March. “Customers’ wishes are well analysed and reviewed together with planning and logistics teams to arrange all necessary materials and consumables,” says the company’s heavy line maintenance unit head Kaspars Podins. “It’s the same for components – with on-time necessary shop visits either with the Tallinn-based workshop or Magnetic Group’s range of partners. At least 40 per cent of the customer assets that are parked or stored in our Tallinn hub are awaiting scheduled maintenance slots in May 2021 and onwards in summer. Those will undergo heavier check and cabin reconfigurations and livery change to meet high-quality service.”

For Podins, the main factors to consider as work ramps up are response times to requests, meeting set deadlines and turnaround times with customers, as well as quality of service, the accuracy of the final paperwork and delivery to the customer or CAMO department. “The pandemic raises many unique challenges and innovative approaches are needed to find suitable solutions for both customer and MRO provider,” he says.



SAMCO says its geographical spread enables it to support customers at short notice



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Adapt to survive

The outlook for line maintenance – and for heavier work – remains uncertain in 2021 and beyond. “In line with most industry forecasts, we are hopeful of an uptick in activity in the second half of 2021, as passenger confidence returns with the widespread introduction of vaccines,” comments StandardAero’s Hawley. “Many surveys have identified a strong pent-up desire for travel, though the recent emergence of new coronavirus variants does add some concern regarding the outlook. Given the relative strength of domestic markets and regional aviation, which are our main focus, we would be hoping for a near complete return to 2019 levels of mobile repair activities by the end of 2022, barring any new pandemic.”

The second half of 2021 is also the target for SAMCO, according to van Schaik. “We are committed to supporting our customers and locating to stations anywhere in the world,” he affirms. “Our geographical spread enables us to be agile and support at often short notice.”

SIA Engineering points to forecasts by industry analysts that full recovery to pre-pandemic levels is not expected

till 2024. To boost competitiveness in the post-Covid-19 MRO landscape, the company is investing in digitalisation and automation, with the aim of bringing about greater efficiencies in operations and adding more value for customers.

A recently launched digitalisation initiative has provided line maintenance engineers with immediate access to information and decision support, while a lean pilot project on Boeing 787 A checks has improved the turnaround time for the check by 25 per cent, the company notes.

In another example, SIA Engineering is investing in the development of an engine lifter which is expected to reduce required manpower and turnaround time for changing the engines of widebody aircraft by 50 per cent. “At the same time, we are focusing on proliferating lean process improvements across the company, upskilling our staff to broaden their expertise, and developing a culture of continuous improvement,” the spokesperson states.

Change is certainly in the air – or more literally on the ground – at many MRO companies. While providing “flexible solutions” for the time being across its stations, Magnetic MRO’s

Klerk foresees a shift taking place within line maintenance in the wake of the pandemic. “Airlines will seek more independent line maintenance network service providers for innovative and reliable services to maximise aircraft utilisation and seek new adaptive solutions to minimise ground time,” he explains. “In response, we will integrate Magnetic MRO’s line maintenance unit within the direct maintenance operation to expand to 20+ stations across 10 countries in Europe and Africa.”

At Aero Norway, some change was already planned as the company has been preparing repair capabilities for CFM’s LEAP engine, although the timetable has been pushed back due to Covid-19.

Reflecting on lessons learnt over the past year, Marston’s thoughts will echo those of many in the MRO community. “You need to be agile and stay flexible. You need to have a strong relationship with customers in the bad times when they are struggling,” he says. “We had to think of our own survival too, of course, but we always want to support our customers. Although we had all these things in mind already, the pandemic has shown us how much more they are all required.” 



MRO *to* *the* MAX

The 21-month grounding of Boeing 737 MAX in-service jets has necessarily impacted the air transport industry, but will it affect the commercial aviation MRO business in years to come? *Chris Kjelgaard* investigates

Left: Opinion is divided as to the extent of the impact of the 737 MAX grounding on future MRO capacity

pandemic has had on the commercial aviation sector globally.

Two schools of thought exist on the extent of the effect the 737 MAX grounding will have directly on future MRO capacity for the type, and also for future MRO capacity generally. One view, argued compellingly by Phil Seymour, CEO of aviation technical consulting firm IBA Group, holds that deferrals of calendar-dependent MRO items granted to operators of previously in-service 737 MAXs by the FAA and EASA during the grounding will mean “a lot of catching-up of deferred items” in the next few years.

At the same time, deliveries over the next two to three years of the 400-plus new 737 MAXs rolled out by Boeing during the grounding but immediately stored, as well as additional new-production 737 MAXs now being built as the assembly lines get back under way after Boeing stopped production, will

(ATS), which is headquartered in Paine Field, Everett, USA and a major provider of airframe MRO for a variety of Boeing 737NG and 737 MAX customers, argues equally compellingly for a second school of thought which holds that the grounding “may not be as much of an issue as some think” for future 737 MAX MRO capacity.

First, Dolan notes, some, if not many, of the 737 MAXs in service before the general grounding were already established on maintenance-flow schedules and already had received some of their required calendar-determined work by the time the grounding began.

Additionally, in some or many cases during the grounding, “airlines managed to get worksopes done” on the calendar-determined maintenance items their 737 MAXs required, says Dolan. ATS has been assisting its 737 MAX MRO customers and Boeing with the remedial work required to get stored aircraft back

into service and any need to complete maintenance items deferred during the grounding is “not necessarily what we’re seeing”. Most 737 MAXs previously in service will return to service fairly quickly,

probably this year.

Dolan agrees with Seymour that it will take two to three years for the market to absorb the new 737 MAXs that Boeing rolled out during the grounding but didn’t deliver. However, he thinks there are several reasons why deliveries of those aircraft, on the heels of re-deliveries of the 737 MAXs previously in service, won’t lead to a bunching of calendar-dependent MRO tasks – and the consequent possibility of 737 MAX MRO under-capacity developing – in six years’ time.

According to Dolan, deliveries of the 400-plus new aircraft rolled out during the grounding will be “phased in” with deliveries of the newly assembled 737 MAXs which will soon be coming off Boeing’s re-activated assembly lines, creating “almost a normal delivery schedule”. This is because, in many cases, Boeing won’t be able to deliver the new aircraft it rolled out during the grounding as soon as it would otherwise like for the health of its cash-flow.

While the pandemic reduced aviation’s manpower demand in the short term, in the longer term it will return

see hundreds more aircraft beginning their maintenance-flow schedules. While the maintenance burden on these new aircraft should be light during their first several years of operation – very largely they will just require overnight line maintenance – nevertheless the clock starts ticking on each aircraft’s calendar-determined maintenance requirements as soon as it is delivered, Seymour notes.

“So now a wave of time-expired checks [on previously delivered 737 MAXs] needs to be done, and it accelerates the next wave of checks as well for the structural-inspection programme and the corrosion-prevention programme,” which begin at year six, he says. So bunching of 737 MAX MRO checks is likely to happen in a few years, potentially causing an MRO capacity shortage for the 737 MAX – particularly in areas such as the Indian sub-continent, where not enough capacity exists today, says Seymour.

However, Paul Dolan, president and COO of Aviation Technical Services

Some 380 Boeing 737 MAX aircraft delivered before the type’s March 2019 grounding are gradually re-entering service, while 400-plus new-build MAX planes built during the grounding but not yet delivered are finding operational homes – whether with their original customers or with different ones. As they do, industry opinion varies as to whether 737 MAX MRO will be affected in the future.

Just as important is the closely related question of whether the 737 MAX grounding will affect the MRO industry more generally in future years – particularly when its effects on the air transport business are considered in tandem with the effects the Covid-19

In some cases, customers have deferred delivery until later dates as a result of the devastating effects of the Covid-19 pandemic on the air transport industry globally. In other cases, customers either cancelled their orders during the grounding – taking advantage of clauses which allowed penalty-free cancellation if Boeing delayed delivery more than a year – or went bust, and Boeing now has to find new customers for those 737 MAXs. Boeing (or its lessor customers) will need to negotiate new purchase or lease deals on the aircraft and their new operators will need in turn to negotiate support agreements for the jets with MRO facilities, ground-handling companies and other vendors.

Additionally, Dolan says, many re-homed 737 MAXs will need to be

Right and below: It is estimated that it will take two to three years for the market to absorb the new 737 MAXs that Boeing rolled out during the grounding but didn't deliver

manufacturer, the engine OEM and the airlines. The process involves very focused training and information sharing, which has successfully happened during the preparation phase," says Alan Kelly, general manager of CFM Services, the global repair network for the LEAP engine.

"Today, the mission-based, cross-company teams are out making it happen, and they are doing an amazing job. The overall efforts of the fleet preservation process began immediately once the aircraft were taken offline. It's a

detailed process that requires a rigorous check-list approach and testing, all tightly planned with a proactive forward look towards re-entry into service."

In the longer term, Kelly says CFM does not anticipate a bottleneck or bunching problem on shop visits, "primarily because our strategic maintenance support of the LEAP-1B programme has been well established since the entry into service, and thus we have done the heavy lifting in terms of preparedness". He adds: "We remain focused on our mission, which is to ensure our own shops are ready, and that we're facilitating readiness for MRO network shops as they come online to support the programme."

Similarly, CFM is not anticipating any "under-capacity" for LEAP-1B MRO in future years. "In addition to our owned shops being ready and prepared, we'll be delivering on our commitments to the MRO network worldwide. We'll have capacity in owned shops, and there could be new MRO shops coming online in the near future depending on the market and customer demand."

Bunching of 737 MAX MRO checks is likely, potentially causing an MRO capacity shortage for the 737 MAX

reconfigured (perhaps even structurally, with doors and emergency exits needing to be located in different places) and/or repainted. Galleys may need moving and seats replaced. Other equipment changes might be required, depending on the new operator's needs. The bottom line for 737 MAX MRO capacity, says Dolan, is "there's a long way before we see a bow wave – it's going to be quite some time before relatively heavy maintenance" is required on those aircraft.

LEAP-1B engine MRO capacity

Of course, no Boeing 737 MAX can fly without its engines – the CFM LEAP-1B being the sole-source engine for the aircraft type. So future LEAP-1B engine MRO capacity is just as important for the overall 737 MAX MRO-capacity landscape as is the airframe MRO capacity available. However, CFM International believes the situation is well under control, both as regards initial rehabilitation (from de-preservation) and re-activation of the engines of the 800-plus stored aircraft and – in the longer term – for there not being a squeeze in several years' time on LEAP-1B shop visits for replacement of life-limited parts and overhaul.

"De-preservation and re-activation of the engine has more to do with a coordinated effort between the aircraft





The wider picture

Whatever happens to 737 MAX MRO, the grounding could eventually produce under-capacity elsewhere in the MRO industry, says Seymour, particularly when its longer-term effects on air transport are looked at together with those resulting from the Covid-19 pandemic.

Seymour thinks that one factor which has been significantly under-estimated in most forecasts' assumptions of required MRO capacity in the wake of the 737 MAX grounding is that many airlines have needed to operate fleets of older aircraft such as Boeing 737NGs – many of them leased – for much longer than planned, because their new replacement jets were unavailable.

An immediate consequence of this was that many carriers had to have MRO performed on aircraft they had expected

to be able to return to lessors when they received their new 737 MAXs, according to Seymour. This created unexpected and high levels of expense for them, just before the pandemic struck at the end of 2019. He says some carriers have included these costs in their negotiations with Boeing over compensation for late delivery of their 737 MAXs.

But more important for the MRO business is that “an area being missed by everybody” in estimating requirements for MRO capacity “is aircraft on operating lease, and the work required to get them into redelivery condition”.

The effects of longer-than-expected lease terms – with the associated added costs of lease extensions agreed at short notice – have been compounded by airlines' sudden desires during the pandemic to return aircraft to lessors early, and in many cases the carriers' inability to continue paying monthly rentals on their leased aircraft. This has often led to lessors unilaterally extending airlines' leases by six months or more, simply because throughout much of 2020 the lessors weren't receiving rentals from the lessees, according to Seymour.

In IBA Group's estimation, the most important consequence of the combined 737 MAX grounding-plus-pandemic-onset for the lessors, and also for the MRO business, is that this year the lessors will see double the number of aircraft returned from lease that they usually do. Normally, lessees return about 1,000 single-aisle jets and 200 widebodies to lessors each year, says Seymour. This year, IBA Group expects more than 1,000 additional aircraft to be returned early.

According to Seymour, this is hugely important for MRO industry capacity, because many aircraft leases and redeliveries to new customers are timed to take place in a cycle corresponding to the years in which the six-year and

12-year heavy calendar checks required by airworthiness regulations are scheduled to be performed. However, the return-and-redelivery checks required by lessors “usually go way beyond what is required from the airworthiness perspective”, and so these checks make major demands on overall MRO-industry capacity.

A year in which twice as many aircraft as usual are likely to be returned “will cause a massive surge in demand”, says Seymour; MROs “are going to be inundated”. At the same time, however, reacting to the sudden drop in airline flying in 2020 and the general economic decline wrought by the pandemic, many MRO facilities have been laying off staff and cutting back their operations.

Although ATS has been training its staff intensively on 737 MAX MRO to prepare for the forthcoming major requirement for the work, Dolan thinks the pandemic could well induce an industry-wide MRO capacity shortage in the future. Globally, aviation was already beginning to feel the effects of an industry-wide shortage of trained and skilled personnel in all areas of the fast-expanding industry before the pandemic began. While the pandemic reduced aviation's manpower demand in the short term, in the longer term the need will return – and in many cases MRO facilities, having recently trimmed their costs, may find themselves short.

As a result, ATS has pro-actively worked to increase its intake of apprentices to its in-house training academy in preparation for the future capacity shortage it foresees. The company itself is growing quickly, having added component maintenance, aircraft teardown and trading of used serviceable materials in the past few years to its existing portfolio of heavy airframe maintenance capacities.

Just as ATS is expanding, the aviation industry will also grow in the future. With Boeing holding an orderbook for nearly 5,000 737 MAXs, the aircraft type will play an important part in that growth. “The success of re-entry into service and production pick-up will be critical to the success of the industry,” says Dolan. So too will the need for there to be sufficient MRO capacity for the thousands of 737 MAXs which will be in service in a few years' time. 

Keeping MROs on track

JSSI Solutions' president **Joy Nebel** offers her thoughts on lean operations and the digital future of the industry, giving an update on the company's suite of Conklin & de Decker digital tools – which now includes the Aerotrak MRO software

How has Conklin & de Decker, and the wider JSSI organisation, coped with the Covid-19 pandemic and lockdowns?

The business has proved remarkably resilient in the face of the pandemic. To support customers, we have frozen licence and support fees at 2018 levels and offered a moratorium on the cost of additional user licence fees.

At JSSI, only essential travel is authorised in order to protect clients and associates. This has presented some challenges for onsite visits to assist new clients, but these have been overcome through online training and the provision of higher levels of remote support.

Software development has continued throughout the pandemic, with regular customer-focused improvements. We have made it easier for clients to control various pricing models and estimates.

We finalised the separation of the Part-145 performance of maintenance from the Part-M continuing airworthiness management and enhanced our manufacturing module. We introduced interactive web dashboards and mobile apps to drive productivity improvements.

Has there been increased interest in MRO software as a means to become more efficient?

In 2020, Aerotrak demand grew significantly and the software had the highest request for demonstrations in its 20-year history, which highlights the



The need for digitisation in the MRO industry is growing exponentially – accurate records and traceability are essential to its long-term survival

JOY NEBEL

industry's willingness to embrace the benefits of a digital transformation.

After Covid-19, we expect competition to increase between MROs. Many have already re-evaluated their operations and implemented Aerotrak technology to drive efficiencies. As client advocates, we enable businesses to do more with leaner operations, ultimately setting an MRO apart from their competitors.

What are the benefits of Aerotrak and what are the advantages over competitor software?

Since 1999, decades of aviation expertise and data have been leveraged to create Aerotrak. It offers an evolving suite of digital tools to keep MROs on track, improve operational efficiency and enhance the decision-making process. Aerotrak brings discipline and control to business processes and workflow management and produces trusted data. In short, it enables MROs to maximise revenue by doing more with less.

The Aerotrak software has everything MROs need under one roof; from aircraft maintenance, modification, planning and tracking to engine and component overhaul, manufacturing, parts distribution, material forecasting and in-depth analysis of work performed (such as budget cost versus actual).

The Aerotrak software is versatile and can support the eVTOL aircraft, drones and UAVs, in addition to the manufacturers and maintenance facilities

On this page: The Aerotrak software aims to be a complete solution for MROs – enabling them to “maximise revenue by doing more with less” [Image left: © aapsky - stock.adobe.com; image below: © papi8888 - stock.adobe.com]

dashboards, converting and storing data digitally, and working towards a paperless future using mobile technology.

How can MROs best ensure lean operations in the aftermath of Covid-19? How do you see the market evolving this year?

Going digital is one of the key trends this year. MROs have been forced to downsize and, given the uncertainty for the industry's recovery timeframe, there is a growing hunger for functionality that reduces administration burdens and allows organisations to operate with reduced overheads.

Digital tools also allow for remote maintenance work to be carried out from anywhere in the world and users can harness more data to make informed decisions. A major reduction in paper waste also means sustainability will continue to be a powerful driver.

that support them. Aerotrak is the most comprehensive maintenance software in its class and covers all business processes in a single application, including technical, commercial, inventory and logistics, and finance. This is all fully supported by JSSI's professional services team.

How do you assess the MRO industry's transition to digitisation, and do you see this ramping up in 2021?

The need and demand for digitisation in the MRO industry is growing exponentially – accurate records and traceability are essential to its long-term survival. Digitisation provides a method of securely storing documentation and data that is easily retrievable and can then be harnessed to improve safety, performance and decision-making.

We are listening to the needs of the industry and moving from reports to



What areas of functionality will you focus on next with the Aerotrak software? What's next for the company?

To support the digital transformation, we are working on an updated and enhanced version of another digital tool, called Aerosector. This fully integrated electronic tech log creates secure paperless flight logs from handheld devices.

Improved planning and forecasting functionality will be important features looking ahead. We have already implemented a new planning tool that utilises Aerotrak data to project turn-times and estimated completion dates, labour requirement and availability, materials and tooling availability and hangar space. This is complemented by our forecasting tool, which provides visibility over the operational status of a fleet and individual aircraft. **M**



Supporting LEAPs **TO THE SKIES**

The number of CFM LEAP engines in the air is about to increase rapidly, both through aircraft returning from grounding and from new deliveries. **Bernie Baldwin** finds out about the MRO services in place for these developments

Left and below: Lufthansa Technik has begun a multi-million Euro investment to build its repair capabilities for LEAP engines, mainly at its facilities in Hamburg and Shannon

says. "In general, an increased amount of necessary maintenance work can be expected due to the large number of aircraft and engines returning to service. The more extensive maintenance work, however, can be flexibly postponed due to the reduced utilisation and deployment of aircraft.

"Furthermore, airlines are able to swap engines between their aircraft fleet while not all aircraft are being utilised.

This allows the deferral of more extensive and expensive maintenance work for the moment and may result in a tense MRO availability and capacity situation in the future as a wave of

maintenance work builds up."

MTU Maintenance is also ready for the task of all these LEAP engines re-entering service, but has its own take on the extent of that challenge. "As this engine is still comparatively young, MRO tends to be focused on on-site services such as smaller fixes and BSI inspections or quick-turn visits," comments Marcel Gerth-Noritzsch, head of engineering at MTU Maintenance Zhuhai.

"This has not changed due to the storage of the fleet. Engine storage requirements and checks prior to re-entry into service are regulated by the OEM engine manual. We will be supporting our joint venture partner China Southern with their fleet wherever necessary."

Additive manufacturing will be even more important in the production of parts and in the MRO industry

aircraft – powered by the LEAP-1B – are once again being delivered to operators following the aircraft's grounding.

While these new aircraft join the global fleet, there will also be significant numbers of LEAP-powered A320neos and older 737 MAXs coming out of pandemic-driven storage and returning to service, which is bound to have an effect on the amount of LEAP maintenance work when compared with what might be considered a 'regular' level of maintenance.

Lufthansa Technik's senior vice-president of engine services Dietmar Fokke confirms that for these aircraft, in particular the 737 MAX and the LEAP-1B engines, the return to service requires specific maintenance tasks to be performed.

"These tasks can include software updates, oil exchange and visual inspections, and normally do not require the engine to be removed from the aircraft or to even be disassembled," he explains. "However, the performed maintenance tasks can lead to findings requiring further MRO work, hence it is beneficial to have a qualified MRO company under contract. Lufthansa Technik has therefore started preparation on the LEAP-1B to support our customers."

After their storage, the A320neo family aircraft powered by LEAP-1A engines require similar maintenance work as the aircraft are likely to have been parked for a long period of time. "Again, during the checks further findings can occur, hence making it beneficial to have a contract with a MRO company," Fokke

The CFM56 has been an engine family so seemingly ubiquitous in aircraft propulsion that its successor, the LEAP (Leading Edge Aviation Propulsion) family, still feels like it's in its infancy. Yet it is almost 13 years since the programme was launched – and this year the LEAP-1A will celebrate five years in service, on 2 August.

Also this year, the LEAP family's operational presence in the market – on the Airbus A320neo and the Boeing 737 MAX – is scheduled to be expanded by the introduction into service of the Comac C919. And, of course, 737 MAX



Right and below: Lufthansa Technik became one of the first engine MRO shops to provide services for the LEAP family

MRO companies are designing support packages which can differentiate their services on LEAP engines

MTU Maintenance Zhuhai introduced the LEAP-1B into its portfolio in September 2019 and has had full disassembly, assembly and test capacity since autumn 2020. "We also carried out our first on-site activity, a lease inspection, for a LEAP-1B engine in summer 2020 and are currently in the process of introducing and obtaining certification for the LEAP-1A," Gerth-Noritzsch reports. "Furthermore, MTU Maintenance Lease Services will be adopting LEAP engines into its spare engine leasing and technical asset management portfolio."

Beyond this short-term pressure, MRO companies are also building long-term capabilities to maintain LEAP engines. They are designing support packages

to bring benefits to customers which they believe can differentiate their MRO services on LEAP engines from those provided by their competitors.

"As with the around 30 other engine types in our portfolio, MTU Maintenance offers [LEAP] customers individual tailored and specialised solutions, catering entirely to their needs," Gerth-Noritzsch says. "We have short-term slot availability, fast turnaround times, competitive pricing structures

and are able to adapt flexibly to airlines' planning in this current market environment.

"Our MTU Maintenance Zhuhai facility was one of the first MRO shops worldwide to obtain LEAP maintenance

capability, and was the first MRO shop outside the OEM network that could provide quick-turn shop visits service to address any early technical issues in the LEAP fleet."

Lufthansa Technik was also quick off the mark in being one of the first engine MRO shops to provide services for the LEAP family and claims to provide a competitive alternative to the OEM. "We have already performed the first events at Lufthansa Technik in Hamburg," Fokke confirms. "In addition, [we are] the first 'CFM Branded Service Agreement' (CBSA) holder, which includes extended licences, other commercial agreements and a strong technical cooperation with the OEM.

"This enables us to continue to use our strength of developing our own MRO technologies and processes and to make use of our extensive knowledge, experience and engineering capabilities. This is with the aim and focus on tailor-made solutions to support individual customer needs, which in the end are aimed at reducing the total cost per engine flight hour (EFH)."



Fokke says Lufthansa Technik will offer competitive LEAP services covering the complete spectrum of engine MRO, from full performance restoration shop visits to on-wing support including in-house repair capabilities, 'wing2wing' and coverage of the complete engine life cycle. "We're also building up worldwide mobile engine support services for LEAP engines in order to avoid shop visits," he adds.

With new technologies, of course, new repair techniques and processes are often required. And there have been some changes needed to maintain LEAP engines compared with the CFM56.

"Since the LEAP engine is still a new engine type, many of the new repair techniques and processes are still under development," says Fokke. "Many of the basic repair processes can be transferred





There will be significant numbers of LEAP-powered A320neos and older 737 MAXs returning to service

are multi hole laser drilling/HiY (high yttrium) 3-layer thermal barrier coating for the combustion chamber, but also new CCW14 shot peening and corrosion coating procedures for specific parts of the engine," he explains.

"In April 2020, for example, the first LEAP-1A in Hamburg was dispatched for a quick turn. A first inspection of the engine revealed damage to the anti-erosion coating on the fan blades, which is not only an important protection, but also needed to maintain aerodynamic efficiency. As part of our repair activities, a successful repair method was developed and applied within just four weeks, resulting in a cost and material efficient application method for the coating repair of the LEAP-1A fan blades."

At MTU Maintenance, Gerth-Noritzsch also emphasises that LEAP engines are still very young. "Only a limited number of repairs have been released in manuals," he states. "However, conventional repair techniques and processes can also be applied to LEAP engine components. In fact, this philosophy was adopted by the OEM during the design phase in order to maintain high reliability for their new products."

Gerth-Noritzsch highlights MTU Maintenance's position as "engine experts" and discloses that as more

and more repairs are released in the manuals, the company will actively adapt its experience and expertise from other engine types to the new repair techniques and processes introduced on LEAP engines.

One of those new technologies involves 3D-printing/additive manufacturing in which CFM's parent companies – GE and Safran – each developed considerable expertise. According to Fokke, Lufthansa Technik shares the vision that additive manufacturing will play an even more important role in the production of parts and in the MRO industry. "We see that already certain parts, for example the swirler of the fuel spray nozzle, are being produced by this technique," he says. "We can imagine that some of these manufacturing processes will also become available for LEAP engines."

"We believe, however, that this technology and manufacturing process needs to mature further, taking more than five years in time before being used for the manufacturing of parts in higher quantities. Lufthansa Technik sees the potential and the advantages regarding the cost, time and resource effectiveness, as well as design flexibility that additive manufacturing will offer."

The company is already making use of additive manufacturing for the repair of parts for legacy engine types, Fokke says. "In addition, we have invested further into additive manufacturing and built up a centre of excellence specifically focusing on the development, manufacturing and repair of parts until production maturity. The focus is on rapid prototyping, tooling, repair and direct manufacturing. Based on our strong technical collaboration with the OEM, we can bring in our extensive knowledge and experience concerning development of new processes and technologies."

There may be a busy time coming with the reintroduction of stored and/or grounded LEAP-powered aircraft, but the industry has prepared well for that. And plans to support the vastly increased numbers of engines for many years ahead appear well advanced, too. **Q**

from the CFM56. On the other hand, newly introduced materials and parts do require new repair techniques and processes. Examples of new material and parts are in areas such as composites [for example, the new LEAP engine fan blade requires completely new approaches for its repair], ceramic matrix composites (CMCs) and blisks.

"In addition, new technologies and repair processes have been developed and are available for the new engine types, such as cold-gas-spray."

Fokke notes that Lufthansa Technik has begun a multi-million Euro investment to build its repair capabilities for LEAP engines, mainly at its facilities in Hamburg, Germany and Shannon, Ireland. "Some of the new repair technologies we are focusing on

Washing away harmful emissions

Fuel efficiency can be improved – with carbon emissions going down
– as a result of good engine washing. GE's latest engine cleaning solution promises to take these savings to the next level

The “ground-breaking” ‘360 Foam Wash’ engine cleaning solution from GE offers an alternative to the water wash method, with fuel efficiency improvement and associated carbon emission reduction.

The solution has recently been launched with Etihad Airways, optimising performance of the airline’s GE90 and GENx-1B engines on its 777 and 787 fleets.

The wash process involves the specially formulated, proprietary detergent being driven into the engine via a controlled cleaning process by the 360 Foam Wash cart. The foam fills target areas, enabling more effective removal of dust and dirt that can build up in engines and decrease engine efficiency.

The system is self-contained, allowing it to be used inside maintenance hangars or outdoors.

In Etihad’s case, 360 Foam Wash reduced build-up of deposits in the engine, lowered engine exhaust temperatures and improved engine compressor efficiency.

GE Research and GE Aviation have been developing an engine cleaning solution for hot and harsh



360 Foam Wash reduced build-up of deposits, lowered exhaust temperatures and improved compressor efficiency

environments for several years before technology testing started with customer engines. Extensive testing was performed on components and test engines before releasing the procedure for field use. The first on-wing trial of 360 Foam Wash was with an Etihad Airways’ GE90 engine in January 2017.

It is now approved for use on multiple GE engine programmes, including the GE90, GENx, CF34 and CF6 as well as Engine Alliance’s GP7200 engines. Customers

need to obtain a technical licence to use 360 Foam Wash, due to the proprietary solution and for training purposes on the process.

The product has been licensed to multiple customers since 2019 for GENx and GE90 engines, but Etihad Airways has become the first customer to receive a technical licence to use 360 Foam Wash on GE90 engines. Etihad also has a licence for its GENx-1B engines, making Etihad Airways the first airline to

receive licences for multiple GE engine programmes.

Of the partnership with Etihad, GE Aviation’s aftermarket strategic solutions vice-president and general manager Jean Lydon Rodgers said the companies “shared a commitment to develop innovative solutions in aircraft engine maintenance. We are learning more about how our engines operate and respond in hot and harsh environments than ever before, and our relationship with Etihad has been integral to that process.”

Etihad Airways’ senior vice-president of technical Paul Kear said the airline expected to realise significant fuel savings and a reduction of more than 7,000 metric tonnes of CO₂ for the GENx-1B and GE90 engine fleets in 2021, compared to water wash methods.

GE noted that while fuel efficiency and carbon reduction varies by engine line and region, among other variables, the company works with customers to optimise 360 Foam Wash and maximise the benefit to their fleets.

Trials continue with more customers globally, as the company learns “more about the benefits of the engine cleaning system in different operating conditions and with additional engine models”. 



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