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MRO

Management



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FUTURE VISION

Joramco CEO Fraser Currie has ambitious growth plans

CFM56 MAINTENANCE

How MRO providers have found new ways of working

FULL VIEW

New technologies for the remote inspection of aircraft

CARING FOR A CLEANER WAY TO FLY



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Editor's Letter

Welcome to the first issue of MRO Management in 2022. We've all become accustomed to uncertainty, change and unwelcome surprises in

the past few years but, with many MRO companies now reporting busy hangars, the industry is facing the immediate future with renewed hope and optimism.

In this issue, our focus is on discerning trends for the year ahead, and beyond. We asked Alton Aviation Consultancy's managing director Jonathan Berger for his predictions for 2022 in our regular 'Industry voices' column. His thoughts turned to the shortage of skilled labour, air cargo market growth and supply chain near-shoring in what is a compelling read. In the same column, Aviation Logistics Network's co-founder Ralph Perkins provides a thoughtful analysis on how – with careful investment and a targeted use of technology – companies such as his might be able to help MROs reduce their logistics costs without a decrease in service.

In our cover story, the MRO market in the Middle East is in the spotlight, along with the companies that are headquartered there.



Fraser Currie, CEO of Jordanian MRO Joramco, believes the region is leading the MRO and wider aviation recovery. There is certainly a lot of room for growth, and with Boeing forecasting a need for US\$740 billion of aftermarket services by 2040, the future for the MRO industry in the Middle East is bright.

The future also appears promising for technologies that enable the remote inspection of aircraft components and structures. Remote live-video-based solutions became essential for many businesses during the Covid-19 crisis, while technologies such as nanobots, robotic arms

and drones are gaining momentum, and we explore these developments in detail in an article on page 44.

Finally, digitalisation will remain an ongoing movement in 2022, and on page 38 we assess the state of the MRO industry's transition from paper to digital records – pondering whether going fully digital will be a viable possibility any time soon.

I hope you enjoy reading the issue. Let's also hope there are only surprises of the good kind for our industry for the rest of the year!

Jason Holland
EDITOR

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A new Airbus facility in China will ensure more aircraft get either a new lease of life or a sustainable ending

News from across the industry

HANGAR *talk*



TRANSACTIONS

Heston MRO acquires Cairns MRO facility

Heston MRO has signed a purchase agreement for the acquisition of Cairns MRO from Jet Aviation. The acquisition will expand Heston MRO's capabilities into full heavy maintenance for regional aircraft, the company said, as well as avionics repairs shops for a wider range of aircraft types. Cairns MRO is housed in 5,400sq m of space – hangars and offices – and is the largest MRO centre in Far North Queensland.

“We are excited to add [the] Cairns facility to the Heston MRO family,” said Heston MRO's director and partner

Once the transaction is completed, the Cairns facility will operate under the Heston MRO brand

Jonas Butautis. “Over the last couple of years our company has been looking for the best options in how to expand into heavy maintenance and components repairs in Australia. Having done the analysis on the Cairns facility, its professional and experienced staff, range of capabilities and growth potential, we decided that it fits well into the overall Heston MRO vision of becoming a ‘total care’ partner for airlines in the Australasian region.

“Once the transaction is complete, Heston MRO will be offering line, base, components, engines MRO capabilities, as well as technical training and other services. With selected services we will be able to cover the full suite of aircraft types, from smaller regionals like ATR and Dash 8 Q400, narrowbodies like 737s and A320s, to large widebodies like 777s, 787s, A350s and A380s.”



ENGINES

SIAEC signs deal with Rolls-Royce to provide Trent services

SIA Engineering (SIAEC) and Rolls-Royce have signed a 10-year agreement in which the MRO company will provide line maintenance and in-field services for Trent 7000, 1000, 900, 800, 700, 500 and XWB engines in Singapore, with Singapore Airlines among its customers. The new deal extends SIAEC's existing on-wing care services with Rolls-Royce, covering on-wing support, borescope inspections, engine changes and engine build-up services for Trent 1000, 900, 800 and 700 engines.

4



TUI Airways placed four more aircraft into Caerdydd's facilities in early January to undergo maintenance work

3



Chinese MRO GAMECO has expanded its maintenance capacity by completing a third hangar




● Sherwin-Williams Aerospace Coatings has launched a new interactive aircraft paintwork tool. The 'Aircraft Color Visualizer' allows plane owners, paint shops, aircraft designers, OEMs and aviation enthusiasts to customise six aircraft models with any colour in the Sherwin-Williams aircraft colour library. The pre-designed schemes can integrate one base colour and up to three accents in both solids and metallics, the company said.

● Delta TechOps MRO has completed the first shop visit and test of a Rolls-Royce Trent 1000 TEN engine at its maintenance facility in Atlanta. During the visit, the engine was disassembled to replace high pressure turbine systems and blades, and several reliability improvement service bulletins were incorporated.

● SR Technics' Malta subsidiary has been awarded a renewed base maintenance contract with easyJet. The agreement is for an additional two years and covers two lines of base maintenance work. SR Technics Malta has held a maintenance contract with easyJet since 2010, providing a range of MRO services.

● AMETEK Singapore is investing in Airbus A350 maintenance solutions. The company said it would now be able to provide Asia Pacific operators with a regional support option for the full suite of cargo and galley heaters for the aircraft type.

● Czech Airlines Technics has won line maintenance contracts from Eurowings and Bees Airline.



COLLABORATION

MTU partners with Nayak Group

MTU Maintenance has entered into a collaboration with line and base maintenance specialist Nayak Group to broaden its MRO service offering. MTU will now offer its range of on-site engine services in combination with aircraft line and base maintenance performed by Nayak Group, which has 50 facilities in 16 countries and services more than 75 aircraft and engine combinations.

"This agreement is the next step in MTU's commitment to our customers to increase our services and network and become the number one on-site engine service provider in Europe," said MTU Aero Engines' SVP MRO programs Martin Friis-Petersen.

"We are excited to be partnering with such an experienced maintenance provider to improve the speed at which we can support customers with

comprehensive solutions that minimise downtime and keep airlines flying."

Nayak Germany's managing director Jörg Sauerland added: "We are delighted to be collaborating with MTU Maintenance, expanding our existing engine services such as performance washes, changes and borescopes to include the breadth and

depth of the MTU portfolio and expertise. "With our complementary service portfolio, we can provide our customers a wide range of solutions."

50



Nayak Group has 50 facilities in 16 countries and services more than 75 aircraft and engine combinations

Trend watch.

New technologies, partnerships and tools are driving innovation in the MRO industry



01

Here comes the swarms

Korean Air has developed a technology that can inspect aircraft using drone swarms.

The ability to deploy multiple drones simultaneously has the potential to reduce the usual visual inspection time of about 10 hours to about four hours, the company said, which represents a 60 per cent decrease in time.

A drone with a one-metre width and height, weighing 5.5 kg, has been developed by Korean Air and is programmed to take photographs of aircraft fuselages.



05

Precision move

HAECO has signed an agreement with 321 Precision Conversions to provide passenger-to-freighter conversions for its A321-200PCF programme. The conversion work will be performed at HAECO Xiamen's facility, beginning in February 2022.

Gary Warner, president of 321 Precision Conversions, commented: "Since 2009, HAECO Xiamen has been a great partner on our 757-200PCF programme demonstrating high quality and efficiency. Expanding the A321-200PCF conversions into HAECO Xiamen was an easy decision [for us] as we continue to expand conversion kit capacity to meet high customer demand."

"HAECO looks forward to providing a wider service to Precision with our capabilities"

02

Going solar

HAECO has launched a solar project at Hong Kong International Airport in collaboration with EcoSmart Energy. Expected to be completed in April 2022, a solar photovoltaic system with a total capacity of three megawatts will be installed on the rooftops of its aircraft maintenance hangars at the airport. The companies estimate that approximately 1,064,609kg of carbon emissions will be effectively reduced per year as a result of the initiative.

"It will definitely set an example for solar power projects in Hong Kong"



03

Into the Atlantic

Airbus Atlantic – a new aerostructures company and wholly owned Airbus subsidiary – was officially established on 1 January 2022. The new company aims to bring together the "strengths, resources and skills" of Airbus' sites in Nantes and Montoir-de-Bretagne, the central functions associated with their activities, together with Stelia Aerospace sites worldwide, according to Airbus.

The manufacturer said the unification was part of a transformation project announced in April 2021 which aims to strengthen the value chain of aerostructure assembly within Airbus' industrial setup, as the activity is considered a core business.

04

GREATER EFFICIENCY

Pratt and Whitney has unveiled a new single-aisle aircraft engine, which it has dubbed "the world's most fuel-efficient and sustainable". The 'GTF Advantage' is thought to decrease fuel consumption and CO₂ emissions by 17 per cent compared to prior-generation engines, and will be compatible with 100 per cent sustainable aviation fuel when it enters service in January 2024.





08
←

Levelling up

US cargo airline Kalitta Air has begun using a handheld and completely wireless 3D scanner tool with integrated AR to improve its maintenance operations. The 'dentCHECK' tool has been created by 8tree and is purpose-built for the aviation maintenance industry.

Kalitta Air said 8tree's dentCHECK would enhance the efficiency and quality of its dent mapping activities. The tool delivers real-time 'go/no-go' answers at the push of a single-button, 8tree said, and "significantly reduces" damage mapping and reporting times compared to traditional manual methods that use depth-gauges and straight-edges.



10
↑

Tailor-made solutions

FL Technics and SETAERO have signed an agreement for the delivery of tailor-made solutions for aircraft parts and materials. The scope of the agreement covers advanced maintenance and repair services integrated with a network of FL Technics' asset trading and management. The companies said this would form a portfolio of tailor-made solutions to repair, supply and maintain airframes, flight surfaces and nacelles. They also noted that all components can be scaled and specialised based on clients' aircraft type, fleet size and geography of operations worldwide.

"FL Technics continues decisive expansion of capacity and capabilities as a global MRO"

06
↓

Online access

GA Telesis and Honeywell Aerospace have entered into a consignment partnership in which they will provide airlines with greater component availability and better access to parts through online portals.

The new programme, which will be managed by GA Telesis' Flight Solutions Group and the Honeywell Aerospace Trading division, will ensure airlines receive components repaired and certified with genuine OEM parts.



09
↓

SOFTWARE UPGRADE

Jet Support Services (JSSI) has acquired SaaS solutions provider TRAXXALL. TRAXXALL delivers software to help customers reduce aircraft downtime, improve data accuracy, and have comprehensive visibility over maintenance costs, parts inventory and MRO operations. It is headquartered in Montreal, Canada and has offices around the world.

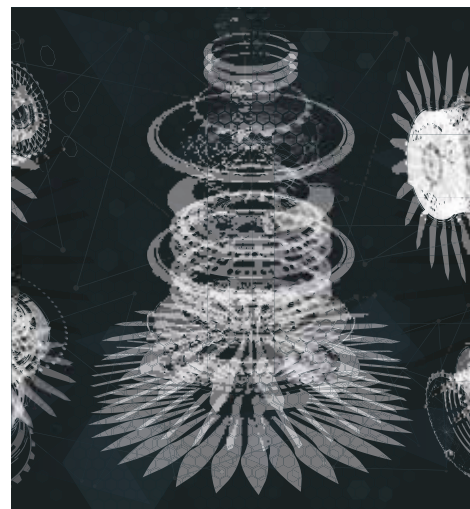
07
↑

An industry first

Lufthansa Technik has become the first independent MRO provider to sign a CFM branded service agreement (CBSA) with CFM International for LEAP-1B engines.

Under the terms of the agreement, Lufthansa Technik will begin offering MRO services for the LEAP-1B engine ranging from overhaul and parts repair to on-wing support and engineering support.

Lufthansa Technik is the only independent MRO provider worldwide that holds both a CBSA for the LEAP-1A and LEAP-1B engine.



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2022 MRO PREDICTIONS:

DÉJÀ VU ALL OVER AGAIN

What does 2022 have in store for the global commercial MRO industry? Alton Aviation Consultancy's managing director **Jonathan Berger** offers three predictions



“2022 will highlight how the pandemic has been a tremendous accelerant to pre-existing industry trends that were already transforming the industry”



Jonathan M. Berger is managing director of Alton Aviation Consultancy, a global aviation and aerospace advisory firm. For more information, please visit altonaviation.com

The legendary hall of fame New York Yankees catcher Yogi Berra is today perhaps best known for his many ‘Yogi-isms’; witty and irreverent life observations where he inadvertently mangled phrases with the intention of sharing wisdom and insight. The start of 2022 brings to mind one of the more famous Yogi-isms – ‘it feels like déjà vu all over again’. After a long two years of managing through the worst pandemic in a century, many of us thought, or perhaps too optimistically hoped, that 2022 would be the year that commercial aviation would return to some semblance of normalcy. Apparently the latest Covid variant, Omicron, didn’t get the memo. Airlines still require all passengers to wear masks, governments worldwide continue to plead for their citizens to get vaccinated (and boosted), and global supply chains remain gridlocked. It indeed feels like déjà vu all over again.

I choose to remain optimistic that better times are ahead. Accordingly, the following are my annual

commercial MRO predictions for the new year. In general, 2022 will further highlight how the pandemic has been a great accelerant to several pre-existing industry trends that were already transforming the industry: the shortage of skilled labour, air cargo growth and supply chain near-shoring.

1) Labour, labour, labour

While 2021 is being touted as the year of the ‘great resignation’, I prefer

the term the ‘great reflection’. The isolation and dislocation caused by the pandemic has enabled thoughtful introspection and a re-prioritisation of what is truly important in life. As a result, virtually every industry has ‘help wanted’ signs posted, and the MRO industry is not immune (no pun intended).

To avoid involuntary furloughs, most airlines, OEMs and MROs alike offered generous early retirement packages and, when combined with the great reflection, take-rates

far exceeded expectations. While these early retirements avoided painful employee furloughs, the unintended consequences were the single largest loss of institutional knowledge our industry has ever experienced. Clearly pilot, mechanic and engineer



7.2



More than 43,500 new aircraft valued at \$7.2 trillion will be needed by 2040 globally

1. Many more players than just traditional air cargo operators such as FedEx are benefiting from the growth of the air cargo market – including the MRO industry
2. A global mechanic and engineer shortage has been compounded by the Covid-19 crisis

“Airlines will pay more for maintenance and should expect MRO cost inflation”

shortages were a concern pre-pandemic, but now the shortage of human capital and more limited experience of existing employees is the single greatest issue facing company boardrooms and will surely further hamper the recovery.

In order to retain existing employees and attract new recruits, salaries and benefits will inevitably rise. Ultimately, this will lead to airlines paying more for maintenance (labour and material) and they should anticipate ‘MRO cost inflation’; my first prediction for 2022.

2) A rising tide lifts all boats (or cargo aircraft)

One of the few aviation bright spots during the pandemic has been the growth of the air cargo industry, driven by e-commerce (also turbocharged by the pandemic) with the beneficiaries extending far beyond the traditional air

cargo operators to include commercial airlines, MROs and OEMs. Commercial airlines were able to offset some losses by operating ‘preighter’ aircraft.

The MRO industry continues to experience tremendous benefits from a growing air cargo industry. Older, maintenance intensive air cargo aircraft that were due to retire have returned to service to provide additional capacity. Airframe, engine, line and component MROs and players in the entire aviation material supply chain are all grateful for this increased demand. In addition, the market for passenger-to-freighter (P2F) conversions is at an all-time high and keeping engineering firms as well as MROs running at full capacity.

Lastly, OEMs are now receiving a significant increase in orders for new freighters after experiencing a decline over the past decade. This will ultimately have a positive ripple effect throughout the manufacturing supply chain.

Given the favourable tailwinds in the air cargo market, my second prediction for 2022 is that there will be a significant increase of M&A activity in the air cargo sector and the associated supply chain as the investment community seeks to capitalise on these trends.

3) Supply chain ‘near-shoring’ Over the past year, global supply chains have been paralysed by a confluence of factors:

OEM production facilities temporarily shuttered by regional quarantines; a shortage of truck drivers and shipping containers; and gridlocked ports unable to handle the increased demand. Compounding this, global political instability driven by nationalism, anti-globalism and xenophobia has led to trade wars and tariffs without winners.

As a result, companies both large and small are reconsidering their supply chain strategies, which have historically focused on labour cost arbitrage or the outsourcing of non-core activities to the lowest labour cost provider in far-away lands. In response, we’ve seen companies adopt vertical integration strategies to better control their supply chain and intellectual property.

If there has been one lesson learned from the pandemic, it’s that the aviation industry is indeed cyclical, and therefore maintaining a more highly variable cost structure is critical to managing through the inevitable black swan events. While I don’t envision OEMs and MROs going vertical and bringing previously outsourced activities back in-house, I do believe they will seek suppliers closer to home and their core customer base. Again, this is not a new trend, but will be further accelerated by the pandemic.

My final prediction for 2022 is that Mexico (for North America) and Eastern Europe (for Europe) will see significant growth in strategic partnerships and investment in additional aerospace manufacturing and MRO facilities. **M**

HOW TO IMPROVE LOGISTICS IN 2022

Davies Turner Air Cargo director and Aviation Logistics Network co-founder **Ralph Perkins** outlines some initiatives that will help MRO operators navigate the year ahead



“Managing a global logistics network is a labour- and capital-intensive undertaking. The MRO sector is literally the lifeblood that keeps our network alive”



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

Happy New Year! I wonder what 2022 will hold for us. Already we have got off to a shaky start with the Omicron variant of Covid which, yet again, has demonstrated how fragile the recent improvement in our activity and capacity levels is, as it can be turned off just like a tap. Concerns over new variants of the virus are holding the global economy to ransom like some awful biological highwayman forcing the aviation industry to stand and deliver its hard-won gains from the end of 2021.

Against such a backdrop we are looking forward to trying to operate in our sector as well as we can, given the current circumstances. For my colleagues and I in the Aviation Logistics Network (ALN), as with everyone else, the question is ‘what to invest in’ when things hopefully continue to improve after another variant of Covid that has hit on a global scale.

Managing a global logistics network such as ALN is a hugely labour- and capital-intensive undertaking. The need for warehouses, trucks, forklifts, screening equipment, IT systems, staff and accounting with IATA airlines is only part of the picture. Clients are the key and for us the MRO sector is literally the lifeblood that keeps our network alive.

Herewith are some of the initiatives we have earmarked for this year:

1



1. How do we improve our information flow to our clients in real time? This is something we are currently looking at in great depth. As a network, we use track and trace software, RFID devices on some items, GPS trackers on others, and barcodes on still others. What works best and what could be a unified standard? Currently we are experimenting with QR codes and QR readers on the basis that everyone could scan/read a QR code.

The concept is every shipment will have a unique QR code generated for inclusion on shipping documents and on freight. With each task of the logistics function, the QR code is scanned and then uploaded to a dedicated ALN application that enables the viewer (MRO/airline/parts supplier) to see the progression of the shipment through our logistics process from start to finish.

We believe this will be popular with many MRO clients who require KPI information but struggle to get real time information and must wait in some cases days or weeks for completed KPI audit trails. Likewise, it should help eliminate the arduous time spent manually completing these reports on spreadsheets as everything will be populated to the cloud-based server system.

2

2. Our ongoing green initiatives remain crucial. Key hubs are already ISO 14001 compliant, and it is a major driver for us to ensure that we meet and exceed our carbon footprint reduction targets in 2022. That translates to new premises, all with the latest technology, together with waste management policies and recycling targets.

3. There will be further development on finding ways to work with our clients to reduce their logistics costs without decreasing service. To do this we are:

i. Working with key airline partners to upgrade and increase our access to greater freight capacity in the key aerospace markets in North America,

- 1.** How will the recovery continue in 2022?
- 2.** ALN is developing its specialist engine transportation services further this year

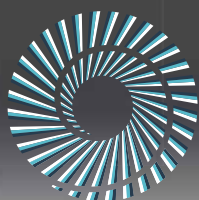
Asia and Europe. Our aim is to reintroduce into the market airfreight consolidations geared solely to the aerospace industry at routine not critical pricing structures.

ii. Developing our specialist engine transportation services further with enhanced T1 guarantees coupled with new dedicated engine handling super hubs capable of handling everything from CFM56 through to Trent 1000 engines.

iii. Continuing to invest in recruiting staff who specialise in engineering and MRO. ALN is a unique network; we have first-hand experience/knowledge of MRO operations, having actively recruited from that field to work with us to refine the services we offer and to broaden the appeal of our network to our MRO clients.

Unlike the adage, 'He knew the cost of everything and the value of nothing', the MRO sector knows and understands the value of working with trusted providers for logistics. Long may that trust and understanding continue. Stay safe, and here is to better times ahead. **M**

“The MRO sector understands the value of working with trusted logistics providers”



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Entering into an authorised MRO agreement

PART 3 – GENERAL CONCERNS

In the third of a multi-part series, Washington Aviation Group president **Jason Dickstein** examines the more general concerns that may arise when negotiating ‘authorised network’ agreements

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

Win-win

It is important to understand that any authorised facility relationship represents an opportunity for both sides to work together for mutual benefit. The proposed agreement should be viewed in this context. If you do not see benefit in the relationship then you may want to pass on the opportunity. If your partner can’t see benefit in the agreement, then you should expect your business partner to pass on the opportunity as well.

With this in mind, you should be structuring the agreement so that: both partners can be successful; both partners can be protected; and the types of problems that might arise are identified, and reasonable arrangements are made to resolve how they will be handled.

The clauses of a contract should not be viewed as ‘gotchas’, but rather they should be viewed as a reasonable set of resolutions for occurrences that may arise, from the manner of payment to how liabilities will be handled.

Write what you mean

Make sure that the agreement says exactly what you mean it to say. Good lawyers writing in this century don’t use



One problem is language endorsing illegal conduct

a lot of fancy words that do nothing but confuse the reader. They write plainly so that the parties can clearly understand their rights and their obligations.

I have seen parties who waive aside the problem of unintelligible or confusing language, claiming that “we both know what we really mean”. That may be true but, in a worst-case scenario, a judge might not be privy to the same understanding. If both sides know what they really mean, then that understanding should be expressed in plain language in the agreement. I have had clients that purposely want

to provide vague language so that it can be reinterpreted later. This is dangerous! There is a principle of law – known as *contra preferentum* – in which confusing language will be interpreted against the drafter. Even without this, vague language runs the risk of being interpreted opposite to the way you want.

A well-written agreement that clearly establishes (at the beginning, when both sides are most optimistic about the relationship) each party’s rights upon termination can help preserve a business partner and avoid costly legal resolutions and a permanent end to the relationship. It is easier to avoid conflict when you can point to a clause in the agreement and remind the other party of your original understanding.

One strategy I use when supporting a client’s negotiations is to raise common hypotheticals and ask, “how would you want this resolved?”. It is easier for the parties to agree on the “fair” approach at the front end of the agreement when the eventuality has not yet arisen in real life than it is for them to agree when there is real liability at stake (also an up-front apportionment of liabilities makes it easier to ensure that your liability insurance coverage is appropriate).

Ask a lawyer for help

OK, I am a lawyer, so you shouldn’t be surprised that I advise you to seek legal advice. An authorised facility relationship is a partnership, and you need to make sure it will yield the benefits you expect, while also extracting only the costs you anticipate. I have reviewed authorised facility agreements and identified a variety of problems in the drafts.



your facility is located in the European Union, then it is likely that you issue EASA Form 1 for completed work. An agreement whose standard language requires you issue an 8130-3 tag is going to make life difficult.

I once saw an agreement for an authorised repair facility that required it to issue release certificates signed

on the left side (like manufacturing certificates). Correcting this technical impossibility was fairly straightforward, but the partner's first response was to say that many others had signed the template agreement without complaint. This tells me that too many repair facilities are signing authorised facility agreements without reading them.

Finally, your attorney should be able to explain complicated contract elements to you (like the interaction between two clauses), but ideally the contract should be written simply enough that anyone can read it and understand the parties' intent. Writing complicated provisions in clear, simple-to-understand language

is an art; and it is what you should expect from your attorney. I often tell clients that you don't need a well-written contract until something goes wrong but, when it does, a well-written contract can save your business.

'Authorised MRO' and 'authorised distributor' agreements are an important part of your relationships with your business partners, but they need to be negotiated so that (1) your business can thrive during the relationship and (2) your business can continue to thrive if the relationship ends. At the beginning of a relationship, it is difficult to imagine its end, but they do. If you are worried that you might not be objective in examining your agreement, then you should entrust the agreement review to your business' attorney to support your negotiations. **M**

One is language endorsing – or even requiring – illegal conduct (such as clear violations of antitrust law). When you can identify illegal behaviour in the plain language of the agreement, most of the time the party proffering it will agree to modify it to remove the illegal elements. If the other party won't agree to remove it, then it might not be a partner with whom you want to do business.

Another problem is impossible requirements. I have seen authorised facility agreements that anticipate the signer will hold certain certificates, when in fact the real participants hold other certificates (or are ineligible for the anticipated certificates). If

Jason Dickstein is a Washington-DC based attorney who has advised aviation businesses on transactions and contracts for 30 years. He is active in several aviation trade associations.

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MRO FOCUS: MIDDLE EAST

The Covid-19 recovery was well underway last year in the Middle East and, despite the uncertainty caused by the emergence of Omicron, 2022 looks set to be a strong year for MRO companies headquartered there. **Jason Holland** reports

Some 3,000 new commercial aircraft valued at US\$700 billion will be required in the Middle East over the next two decades, with US\$740 billion of aftermarket services such as maintenance and repair needed.

That's according to Boeing's '2021 Commercial Market Outlook' (CMO), with the aircraft manufacturer expecting the region to capitalise on the recovery of regional and international travel and cargo demand.

Middle East passenger traffic and the region's commercial fleet are projected to more than double over the CMO's 20-year forecast period, according to Boeing, with more than two-thirds of aircraft deliveries to the region

accommodating growth, while one-third of deliveries will replace older aircraft with newer models.

"The Middle East region's role as a global connecting hub continues to be important for developing markets to and from Southeast Asia, China and Africa," says Randy Heisey, Boeing's managing director of commercial marketing for the Middle East. "The region has been a leader in restoring confident passenger travel through multi-faceted initiatives that aid international travel recovery."

The CMO bodes well for the MRO companies headquartered in the Middle East. Many of them were able to make a strong recovery from the worst of the Covid-19 crisis in 2021. Etihad Engineering, for instance, said it would most likely close the year "pretty much at

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doing extremely well. The region is set up, some of the competitors are in-house MROs as well as independent MROs," he reports. "We look towards Emirates, for example – they led the way with getting their fleet back in the air, with very proactive decisions taken by the leadership there – so Emirates are just marching ahead. I fly on an Emirates A380 very

"We see the MRO industry in the Middle East doing extremely well"

pre-pandemic levels". The emergence of the Omicron variant of Covid-19 caused a dent in market confidence and added to existing uncertainty levels, as with the rest of the world. But there are good reasons to believe this might only be a blip and the growth trajectory seen in 2021 will continue in 2022.

"The Middle East – I always believed and I've certainly seen it – is leading the recovery," says Fraser Currie, CEO of Jordanian MRO Joramco. "We have an order book that is solid. We've just looked at our financial results for 2021 – it's the highest revenues ever recorded in the history of the company. Yes, we're still dealing with Covid but it's right to specifically call it Omicron. We're dealing with Omicron now. The protocols are still the same but we're seeing a completely different profile in terms of the symptoms and the state of the unwellness of the individual who gets it."

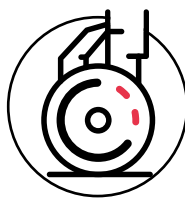
He reports that Joramco is currently at maximum capacity, running 17 lines of heavy maintenance – five widebody and 12 narrowbody. It is even in the position of having to turn work away. "We see the MRO industry in the Middle East

regularly and the aircraft is full – and that's a regional flight in the Middle East.

"There is a bit of a mismatch though between the airlines putting aircraft back and the MROs not having enough capacity to react quickly enough to get them in the air. That was always going to be the case – there was always going to be a bow wave and that is what is hitting now, albeit smaller than expected."

Frederic Dupont, VP of technical sales at Etihad Engineering – one of the largest in-house MRO companies in the region [that also supports third-party customers] – reports a similar situation in which the company is "completely full today. We have secured a lot of new customers and benefited from the recovery of the industry."

Etihad Engineering has had to adjust the make-up of its business as a result of



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↑
Middle East airlines
will require US\$740bn
of aftermarket
services by 2040

1. As well as supporting parent airline Saudia, Saudi Arabian Aerospace Engineering Industries provides third-party MRO services from its base in Jeddah

2. Etihad Engineering has taken on more narrowbody work in light of the pandemic – but widebody MRO has returned in force

2



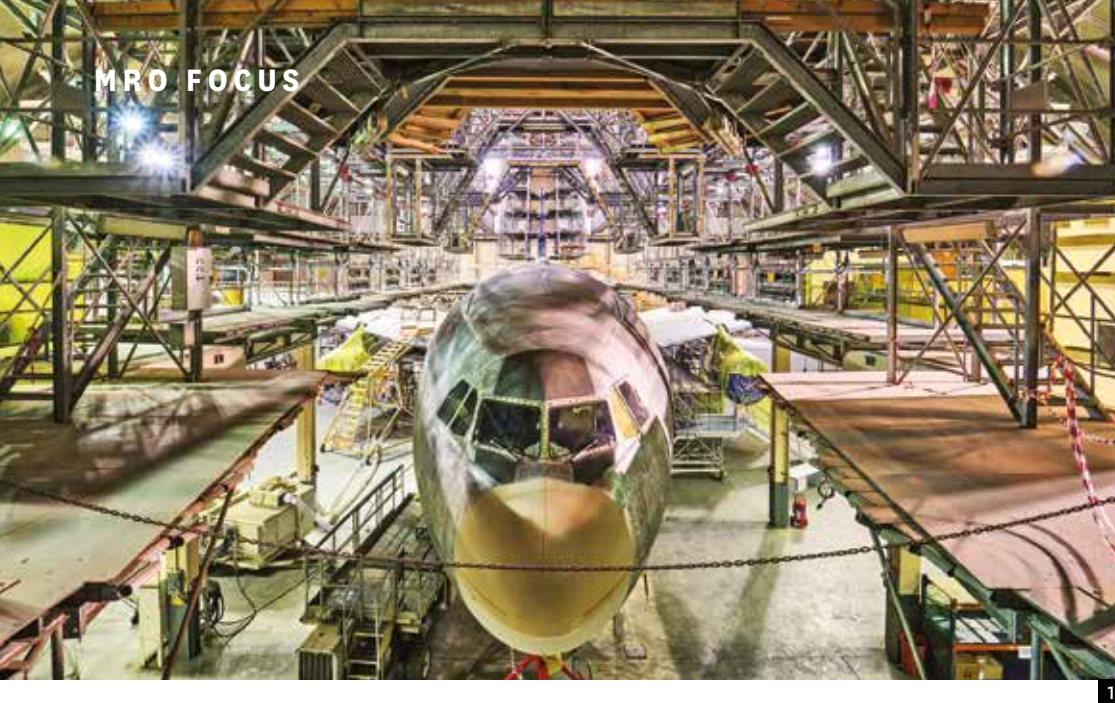
the Covid-19 crisis. Where it used to be predominantly widebody-focused it now has a "significantly bigger content on the narrowbody end", according to Dupont.

That's largely because the MRO recovery was led by narrowbody work as it was these aircraft types which were flying at much greater levels. But widebody work has returned across the Middle East. "We've seen a resurgence in widebody work since the American routes opened up again," reports Currie, "and interestingly we're now turning widebody work away."

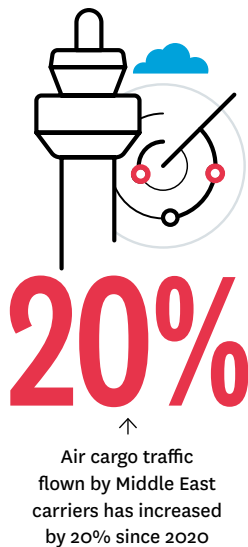
The pick-up in widebody MRO activity in the Middle East will continue in 2022, as the big players operate more flights, Dupont believes. "There's going to be a lot of return to service throughout 2022, as there are still quite a few aircraft parked," he says.

Review of MRO companies

The MRO market in the Middle East is driven by airlines' in-house operations, independent companies and joint ventures and partnerships with both local and international players. MROs from outside the region might also win MRO contracts from Middle East-based



1. Alsalam Aerospace Industries is based in the Riyadh King Khalid International Industrial Zone
2. Emirates Engineering has a big job in supporting its parent airline's fleet from its facilities in Dubai



airlines; in one recent example, Gulf Air awarded Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) a support contract covering the CFM56-5B engines powering its A320ceo fleet. A component support contract for the Kingdom of Bahrain national carrier's A320 fleet is already in place between the two companies, and they have been working together for more than 10 years, initially with an engine support contract for the airline's A320s and A340s.

"It is a powerful signal of our ambition to expand in the Middle East and Africa across the full array of our MRO services and in particular our engine support services, enabling us to respond quickly to demand in an appropriate manner," says AFI KLM E&M's SVP commercial Pierre Teboul.

Turning our attention to Middle East-headquartered MROs, the aforementioned

Etihad Engineering offers light and heavy maintenance including, but not limited to, advanced composite repair, cabin refurbishment and component services around the clock from its facility adjacent to Abu Dhabi International Airport.

The facility has an area of 500,000sq m with 140,000sq m dedicated to aircraft parking and preservation. Aircraft hangars at the facility cover approximately 66,000sq m, including 10,000sq m of aircraft painting facilities.

Flexibility and adaptability proved key for Etihad Engineering in managing the Covid-19 crisis. "In 2022, we are continuing with our strategy to diversify our portfolio," says Dupont. "We are working very hard to be as flexible and reactive as we can, to meet ever changing customer requirements. They are looking for more solution-orientated services rather than one-size-fits-all. We're putting a lot of focus on customer support and experience."

Speaking to MRO Management in 2021, Etihad Engineering's head of

"We are working very hard to be flexible and reactive, to meet changing customer requirements"

MRO sales David Doherty outlined the company's vision to be "the 'MRO of the future', utilising the latest technologies to provide added and differentiated value to our customers".

He said: "We have successfully automated our logistics operation using laser-guided parts retrieval technology and RFID systems; our automated tool management system helps us keep track of thousands of our tools onsite; and we will be ramping up our onsite additive manufacturing capability to produce and certify a wide range of aircraft parts.

"We are also exploring new technologies like drone inspections and artificial intelligence to add more efficiencies to our operations and further speed up our turnaround times."

In its modern facilities in Dubai, Emirates Engineering is another of the large in-house airline MROs that also supports the fleets of 30 other airlines through third-party maintenance contracts.



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1. The Middle East will require 51,000 technicians by 2040, according to Boeing forecasts
2. A partnership between Emirates Engine Maintenance Centre and Sanad Aerotech established a “collaborative groundwork” for the delivery of new MRO services

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with OEMs such as Rolls Royce, GE and International Aero Engines (IAE). Most recently, in November 2021, Sanad signed a technology collaboration agreement with Dubai-based Lufthansa Technik Middle East [a regional subsidiary of Germany-headquartered Lufthansa Technik] to develop innovation and technology solutions to digitalise MRO operations within the aviation industry.

Lufthansa Technik Middle East and Sanad will aim to support the “growing digitalisation requirements of MRO businesses” by investing in research and development. The partners intend to use digital capabilities such as artificial intelligence and virtual reality to reduce turnaround times and costs.

“In the expected return of the MRO business to post-Covid growth, digitalisation will play a decisive role,” says Lufthansa Technik Middle East’s chief executive officer Ziad al Hazmi. “Therefore, we are proud to join forces with Sanad in order to jointly advance our capabilities in this field even further.

“I am confident that this new cooperation will not only improve our competitiveness, but will also open up whole new possibilities and capabilities for MROs in the Middle East. And most importantly, it will soon also yield the first benefits for our valued local and international customers.”

Lufthansa Technik Middle East offers comprehensive component supply and the repair of structural and composite materials for airline and VIP customers as well as maintenance operations on all short- and medium-haul Airbus and Boeing aircraft, including an engine wash service. The company’s airframe related components (ARC) pool provides access to the complete range of spare parts for CFM56-5B and GE90 engines.

The previously mentioned Joramco, in which Dubai Aerospace Enterprise has



2

Offering extensive base and line maintenance capabilities as well as a paint hangar, various overhaul workshops, an engine maintenance centre and an engine test cell, it is well positioned to do so.

The MRO wings of major airlines have in recent times announced collaborations with third-party MRO service providers, and Emirates is no exception. In 2019, for example, through its aircraft engine MRO division Emirates Engine Maintenance

Centre (EEMC), the company signed a Memorandum of Understanding (MoU) with Sanad Aerotech, a wholly owned subsidiary of Mubadala Investment Company.

The companies were aiming to change the UAE’s “future MRO landscape by establishing collaborative groundwork for the delivery of world-class MRO services through shared knowledge and a strong heritage in aviation excellence”. The

collaboration is expected to create aero-engine centres of excellence, dedicated repair and training capabilities, and enable knowledge sharing and technology collaboration.

Sanad has been active in building strategic partnerships, including

“We now have instant access to a ready supply of engine parts and equipment”



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**“Companies will come
to the Middle East
because we do have a
high degree of stability”**

an 80 per cent ownership, is embarking on a growth strategy after successfully navigating the Covid-19 crisis. “There will be a lot of growth, and we’ve secured land deals at Queen Alia International Airport where we’re based, and that’s for the construction of new hangars both for maintenance and paint services,” reports Fraser Currie, who was appointed CEO of the company in October 2021 having previously been the CCO since April 2018 [see page 28 for our ‘Top table’ interview with the executive].

“So we’re pushing ahead with that. Final designs are in an advanced stage now, and we are looking at having all agreements for that in place by the end of the first quarter [of 2022] and having new hangars in place taking aircraft by the end of the first quarter

of 2023. That will put something in the region of another 25 per cent capacity on top of what we have at the moment. We wish we’d built the hangars sooner!”

Qatar Airways is another company expanding its MRO footprint. In April 2021, the company opened a 9,000sq ft engine facility as it aims to streamline the cost of its technical maintenance operations by more than US\$2.2 million per year. The new facility is located in the Qatar Airways Technical Maintenance complex and is expected to enable the airline to improve workflow by over 1,800 man hours per month, or 23,400 man hours per year.

This will be achieved by centralising Qatar Airways’ engine production and engine parts storage processes, increasing the number of its engine production lines from four to eight covering a variety of aircraft engine types. In addition, the facility can house

2



1,570

↑
There are expected
to be 1,570 widebody
deliveries to the Middle
East by 2040

a total of 80 engines of varying sizes in a temperature and humidity controlled environment. Two specialist 'dust control' rooms limit the presence of dust and harmful particles, while a dedicated supply chain area aims to minimise waiting times for the ordering and transportation of spare parts.

Qatar Airways' group chief executive Akbar Al Baker notes a strategy of continuous improvement and expansion of its technical maintenance facilities.

"With the new engine facility, we have not only created one of the most technologically advanced engine assembly and disassembly facilities available within the commercial aviation industry to date, but also doubled our engine production capabilities," he says.

"The facility's extensive dedicated supply chain area also means that we have instant access to a ready supply of engine parts and equipment, reducing

our reliance on external suppliers and further supporting the reliability and technical capability of Qatar Airways' fleet of next-gen aircraft."

MROs in Saudi Arabia are also progressing, but with little external fanfare. Alsalam Aerospace Industries is a joint venture under the Kingdom of Saudi Arabia's offset programme, which aims for self-sufficiency in commercial and military aircraft maintenance, overhaul and modifications. The MRO is based in the Riyadh King Khalid International Industrial Zone and also offers

manufacturing, technical support and VIP interiors capabilities.

Saudi Arabian Aerospace Engineering Industries (SAEI) is wholly owned by parent airline Saudia and is headquartered at King Abdulaziz International Airport in Jeddah. As well as supporting Saudia and its affiliates, the company also provides MRO services to other local, regional and international airlines, and has ambitious growth plans.

Conclusion

There are a multitude of reasons to choose Middle Eastern MROs for maintenance work, according to Joramco's Currie, not least the expertise of the workforce. But he acknowledges that different parts of the Middle East and different companies there offer different benefits.

"The Middle East is not a one trick pony; the benefits of being in Qatar, the

1. Jordan-headquartered MRO Joramco recorded the highest revenues in its history in 2021
2. Aircraft hangars at Etihad Engineering's facilities adjacent to Abu Dhabi International Airport cover approximately 66,000sq m
3. Qatar Airways opened a 9,000sq ft engine facility to try to streamline the cost of its technical maintenance operations

benefits of being in Abu Dhabi, Dubai or Jordan are very different and it all depends on the proposition that you're offering," he says.

One particularly relevant challenge at the moment is the people factor – and the "significant movement of people we're going to see not just in the Middle East but across the globe". Many people were either let go, changed jobs or reconsidered their career as a result of the Covid-19 crisis. "Already the industry is starting to see pressure on people being attracted to new roles across the



region," reports Currie. "Companies have to consider the complete benefits package as they can't focus on rates as the industry is not well positioned to sustain increases."

Regardless of the "shuffling of the pieces" around the Middle East, Currie says the region does have a very stable workforce, and this is a major benefit for MRO companies there.

"People want to be in this region," he says. "The lifestyle, whether it's looking for a family-orientated lifestyle in Jordan or an expat lifestyle in Dubai, once you've made that decision to work in those areas you tend to stick with it. So although you'll see movement of people, it is sustainable. Customers will come to the Middle East because we have a high degree of stability and we do attract the excellent engineers." ☐

BUILDING FOR THE FUTURE

On 1 October 2021, **Fraser Currie** officially became Joramco CEO, having served as CCO since 2018. Here, he outlines the company's ambitious growth plans and future vision

❶ **Joramco appears positioned for growth in the MRO market. What are your plans?**

▲ There will be a lot of growth. We've secured land deals at Queen Alia International Airport where we're based in Jordan, and that's for the construction of new hangars both for maintenance and paint services. We're pushing ahead with that and this hangar growth is our main focus at the moment.

The final designs are in an advanced stage now, so we are looking at having all agreements for that in place by the end of the first quarter, and having new hangars in place taking aircraft by the end of the first quarter of 2023. That will put something in the region of another 25 per cent capacity on top of what we have at the moment.

We had our best year ever in 2021 and have got some very aggressive targets set for 2022. Demand is very strong. Based on modelling we have done internally and



2

“

We had our best year ever in 2021 and we have got some very aggressive targets set for 2022

with our parent company DAE to look at the demand, we will add 25 per cent to our capacity based on what we see. I could build more capacity but I have to build within the constraint of being able to man that facility as well. So 25 per cent is what we can reasonably manage.

Long-term growth will come from different aircraft types. The Covid-19 pandemic has definitely put more aircraft into storage and ultimate teardown than was expected.

For example, there are probably less than five years left to run of the A340 and maybe one or two carriers with the younger airframes will keep it going for a few years more, but we then have to move on and that's why there's a benefit to having a broad spread of capability like we do – into 777s, 787s, MAXs and neos. Some of the legacy types like the A340 will start to diminish and we'll be moving on to the new types.

❷ **Do you see there being an upswing in partnerships, joint ventures or consolidation in the MRO market?**

▲ There is going to be more collaboration. We set up a Memorandum of Understanding with VD Gulf at the last MRO Middle East show [in June 2021] and that is, in principle, where we can come together on new projects. No one MRO can manage the entire fleet of a large airline, so cooperation by the MROs can start to get standard terms, standard turn times, from two independent MROs.

With a single point of focus to the customer, I think in heavy airframe MRO you're going to see more of that. Partnerships with suppliers will become stronger; partnerships with paint specialists for our new paint hangar, for example. That's a route that's very open to us. We need to deliver the best quality service that we can and we'll do that through cooperation and partnership where needed.

❸ **Have the trials and tribulations of Covid-19 encouraged greater collaboration between companies?**

▲ It's been a challenge for MROs and airlines to find a new way of working together. It's certainly my experience



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1. Joramco is currently at maximum capacity, running 17 lines of heavy maintenance
2. The Jordanian MRO company's CEO, Fraser Currie
3. Joramco has seen widebody MRO work increase and expects the trend to continue in 2022



in the past few years, we work hard and we have a reputation of being very cooperative with our customers. We have this very open and transparent way of working with our customers because that was one of our key strategic areas in going from being a small regional MRO into a large world-class MRO.

Although we have very well defined commercial contract terms, we understand that unforeseen circumstances require a degree of flexibility. Lease returns can be challenging, not due to customers being difficult, but when there are three parties in the relationship and not all three are contracted together it's always going to be a challenge; e.g. the MRO, the airline/operator and the lessor.

That can be a difficult relationship to manage and certainly we've had to become much better at navigating three-way relationships. We have a relationship with the customer and we deliver a well-defined package of work, but the airline has lease return conditions with the lessor and that is where the challenges arise that can have an effect on turnaround times. The lessor/airline/MRO connection has been a challenge but one that I hope we've become expert in.

Q What do you see as the main challenges to growth?

A The growth challenges are around people. It's about having a training academy and being able to attract sufficient people into that, because that is the lifeblood of our organisation. We don't tend to take people from outside of Jordan so I have to generate my own staff. So ensuring that I have enough people coming through the academy is a

challenge. I've got to make the aviation airframe maintenance business attractive to a broader spectrum of people, who as we know from the past 10-15 years have been more attracted to new tech roles. Why should somebody come into the maintenance business? That's a challenge that I'm dealing with right now, and then retaining people.

Jordan has got a wonderful history of very smart engineers and there's a huge number of graduates in the engineering industry as a whole in Jordan. Engineering is seen as a high-level profession and aviation is seen as one of the highest professions within the engineering sector. What we're doing now is campaigning to bring more women into the training environment.

We have a lot of excellent engineers within Joramco but they are within our service engineering department or within logistics and administrative roles – we need to get more women onto the engineering maintenance side of things and that hasn't traditionally been a role they would take.

Joramco is constructing new maintenance and paint services hangars at Queen Alia International Airport in Jordan which will add around another 25 per cent capacity

Q How can Joramco help with the global shortfall in training technicians?

A Our academy can offer other countries' airlines the chance to come and buy training from Joramco. Jordan is regarded as

having a fantastic talent pool of future engineers and our academy is regarded as delivering excellent engineers. So we encourage other companies to plan ahead by four years and use our academy to train their future engineers. They can even sponsor an entire course of engineers and we will deliver those to you at the end of the four-year period.

When we respond to RFPs on training, a lot of people are saying there's some great training colleges and academies out there but they don't have the ability to offer the practical training. We're in a very fortunate position where we can do the theoretical classroom and the practical aspects. At the end of four years we can deliver a fresh engineer who is ready to go. And Jordan is a beautiful country to do that in. We'd like to see our training academy grow exponentially. M





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MRO FOR THE CFM56 FAMILY

1. Lufthansa Technik is seeing strong signs of recovery in CFM56 work; it recently won new contracts with Frontier Airlines and Royal Jordanian

CFM56 family MRO providers have adapted as a result of the Covid-19 crisis and found new ways of working, and are now looking to the future with renewed optimism, as **Luke Chamberlain** discovers

Despite production of the CFM56 engine winding down – with the final deliveries of the Boeing 737NG and Airbus A320ceo aircraft having completed in 2019 and 2020 respectively, and the production of spares due to end in 2024 – the narrowbody engines were the first to be reactivated following the Covid-19 crisis. And according to Marcel Gerth-Noritzsch, global product manager at MTU Maintenance, they will continue to be the engines of choice during the ongoing recovery.

“We are prepared for this and expect to see our global MRO levels recover in 2022/23, which is earlier than market predictions, which forecast engine MRO recovery in 2023/24,” Gerth-Noritzsch reports. “We have retained our highly qualified staff during the pandemic and are ready to support airlines once recovery occurs. MTU Maintenance carried out more than 150 CFM56 shop visits last year and is well on the way to achieving pre-pandemic levels for this engine programme in 2022.”

Lufthansa Technik's CFM56 programme is also showing signs of recovery. According to the company's head of engine overhaul, Oezguer Yesilkaya, the company is currently operating on a “significantly increased level” compared to 2020, and in recent months has won new contracts with the likes of Frontier Airlines and Royal Jordanian. However, with a global shortage of parts supply for repair services, “managing our supply chain in order to avoid disruption for our operation and ultimately safeguarding our airline customers' operation is our key target”.

With record demand for air cargo, one of the challenges of the Covid-19 crisis, Aero Norway notes the high number of ‘classic’ freighters now at its facilities. “Our focus has always been to get more -5Bs and -7Bs into the shop. In 2019, 63 per cent of our inductions were CFM56-5Bs and CFM56-7Bs, with

37 per cent CFM56-3s [the first derivative of the series],” says the company's global sales and marketing director Ramon Peters. “Our forecast for 2021 was 72 per cent -5Bs and -7Bs, and 28 per cent -3s, and we had paved the way to encourage those customers into the shop.

“However, the actual split in inductions between CFM56-5Bs/CFM56-7Bs and CFM56-3s has been 52 per cent to 48 per cent. Although this is not the worst-case scenario by any means, it is certainly not what we had envisaged and planned for. We would of course like to focus more on the -5Bs and -7Bs, however supporting our customers remains a priority and we have already agreed

to support their CFM56-3 requirements until 2026. Although these rewards may be limited in the short term, in the long run business will perpetuate as these carriers will fly the new generation engines in the future, so we can undertake the -7B work.”

**“The CFM engine
MRO market
has always
been very
competitive”**

New ways of working

In many cases, CFM56 service providers are turning to new ways of working as the industry recovers from the Covid-19 crisis. As Peters explains, Aero Norway continues to come up with “creative and clever solutions”

to help its customers. “We are constantly reassessing, re-evaluating and looking for ways to improve our processes in pursuit of reduced turnaround times.

“In 2019 we invested in a state-of-the-art high-speed grinder, which was followed by an upgrade to our plasma spraying machine and most recently to our static balancing machine. We are also carrying out numerous small projects around the shop to benefit our customers and this time has given us the opportunity to complete these.”

In terms of its workforce, Peters says the company was initially forced to modify working patterns to accommodate social distancing measures – but this has benefitted Aero Norway in the long-term. “We have followed all the guidelines set by the Norwegian government with regard to restrictions to visitors in the



1. MTU introduced the CFM56-7B to its facility at Berlin Brandenburg Airport last year
2. Lufthansa Technik says it improved its services portfolio throughout the Covid-19 crisis
3. Aero Norway has invested in new equipment and upgrades for the benefit of customers

1

shop, and business travel,” he says. “We have found that having engines for repair has enabled us to provide a socially distanced physical barrier for our team who can position themselves at intervals around the engine; any collaborative work or checks have been carried out with social distancing in mind. This was only for a short period, but it ensured Aero Norway kept all of its workforce and maintained its work culture.

“This means that we are still staffed on 2019 levels and even hired six new technical apprentices in September. Getting back on track for an increase of CFM56 MRO work and preparing for LEAP MRO are our main goals and we look to the future with confidence.”

MTU’s Gerth-Noritzsch stresses the importance of adapting its approach according to operator needs. “The MRO focus for operators with younger fleets tends to be on generating more flight hours with customised solutions. We achieve this with intelligent fleet

management that optimises removals across a defined period. Such services are complemented by predictive maintenance, based on engine trend monitoring, on-site services and spare engine support,” he explains.

“This is particularly key at the moment as operators turn to smaller workscopes and on-site fixes to extend time on-wing during the crisis. Such workscopes are also highly suited to CFM56 engines, as they were designed to enable more on-wing fixes than previous generations and are built in such a way that modules can easily be swapped as needed.

“Managing our supply chain to avoid disruption is our key target”

“Once an engine comes into the shop, our customised workscoping, EASA-FAA approved repairs and our engineering expertise help lower overall costs. We call this programme ‘PERFORMPlus’. This is particularly relevant for customers preparing for increased flight schedules later in the year and we are seeing a number seeking full shop visits and carrying out long-term planning.”

MRO costs naturally increase as engines age, and Gerth-Noritzsch says this is why MTU also offers “smart strategies” for mature engines. “Our fully independent solutions include alternative MRO, such as smart repairs and tailored

2



workscopes to suit operators’ remaining flight periods as well as material salvation and intelligent teardowns,” he says. “Furthermore, these services can be combined with alternatives to MRO such as leasing in of green-time engines or exchanging engines for the remaining period until phase-out.

“This service solution goes by the name of ‘SAVEPlus’. We expect increased utilisation of used serviceable material (USM) in the coming years. and, through our extensive experience and material management services from our leasing company MTU Maintenance Lease Services, are confident we can provide a reliable supply of USM for customer shop visits at fair market prices.”

Smarter digital services will also help to support an effective post Covid-19 industry restart, according to Gerth-Noritzsch. Summarising how MTU is embracing predictive maintenance,



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1. MTU expects to see a trend towards ad-hoc hospital shop visits and smaller worksopes over full-scale core performance restorations

Adapting to customer requirements is one way for CFM56 MRO providers to stand out from competitors, according to Peters. "At Aero Norway, we distinguish ourselves mostly by the way we adapt to our customer requirements. We offer multiple tailor-made added-value solutions, varying from technical, financial, material, logistics or a turnaround perspective. We go the extra mile in fulfilling customer requirements."

Looking forward

Aero Norway remains positive there will be an upturn in MRO requirements for the CFM56 engine family over the coming year. However, as Peters puts it, "we do not know exactly when it will happen. By the end of 2022 to mid-2023 we would expect to see an increase in demand for CFM56-5B and -7B and LEAP maintenance worksopes. Single aisle aircraft operation is rapidly increasing in Europe, and we expect to see a shift in MRO requirements in the coming year."

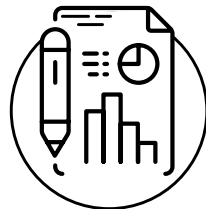
Yesilkaya says Lufthansa Technik is "very much looking forward" to 2022, holding the view that while domestic air traffic and the need for CFM engine MRO services are strong, capacities in the market remain limited. "Airlines should make sure they secure themselves – right now – sufficient capacity for engine MRO services for the next few years," he says.

MTU expects to see a trend towards ad-hoc hospital shop visits and smaller worksopes over full-scale core performance restorations, which Gerth-Noritzsch says is one reason the company has added on-site capability around the world and opened a dedicated facility near Berlin.

"We expect to see a continued trend away from traditional planning with fixed maintenance intervals to more

individually tailored solutions," he says. "Some airlines are concentrating on short-term savings with cash preservation as the main objective, while others are focusing on long-term planning. MROs must flexibly meet both goals to provide the best solution for customers." 

"We are constantly looking for ways to improve our processes"



2023

↑
By the end of 2022 to mid-2023 Aero Norway expects to see an increase in demand for CFM56-5B and -7B and LEAP maintenance worksopes

he explains: "At MTU, our engine trend monitoring tool was introduced in 2006 and is continually developed. In 2021, we took it to the next level and integrated it into our proprietary engine fleet management software 'CORTEX' to support our customers. Using CORTEX, an intelligent maintenance costing and planning tool, we generate engine fleet management scenarios and worksopes.

"Smart predictions by use of artificial intelligence enable customised, immediate and proactive MRO planning options not currently available on the market today. Fleet planning scenarios can be immediately and endlessly adapted as the financial, technical, operational, environmental and market considerations continually change – as we are experiencing daily at this time."

Competition

A positive sign of recovery is that competition remains strong among CFM56 MRO providers, with Air France Industries KLM Engineering & Maintenance, ST Engineering, SR Technics and StandardAero among the major players in the field [besides those already mentioned]. According to Gerth-Noritzsch, competitiveness has only increased as a result of the pandemic. "The CFM engine market has a large number of MRO providers and has always been very competitive – though we would add this is good for

customers, who are sure to get the most competitive offers for services."

Last year, MTU introduced the CFM56-7B to its facility at Berlin Brandenburg Airport, making it the third within its network capable of servicing the engine family. "This signals our commitment to the engine programme well into this decade," says Gerth-Noritzsch. "We also opened a new on-site services space near Berlin with quick-turn docks that is specialised in on-site and near-wing events as well as hospital shop visits. The first CFM56

engine was in this area in December. This success is something we intend to grow upon, and we aim to become the number one on-site and near-wing engine service provider in Europe with this facility."

Lufthansa Technik's Yesilkaya notes that with the company's "on-site service teams and our global network of repair stations, we are well positioned to support our customers". During the pandemic Lufthansa Technik "kept working on our strategic fields of actions and improved our services portfolio and competitiveness to increase our market share".



TECHNICAL RECORDS IN THE DIGITAL AGE

Mario Pierobon reached out to industry experts to assess the state of the commercial aviation MRO sector's transition to digital records

1. AFI KLM E&M aims to develop software which includes all the information a mechanic needs, supported by an iPad and apps



“Individual airlines and MROs experience different progress depending on the target output and possibly deviating from it under the framework conditions of the prevailing pandemic and the associated investment opportunities or obstacles.”

Recent developments in remote collaborations and virtual inspections have

stretched the boundaries of technical records to also manage new forms of data like voice and videos with the ability to archive and audit for regulatory purposes, according to Saravanan Rajarajan, director of aviation solution consulting at Ramco Systems. “The rapid progress and maturity of mobile technologies and digital content availability has made shop floor digitisation a reality,” he says. “Paper-based recording of observations and findings are replaced by digital recordings.”

An MRO’s success in working fully digital can be measured by the amount of functionalities it can offer in a digital way to a mechanic, according to AFI KLM E&M. “We develop software which is intended to include all the current and future information a mechanic needs to be fully ‘hands-on-metal’ supported by an iPad with high-quality apps,” the company says. “The current state of development of these apps is that mechanics can

already execute and electronically sign their maintenance tasks, consult aircraft documentation, monitor progress of the overall maintenance check, appoint cards for execution, and create faults and non-routine cards, among others.”

Indeed, most aircraft OEMs now deliver documentation such as aircraft maintenance manuals and task cards in an electronic format which makes it a great source to generate digital ‘mechanic-friendly’ work instructions, observes Julien Methot, head of consulting services, projects & digital solutions at Swiss AviationSoftware. “Many airlines and MROs have rolled-out this technology using iPads for their line and base maintenance. About 40-50 per cent of our customer base have either completed or started an implementation of such digital task cards,” he says.

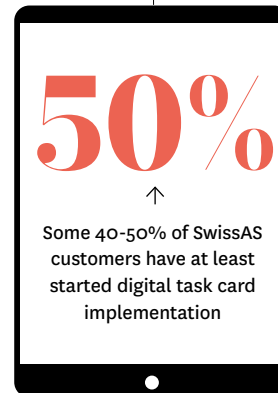
OASES’ product manager Adam Frost comments: “We are starting to see electronic task cards becoming available for conducting maintenance activities, although fewer organisations have implemented them so perhaps there are still some practical challenges to overcome. There is now sufficient acceptance of the required technologies to allow electronic task cards to succeed.”

Dealing with older paper records

Having everything digital and well organised – including older records – is a goal

every MRO should have, according to AFI KLM E&M. “Searching for maintenance records in a paper environment is time consuming. A well-organised digital environment is the solution to this. One should start with organising the environment well and then decide for which maintenance records it would be valuable to digitise.”

Lufthansa Technik’s Joppe observes that in the case of older aircraft maintenance records of still active aircraft, supervisory authorities could agree to digitise them with the aim of destroying the physical documents. “A digitisation of physical aircraft maintenance records with the aim of better and faster data access has long



Aircraft maintenance, repair and overhaul organisations are increasingly adopting digital solutions to unlock value through end-to-end digitisation processes. In parallel, the industry is progressively getting rid of paper records, but there are still requirements to keep such paper records in some areas of the business.

Moving away from paper in an efficient way is a challenge many MROs are currently facing, according to Air France Industries KLM Engineering & Maintenance (AFI KLM E&M). “Though software is already used for planning maintenance during maintenance execution, paper is a standard many MROs still use,” the company says.

Transition to digital

According to Mark Joppe, project leader paperless maintenance at Lufthansa Technik, the industry is definitely transitioning towards digitisation. “While some airlines and MROs are targeting the theme of a fully digital company, others are still in the early stages of digitisation,” he explains.

“THERE IS SUFFICIENT ACCEPTANCE OF THE TECH TO ALLOW ELECTRONIC TASK CARDS TO SUCCEED”

Illustration: Phil Couzens



1. The MRO industry is progressively transitioning from paper to digital records – but there are some cases where paper is required
2. AFI KLM E&M's 'PROGNOS' tool offers a range of predictive maintenance solutions to optimise airframe and engine MRO operations

1

been recommended by ICAO and IATA and is practiced most frequently," he says.

That historical aircraft MRO records do need to be scanned and archived is a requirement coming from various local aviation authorities, affirms Swiss AviationSoftware's Methot. "These scanned records are indexed and are fully searchable. Typically, the dirty

fingerprint (DFP) document scanning and indexing is outsourced to specialised service providers. Using smart-OCR, the form's written texts can be used to create the digital records," he says.

According to Ramco's Rajarajan, converting older paper records to digital is of use if there is a business case and the availability of the right tool to derive value out of the data. "For example, our artificial intelligence and machine learning (AI/ML) capability leverages data and advanced algorithms to

40%

↑
Companies can save 40% of their department expenses due to automation of manual processes

derive insights for tactical intelligence," he says. "Leveraging the expertise of our MRO Lab in Singapore, we are actively working with our customers on their specific use cases leveraging robotic process automation (RPA) bots for missing paperwork, missing data entry and reviewing accuracy."

The way in which physically available

aircraft maintenance records are digitised is not a question of the technical possibilities but is dependent on the resulting cost versus benefit ratio with regard to statically available data up to dynamically usable data or data sets, affirms Joppe. "Out of these data and aircraft generated data, Lufthansa Technik has been providing services from the 'AVIATAR' product environment for years, helping many operators avoid AOGs and improve other airline service levels in terms of technical key performance indicators, such as delay or cancellation rates," he says.

Current and upcoming features

The digital planning and storing of maintenance tasks has been mainstream for many years, says AFI



2

KLM E&M. "Next is a strong digital connection with everything which can impact maintenance. Availability of parts, people and skills software companies and platforms offer more and more possibilities to integrate and communicate with other software tools – for instance, warehouse related software, flight planning software or HR software (presence of people and skills)," the company notes.

The use of aircraft data, aircraft maintenance records data, as well as other MRO data for proactive, preventive and predictive business cases is being set up with different application depths depending on individual airline operators, observes Joppe. "From the point of cost-sensitivity – especially after the pandemic – this will come more into focus. It is to be expected that electronic technical logbook systems will also

"ELECTRONIC TECHNICAL LOGBOOK SYSTEMS WILL RECEIVE A BOOST IN THE COMING YEARS"



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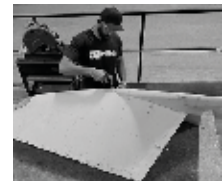
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**“THE FULL EXTENT
OF DIGITISATION
WILL DEPEND ON AN
AGREEMENT ACROSS
ALL STAKEHOLDERS
WITHIN THE INDUSTRY”**

receive a further boost in the coming years and will be used more widely in the form of basic equipment or expansion to in-flight connectivity,” he says.

“Lufthansa Technik is offering an already tested and approved ‘eTLB’ digital solution, which is actually on rollout on one of Europe’s largest low-cost carriers. Some airlines have already contracted and signed on, and many more are in advanced discussions. Lufthansa Technik has a mobile, integrative paperless maintenance application that has been used for years in the hangar environment, but also unrestricted on the apron, giving aircraft technicians all the AMR documentation and approved data libraries access they need, including the ability to integrate eTLB documentation, with a strong focus on usability.”

According to OASES’ Frost, electronic technical logs are becoming common and, in addition to removing duplication of effort transcribing paper records to digital, their main benefit is the improvement in the timeliness of the data available. “This opens up a whole new range of possibilities for future innovation,” he says. “In an operational environment, early visibility of defects and trends can significantly reduce disruption to the flying schedule.”

Providing an end-to-end service including the scanning of historical records in addition to rolling-out a pre-configured cloud-based system makes the implementation and adoption of MRO systems easier, Methot says. “The combination of both data and digital records makes several airworthiness review processes much more efficient, such as aircraft phase-in/-out, lease returns and back-to-birth component traceability,” he says. “SPEC2500 is the main key and driver for the upcoming



industry digital collaborations. It will enable aircraft data transfers between operators, lessors, MROs and OEMs.”

Digital only?

Czech Airlines Technics has been using MRO software since 2008 and is gradually digitising where regulations allow. “We are currently implementing another quality management system (QMS) solution which should allow us to further reduce paper records,” the company reports. “Paper records are still required; it is given by the legislation. The extent of digitisation will depend on an agreement across all stakeholders within the industry.”

Paper records are still commonplace, and some paper forms are still attached to work instructions. If used, these forms will eventually be scanned and archived, observes Methot. “Ideally, these paper forms should be transformed to online forms with direct data entry,” he says. “The same can be said for any type of approval form. The IATA Digital Aircraft Operations vision and mission is to transform all aircraft maintenance to a paperless environment.”

Methot believes “it will happen one day”, but because aircraft maintenance is “a multi-layer process across several areas – from the cockpit’s techlog book to each component shop’s release certificate and sub-contracted line maintenance stations – several stakeholders have to become ‘digital/paperless’ for the industry to be digital only”.

According to Joppe, as long as the relevant authorities clearly do not perceive and permit the digitisation of

“A WELL-ORGANISED DIGITAL ENVIRONMENT IS THE SOLUTION TO A TIME-CONSUMING SEARCH FOR PAPER RECORDS”

aircraft maintenance records or OEM documents with regard to the use and approval of aircraft across the board and uniformly, the use of paper will remain unavoidable. “As to when this will completely change is a look into the crystal ball; however, a timeframe of 5-10 years can be assumed,” he says.

“An important step in this direction would be the standardisation of data formats and structures and the definition of generally applicable data exchange options and B2B interfaces, and finally the mutual recognition of digital signing procedures (CRS), which – as a must – take into account the needs of airline operations.”

1. Digital records improve the timeliness of data availability – potentially allowing defects and trends to be identified earlier

2. Paper records are still required in many cases, but some believe it is only a matter of time before the industry becomes digital only

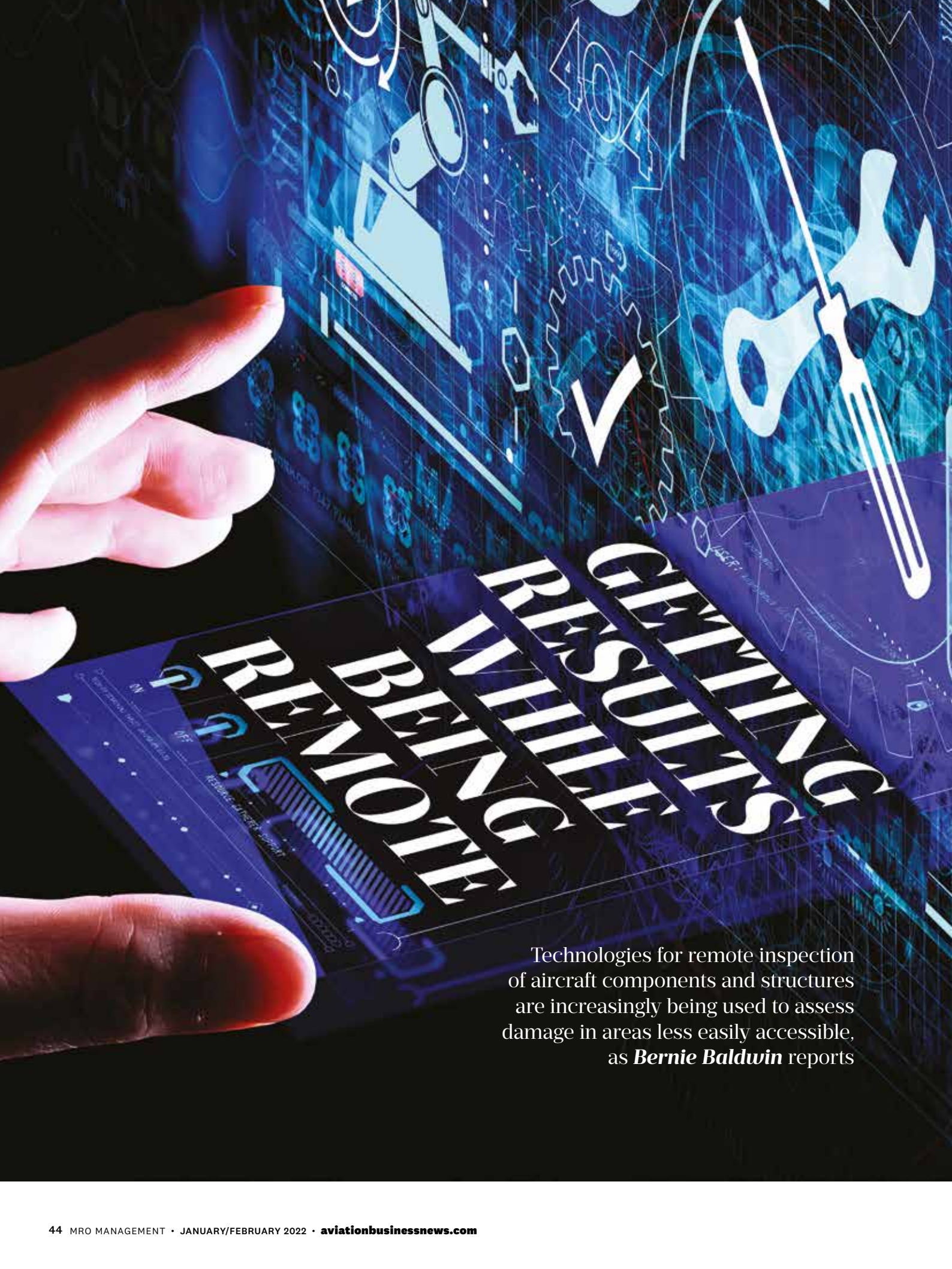
Technical records departments spend considerable effort and time whenever they deal with paper-based documentation for managing error correction, reviewing accuracy, scanning and archiving. Efforts tend to be significantly higher if the organisation does not have a proper technical records system in place, observes Rajarajan.

“We have seen that in pursuing a comprehensive technical records digitisation process, organisations can save 40 per cent of their department expenses due to automation of manual processes and considerable savings on stationary at the organisational level,” he says.

“Full digitisation is possible if there is global consensus among regulators, airlines, lessors and MROs. Until then, organisations have to adapt to process adhering regulatory requirements (such as maintaining a paper trail like DFP) and leverage technologies in parallel to derive value from the data.” **M**



Illustration: Phil Couzens



Technologies for remote inspection of aircraft components and structures are increasingly being used to assess damage in areas less easily accessible, as **Bernie Baldwin** reports

**“TECHNOLOGIES
SUCH AS NANOBOTS,
ROBOTIC ARMS
AND DRONES
ARE ATTRACTING
ATTENTION”**

There's many a time that it has been said that in aircraft maintenance, one of the most important tools is 'the No 1 eyeball'. Even with sophisticated technologies, visual inspection still plays a major role in MRO, but there are times when having the 'right experienced eyeball' in the right place is not possible and inspections must be carried out remotely.

Holger Debuch, project manager at Lufthansa Technik's Engine Services division, explains how that can be done. "In our engine overhaul workshops in Hamburg, we now enable our customers to skip the classic in-person 'table inspection' of dismantled engine parts, and use a remote live-video-based solution instead. The latter delivers a high-resolution live video stream directly to our customers, who no longer have to travel to Hamburg to personally inspect their engine parts in order to make their repair decisions," he begins.

"The video – with up to 4K resolution – uncovers even the smallest details, so customers can rely on crystal-clear images for their important repair decisions. Moreover, the video stream is embedded into our 'AVIATAR' digital operations tool suite that unites all standardised engine event communication between customer and MRO in one platform," Debuch adds. "This Virtual Table Inspection (VTI) was trialled some years ago, but Wi-Fi technology back then created a number of drawbacks, including impaired video quality – an absolute no-go for customers making repair decisions that could easily exceed US\$100,000 for a single part.

"In early 2020 – luckily just before the pandemic hit – we inaugurated our first two dedicated 5G campus networks, one of which is used exclusively for the VTI. We were supported in the adaptation of the 5G technology by Nokia," he continues. "This technology plus our own independent frequency enabled us to tailor the 5G network perfectly to the VTI use case and overcome all Wi-Fi problems, which promoted the VTI to a suitable alternative. When the pandemic struck and travel restrictions stopped customers travelling to Hamburg, the RTI quickly evolved from a test case to become a business-critical infrastructure.

"Based on very positive customer feedback, we officially promoted RTI to a standard offering in 2021. Moreover, we expanded the remote inspections to other engine services, such as remote borescopes," Debuch reports. "Here, the



1. An AI-assisted inspection drone performs an automated visual inspection of a Boeing 737-500 at a hangar in Lufthansa Technik's base in Hamburg, Germany

“WE HAVE NOW MADE A BIGGER STEP TOWARDS AUTOMATED INSPECTIONS OF AN AIRCRAFT’S SKIN”

extremely high video resolution means our customers can request digital measurements within the live video stream, and in one case a customer clearly identified a scratch mark that measured a mere 0.3 millimetres!

“With eased travel restrictions, some customers have returned to sending their representatives to Hamburg to perform table inspections, but many have stuck with the remote solution that is much less time-consuming and also saves on travel expenses.”

At Rolls-Royce, a portfolio of new technologies is in the early stages of development and feasibility testing with the potential to provide remote inspection and repair in the future, according to Ian Mitchell, the company's chief of technology – repair technology and services.

Among the examples are: miniature wireless cameras for inspection of static components which are difficult to inspect with conventional videoscopes; embedded camera systems that could be deployed on the ground for more highly embedded future architectures; and advanced engine health monitoring sensors to provide more information on the performance and condition of the engines in operation.

“These systems will be connected via our digital platforms to realise the ‘IntelligentEngine’, [the company’s programme which sees an engine being ‘increasingly connected, contextually aware and comprehending, helping to deliver greater reliability and efficiency’],” Mitchell explains.

“This will enable us to treat each engine as an individual and tailor the intervention and servicing required to optimise the availability and reliability

AIRBUS ASSESSING REMOTE INSPECTIONS

Although it does not carry out MRO work itself, Airbus – through its Airbus Services division – is constantly seeking to develop technologies to support its customers. Like Rolls-Royce, the topic of inspections is a key one.

Airbus emphasises that while nothing is yet definite, it is “actively considering combining its internal expertise on both UAV and aircraft production to improve aircraft fleet efficiency during inspections, both planned and unplanned”.

Looking at the ground services equipment on the Airbus Services



1. This Airbus Services Combo kit contains ‘LineMAP’ and ‘LineSIZING’ ground support equipment



LineMAP integrates the aircraft 3D design model for precise damage location, mapping and assessment to be completed in 5-15 minutes and increases damage location accuracy

web page, the ‘LineSIZING’ and ‘MAP Combo’ tools used for simplified analysis of aircraft composite structures could well be candidates for such an upgrade. The LineSIZING tool developed by Airbus enables suitably qualified mechanics to perform damage sizing and stringer de-bonding

**Automatic
analysis detects
potential damage
and its size**

assessment on monolithic CFRP. Damage assessment can be carried out using an ultrasonic C-scan to assess the composite.

The scan is displayed on screen but “no interpretation is necessary as the tool automatically measures the damage area and displays the results”. LineSIZING can be performed anywhere, even at the gate. Data is displayed in real-time and automatic analysis detects potential damage and computes its size. The aircraft can be released if no delamination is found or if delamination is within allowable limits, avoiding specialist analysis and costly delays.

‘LineMAP’, meanwhile, is a solution for localisation of damage on an aircraft. With few surface features on composite structures, identifying the location of any damage can be difficult. LineMAP answers this problem by integrating the aircraft 3D design model (the ‘Digital Mock-Up’) for precise damage location, mapping and assessment to be completed in 5-15 minutes and significantly increases damage location accuracy. Adding technologies such as drones to these solutions could unlock further benefits.

of the asset for us and our customers. We are also investigating the ability to remotely operate deployment systems such as the ‘COBRA’ snake robot.”

Rolls-Royce has developed the aforementioned technology in-house or via its University Technology Centre (UTC) network. “Partners such as the University of Nottingham (our UTC for manufacturing and on-wing technology) have been crucial in developing innovative solutions to the complex challenges presented by our existing gas turbine architectures as well as the sustainable propulsion systems of the future such as electric or hybrid electric,” Mitchell remarks.

“These innovative technologies are often delivered through collaborative projects enabled by contributions from funding agencies such as the Aerospace Technology Institute (ATI) and Innovate UK. These projects allow us to bring

Photo by Jan Brandes/Lufthansa Technik



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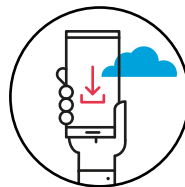


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together a broad range of expertise in robotics, optics, automation and machine vision technologies. Our 'REINSTATE' programme is a great example of this, where we collaborate with partners Roke Manor, BJR Systems, Clifton Photonics, MTC, and the Universities of Nottingham, West of England, and Sheffield on developing miniature maintenance and inspection tools as well as new repair technologies."

He continues: "Inspection is an important area for us at Rolls-Royce, particularly in the context of our IntelligentEngine, where monitoring engine

condition in a structured and repeatable way is a cornerstone of the vision. An example of the future direction of this is where we are developing inspection technologies to extend our capability beyond the conventional vision-based systems into techniques such as spectroscopy for chemical analysis at component level and in-situ.



5G

↑
Inspections using live video require a strong internet connection, which 5G technology has made possible

"We are, of course, continuing to mature snake robot deployment systems with diameters small enough to fit into borescope ports on the side of engines (some of the snakes are smaller than 10mm). The length of the snakes are intended to pass far into the engine and include developments which allow us to know exactly where they are, what path they are taking, as well as fixturing technology to allow them to support their own weight and be useful in situations where gravity works against you with conventional

borescope devices. They are also designed to be generic and allow a range of techniques to be delivered by them, from inspection techniques to repair."

Technologies – including nanobots, robotic arms and drones – are also attracting attention elsewhere. Lufthansa Technik has been one of those monitoring, assessing and sometimes adopting these, and more.

Jan-Christopher Knufinke, lean innovation manager at Lufthansa Technik in Hamburg, confirms that the

"OUR NEXT STEP WILL BE TO IDENTIFY FURTHER USE CASES FOR DRONE TECH BASED ON OUR FINDINGS"

1. A Rolls-Royce 'COBRA' snake robot on an engine attached through a borescope port
2. A graphical use interface connects the high-resolution video stream with Lufthansa Technik's 'AVIATAR' digital operations tool suite in which the customers can make their repair decisions in order to trigger the underlying fulfilment processes
3. A Lufthansa Technik engineer performs a remote inspection on a large engine component using a handheld device delivering high-resolution video to the remote customer
4. Rolls-Royce's snake robots are designed to be generic and allow a range of techniques to be delivered, from inspection techniques to repair

Photo by Jan Brandes/Lufthansa Technik



4

provider with data-driven production. Use of a drone will support the competence of our mechanical experts, so its recording system only pre-selects surface damage, but leaves the actual damage repair – defect rectification – to the highly qualified experts.

“At the current development stage, we are capable of autonomously flying a drone within one metre of the aircraft's skin.

a broad spectrum of surface damages, ranging from dents to buckles or scratches or even scorch marks from lightning strikes. Once identified, any damage location is saved and relevant information for its rectification is automatically extracted from the relevant maintenance documents.

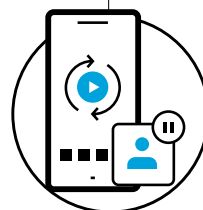
“From the three-year project, we already learned that such automated

drone inspections can indeed lead to increased efficiency and reduced turnaround times, by simultaneously allowing our experts to focus their attention on the rectification of damage detected during the drone flight. However, we also learned that implementation cannot be accomplished overnight, as infrastructural adjustments are also necessary for integration into routine processes. And, of course, all legal requirements must be taken into account.

“That being said, our next step will be to identify further use cases based on the findings from this research project. It will be especially

interesting to follow how further data, including historical data, can be integrated into the processes.”

Given the benefits already being accrued by these technologies, the results should be of industry-wide interest. **M**



0.3

A scratch mark that measured just 0.3mm was identified by a Lufthansa customer in one live video stream

company has been trialling the use of drones for visual aircraft inspections for several years. “Maintenance checks commonly involve mechanical experts who thoroughly inspect the outer skin of an aircraft, spending a lot of time in a crouched or crawling position, secured by harnesses that keep them safe at great heights. This rather uncomfortable and stressful working environment for a human could thus be the perfect playing field for a drone,” he comments.

“While earlier projects mainly relied on manual operation of the drone, a joint research project has seen us make a bigger step towards automated inspections of an aircraft's skin,” Knufinke adds. “Here, we see drones not only as one promising tool to increase efficiency and reduce turnaround times, we consider them a promising technology to support our transformation into a holistic tech-ops

The 3D imaging of hangar infrastructure, aircraft and ground support equipment ensures a permanent orientation and safe operation of the drone within the hangar at all times. Using a 3D light detection and ranging (Lidar) sensor technique, the drone system is not only capable of providing automatic collision avoidance and obstacle detection, it captures high-resolution images from surface damage in a size of 5mm x 5mm (25 mm²) in full HD resolution.”

He adds: “While the drone completes its inspection flight along the pre-defined and most efficient path, artificial intelligence (AI) applications process – in real-time – the high-resolution imagery from which they can identify

THE COMPLETE PICTURE

A range of activities covering an aircraft's entire lifecycle will be conducted at a new Airbus facility in China – ensuring more planes get either a new lease of life or a sustainable ending

Airbus has revealed plans to open the world's first "sustainable aircraft lifecycle centre" in China. In January, the multinational aerospace corporation signed a Memorandum of Understanding (MoU) with the Chinese city of Chengdu and France-headquartered aircraft recycling and maintenance provider Tarmac Aerosave – with a formal agreement to establish and frame the industrial cooperation expected to be signed in mid-2022.

The new centre, which will cover a surface area of 690,000sq m and have a storage capacity of 125 aircraft, will house a range of activities including aircraft storage, maintenance, upgrades, conversions, dismantling and recycling services for various aircraft types. Airbus subsidiary Satair will acquire the ageing

aircraft, before trading and distributing the resulting used parts to complete the full scope of lifecycle services.

Airbus' head of lifecycle solutions development Wolfgang Kortas claims the centre will lead to more sustainable MRO practices. "According to Airbus' projections and Tarmac's operational experience, we expect about 75 per cent of the aircraft stored in the centre to fly again having received maintenance and upgrades to transition them into an

"We expect 75 per cent of the aircraft stored to fly again having received maintenance"



re-use and recycle around 90 per cent of the weight of a dismantled aircraft."

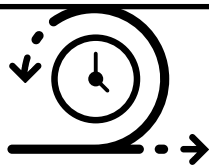
The proposals for the centre mark Airbus' latest effort to improve its operational sustainability as the company continues to deploy its sustainability road map.

Klaus Roewe, senior vice president of customer services at Airbus, describes the centre as "another concrete contribution" to the aviation industry's quest for sustainability.

"This unique centre will support the expansion of Airbus' aviation services while enabling the implementation of China's 'Green Industry' strategy," he says. "Aircraft phase-out in China is forecast to grow exponentially over the next 20 years. Airbus is committed to investing in the region and this one-stop-shop – a first in China and outside of Europe – will see Airbus well positioned on the Chinese aircraft 'second life' services market." 📌

eco-efficient second life as passenger or freighter aircraft," he says.

"Of those aircraft not returning to service, the centre will remove a great number of valuable parts and components for re-use on other serviceable aircraft. Using Tarmac's unique eco-efficient process, the remaining aircraft structure will be dismantled for recycling of the raw materials. End-to-end, [we expect] the Airbus Lifecycle Services Centre will



90%

↑
End-to-end, the Airbus Lifecycle Services Centre will re-use and recycle around 90 per cent of the weight of a dismantled aircraft

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