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MRO Management

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Breaking Good

AerFin's growth business

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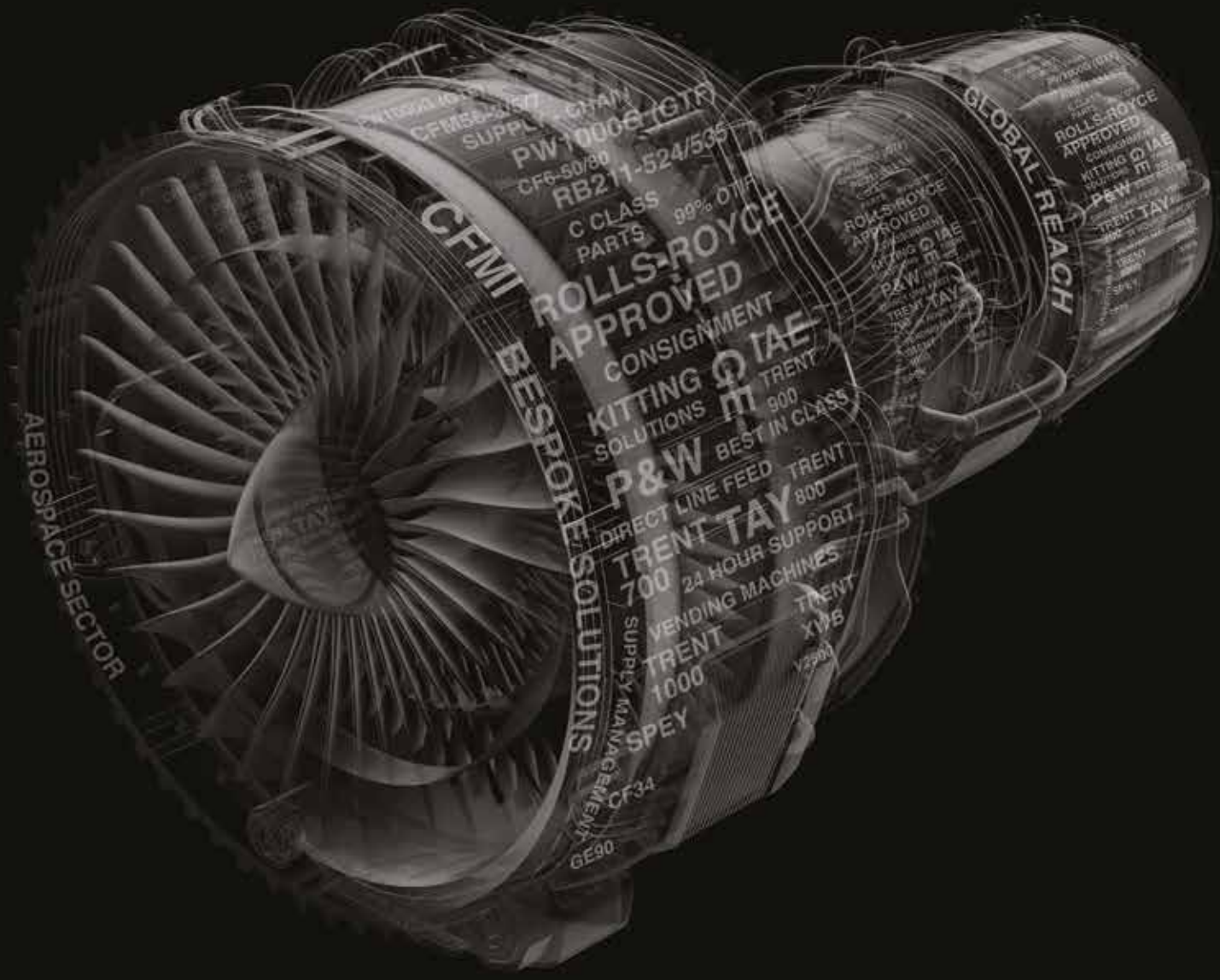

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Editor's LETTER

IAN HARBISON
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Welcome to the exciting new issue of MRO Management. This is our 22nd year of publication and as you will see, we have given the magazine a fresh, contemporary look that I hope you enjoy. Inside this issue you'll find some great new regular features plus in-depth reports and I am very pleased to announce that we are increasing the frequency of the magazine to six times a year. This will give us the opportunity to bring you the very latest on this fast-moving industry.

Our experienced editorial team will continue to bring you the most comprehensive coverage of the industry and with our fresh new approach, we aim to be your magazine of choice, bringing you the very latest from experts and industry figureheads. We will be concentrating on two of the biggest challenges facing the industry today – training and sustainability - and engaging with key industry executives to seek out their views and opinions.

Coupled with this, we have revamped our website – see aviationbusinessnews.com – bringing you the latest news and views in our industry.

I hope you enjoy reading our new-look MRO Management.

The industry seems to be in a good place right now. MRO Middle East in Dubai at the end of February will be a good barometer and we hope to see you there. Certainly, there is confidence for the long term with the construction of new facilities such as XEOS (see page 28); Avia Prime, the Czech-Polish aviation conglomerate winning a tender to acquire 99% of JAT Tehnika.in Serbia (see page 20); and, despite some uncertainty about Europe, a US company, STS Aviation, making UK acquisitions with Apple Aviation (see page 32). Our focus on the environment continues with a look at a new road map for sustainable aviation fuels in the UK (see page 52).

Ian Harbison
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Photo: ST Engineering

FACILITIES

New MRO in Vietnam?

An airframe MRO joint venture (JV) is being explored by ST Engineering in Vietnam with Vietnam Airlines and other potential airline partners.

The JV will operate out of Vietnam Airlines' facilities located at Noi Bai International Airport in Hanoi and Tan Son Nhat International Airport in Ho Chi Minh City to provide base maintenance services.

The joint venture will leverage the rich MRO expertise of ST Engineering and the extensive networks of its airline partners to tap the growing MRO market in the region. According to industry forecasts, the commercial aircraft in-service fleet and the MRO demand in AsiaPacific are estimated to increase at a compound annual growth rate of 4.5% and 5.0% respectively over the next decade.

The venture will leverage ST Engineering's MRO expertise with its airline partners' wide networks

Duong Tri Thanh, President & CEO of Vietnam Airlines said, "The establishment of a joint venture will bring more aircraft and added value to Vietnam. Likewise, it will help to improve the technical level of the domestic aircraft maintenance industry as well as the competitiveness of the national airline. Together with ST Engineering and other potential airline partners around the world, we believe that this joint venture will stimulate and strengthen the Vietnamese job market and aviation industry."

Mr Lim Serh Ghee, President of ST Engineering's Aerospace sector said, "This is an exciting development for us, given that Asia Pacific is a focus market for ST Engineering. Following the setting up of our first component MRO facility in Vietnam in September 2019, this new joint venture will help to expand our offerings to include component and airframe MRO for our customers. Collaboration with trusted customers like Vietnam Airlines will be a strong factor contributing to our success as we will continue to increase our network of facilities to capture opportunities in the region."

4.5 & 5%

According to industry forecasts, the commercial aircraft in-service fleet and the MRO demand in AsiaPacific are estimated to increase at a compound annual growth rate of 4.5% and 5.0% respectively over the next decade

Photo: Virgin

Photo: Sabena technics

HANGARS

New hangars for Sabena

France is the location of Sabena technics' two new hangars. The first, opened in December, is a €20 million paint hangar in Toulouse. The fourth on the site, it is a 7,500m² facility equipped with a ventilation system with a capacity of 500,000 m³/hr, a docking system for widebody aircraft, a heat recovery system and industrial water treatment. A staff of more than 80 have been recruited and trained since 2018, and are now working on Airbus A350 aircraft. The second hangar, which opened in January in Bordeaux, is a €25 million maintenance and modifications facility. The 10,000 m² hangar can accommodate an Airbus A350-1000/ Boeing 777-9X or up to six A320 Family aircraft simultaneously.

10,000m²

THE 10,000 M² HANGAR CAN ACCOMMODATE AN AIRBUS A350-1000/ BOEING 777-9X OR UP TO SIX A320 FAMILY AIRCRAFT SIMULTANEOUSLY

IT

Virgin picks TRAX

Virgin Atlantic's Engineering & Maintenance team has announced eMRO by TRAX as its selected IT system for future maintenance management. The multi-million-pound investment is part of its Engineering Transformation Programme which will relaunch the Engineering & Maintenance digital capabilities. Transitioning to eMRO offers a simple, automated, accessible, paperless platform centred around control and compliance of fleet maintenance. It will ensure that the ground time of aircraft will be better optimised and more efficient. Ultimately this will lead to reduced disruption for customers.

Transitioning to eMRO offers a simple, automated, accessible paperless platform

MRO

Ethiopian teams with Sanad

Sanad Aerotech, part of Sanad and a wholly owned subsidiary of Mubadala Investment Company, has signed a landmark agreement with Ethiopian Airlines to collaborate and maximise on MRO business opportunities in the region. The initial phase will establish a Centre of Excellence for the repair and overhaul of APUs in Addis Ababa, and will start with those used on the Airbus A320 and Boeing 737 aircraft, paving the way for the provision of APU MRO services to other African airlines. The strategic alliance also aims to expand capabilities to include aircraft components and aircraft engine MRO.

Photo: Airbus

Ethiopian Airlines Group CEO Tewolde GebreMariam said, "This Strategic Alliance is consistent with Ethiopian Airlines vision of making its MRO facility the leading MRO service provider in Africa through strategic partnerships with OEMs and selected international MRO service providers."

Photo: HAECO

COMPONENTS

HAECO supports Nokscoot

HAECO ITM Limited, a member of the HAECO Group, announced that it has reached an agreement with NokScoot Airlines to provide inventory technical management support for the company's six Boeing 777 aircraft.

The scope of the agreement includes access to HAECO ITM's component pool, component exchange, repair management, engineering and AOG support in accordance with its guaranteed delivery time and service level. NokScoot will benefit from a tailored inventory management programme, allowing them to focus on their operations.

NokScoot will benefit from a tailored inventory management programme

Executive general manager of HAECO ITM, Thomas Kennedy, said: "We are very happy to expand our customer base through this partnership with NokScoot. HAECO ITM will provide the airline's Boeing 777 aircraft with the same high-quality services we are known for. The agreement once again demonstrates our ability to offer flexible solutions that meet our customers' needs."

Deputy CEO of NokScoot, Giam Ming Toh, added: "NokScoot is pleased to have HAECO ITM as our service provider. With their customised and comprehensive solutions, HAECO ITM will help us maximise the utilisation of our Boeing 777-200 fleet and maintain our strong on-time performance. We are looking forward to a long and successful partnership as we grow our presence in the region."

NokScoot Airlines is a Thailand-based carrier that operates international services out of Bangkok's Don Mueang International Airport to medium-haul and long-haul routes.

Launched in 2014, NokScoot is a joint venture between Thai low-cost airline Nok Air and Singapore-based low-cost airline Scoot, which is 100% owned by Singapore Airlines.

PEOPLE

● **Todd France** has been appointed President of Airborne Maintenance & Engineering Services, a subsidiary of Air Transport Services Group. ● **Ibrahim Fathy** is the new Chairman & CEO Of Egyptair Maintenance & Engineering. ● FLYdocs has named **Suresh Ananthasubramanian** as its General Manager for the FLYdocs India organisation.

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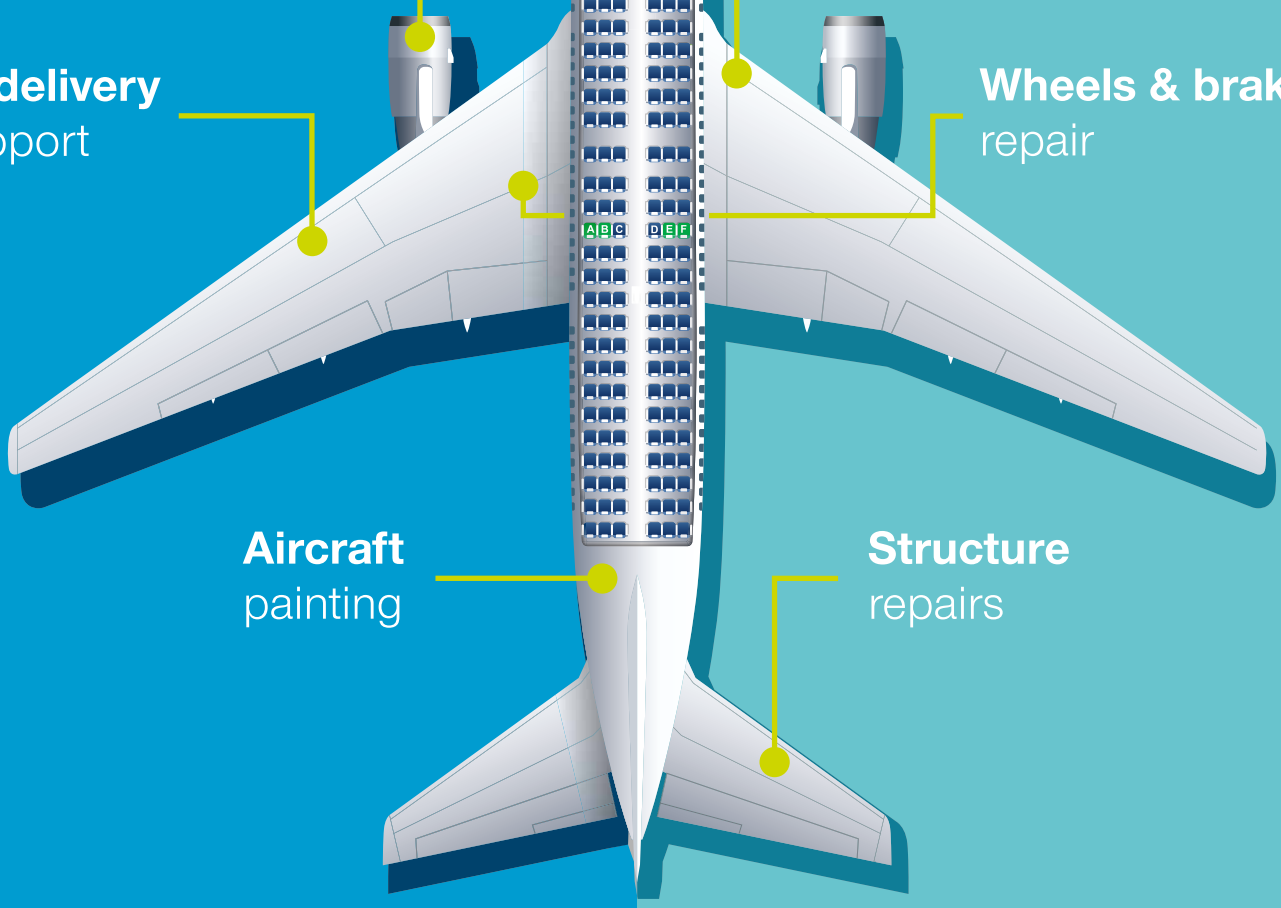

Aircraft painting

Structure repairs

100+ heavy maintenance base checks per year

30 aircraft painted per year

300+ supported flights per day

2.1 MLN man-hours per year

PHOTO: Airbus

ENGINES

Mid East Success For CFM

New engine orders from Qatar Airways and Jazeera Airways has brought CFM associated Rate-Per-Flight-Hour (RPFH) support agreements. Qatar Airways has purchased LEAP-1A engines to power its new fleet of 50 Airbus A321neo family aircraft, placing the largest A321neo order ever in the Middle East. With the support agreement, the deal has a combined total value of $4 billion US at list price. The first LEAP-1A-powered A321neo is scheduled to be delivered in 2020.

Jazeera Airways has selected the LEAP-1A for 20 Airbus A320neo aircraft. The agreement, which is valued at approximately $1.3 billion US at list price, also covers five spare engines. Jazeera Airways became the first LEAP-1A-powered A320neo operator in the Middle East in May 2018 and currently operates four A320neo aircraft. The fleet has logged more than 6,000 flight hours.

$4 BILLION

WITH THE SUPPORT AGREEMENT, THE DEAL HAS A COMBINED TOTAL VALUE OF $4 BILLION US AT LIST PRICE

PHOTO: MTU

ENGINES

New processes for MTU

MTU Maintenance has broadened its portfolio of repair techniques with a wide variety of galvanic processes for new and repaired parts, such as hard chrome plating, cadmium plating and nickel plating, chromic and sulphuric acid anodising, passivation of steel, application of chemical conversion coatings, and etching and burnishing.

It's due to the acquisition of Krauss, a former MTU supplier, now merged into the newly established MTU Maintenance Coating Services, a wholly owned affiliate of MTU Maintenance Berlin-Brandenburg based in Ludwigsfelde, near Berlin.

MTU invested some €30 million at its Ludwigsfelde location in 2018 and 2019. In 2020, the company will continue to invest in the modernisation and expansion of facilities and infrastructure.

COMPONENTS

New facilities for TP Aerospace

TP Aerospace has recently moved into a brand new facility of MRO workshops and warehousing only 9.5km from Orlando International Airport in Florida.

The new 5,750m² facility has been installed with machinery specific to repairing and overhauling airline wheels and brakes. The facility is modern with an open layout for easy configurability to meet ever-changing customer demands.

The facility received approval from the city of Orlando to operate in December 2019 while finalising the driveway construction and landscaping are still underway. After receiving final approvals from the FAA, the facility is now officially open for business. The grand opening of the new facility will take place in late February.

Photo: TP Aerospace

OFFSET

JetBlue offsets emissions

JetBlue has announced that it will offset carbon dioxide emissions from jet fuel for all domestic JetBlue flights beginning in July 2020, making it the first major US airline to take this critical and measurable step toward reducing its contribution to global warming.

The alrline also announced plans to start flying with sustainable aviation fuel in mid-2020 on flights from San Francisco International Airport. It will continue to partner with Carbonfund.org - a leading U.S. based nonprofit carbon reduction and climate solutions organisation.

JetBlue is the first major US airline to offset carbon dioxide emissions for domestic flights

This expansion is expected to offset an additional 7-8 million tonnes of emissions per year, the annual equivalent of removing more than 1.5 million passenger vehicles from the road.

JetBlue plans to offer ways for the airline's customers and communities to connect with these carbon offsetting projects.

Photo: Airbus

The airline has also agreed to purchase sustainable aviation fuel (SAF) from Neste, the world's largest producer of renewable diesel and a pioneer in renewable jet fuel, starting in 2020. Neste MY Renewable Jet Fuel is produced 100% from waste and residue raw materials. Over the lifecycle, it has up to 80% smaller carbon footprint compared to fossil jet fuel. The fuel is being shipped via the fuel pipeline to the airport where it will be safely used alongside regular fuel without safety or operational impact.

FUELS

French roadmap For SAF

The French Ministry for Ecological and Inclusive Transition announced the launch of a roadmap for sustainable aviation fuels (SAF) on 27 January. This followed 18 months of discussions with Airbus, Air France, Safran, Suez and Total, who signed a Commitment for Green Growth in December 2017. The roadmap provides for a short-term substitution trajectory for fossil kerosene with sustainable biofuels of 2% in 2025, and 5% in 2030. Beginning to deploy these products in the short term is in line with the national low-carbon strategy which sets a long-term objective of 50% in 2050.

The roadmap contained the following recommendations:

- Mobilise the necessary volume of raw materials for the aviation sector
- Ensure that sustainable resources, especially sustainable resources sourced from the circular economy, are used to produce advanced sustainable aviation fuel
- Ensure that the industry is economically viable for all actors in the value chain through appropriate incentive schemes
- Utilise existing airport logistics distribution networks
- Support and promote production diversification
- The expansion of sustainable aviation fuel constitutes a strategic lever for reducing net CO_2 emissions from air transport over a full lifecycle by up to 80% before blend.

Photo: Airbus

From left to right: Guillaume Faury, CEO, Airbus; Elisabeth Borne, Minister of Ecological and Inclusive Transition, France; Ville Arhippainen, Head of Sales Western Europe, Airbus; Jean-Baptiste Djebbari, Secretary of State for Transport, France; Stéphane Cueille, Senior Executive VP and Chief Technology Officer, R&T and Innovation, Safran; Anne Rigail, CEO, Air France; Fabrice Rossignol, Senior Executive Vice President, SUEZ Recycling & Recovery France; and Paul Mannes, Aviation Vice President, Total.

Alongside the roadmap, the government launched a call for expressions of interest on SAF production to identify investment projects in second-generation biofuel production units, currently being considered by economic players in France, and in particular investment projects in biofuel production units for aviation.

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- A330
- A340-200/300

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Photo: SUU

NORTH AMERICA

SUU Gets FAA Approval

Southern Utah University has received FAA Part 147 approval, allowing it to offer Airframe and Powerplant (A&P) licences to students upon successful completion of the academic programme requirements and independent testing by a Designated Maintenance Examiner (DME).

SUU's AMT Program is the most up-to-date in the nation, with the curriculum stemming from the Promoting Aviation Regulations for Technical Training (PARTT) 147 Act (S.3043/H.R.5427) that was introduced to the House of Representatives and Senate in December 2019. It is also the only A&P programme with helicopter maintenance used as the curriculum focus while still covering aircraft maintenance.

The first cohort of students begin in spring 2020. Currently, the building capacity is 250 students, but there are plans to expand to accommodate 1,000 in the future.

EUROPE

Magnetic graduates

At the end of January, the very first group of Magnetic MRO apprentices graduated as aircraft mechanics after a two-year programme. The 10 students started work in February 2018 and will now continue their aviation careers at the company.

Magnetic MRO launched AIMM (Apprenticeship & Internship at Magnetic MRO) to train and employ apprentices with specialisation in different areas. The training is conducted under a vocational study program designed by the Estonian Aviation Academy and approved by Foundation Innove.

Illari Lään, the Head of Administration at Estonian Aviation Academy, says that work-based learning has become more and more popular thanks to its flexible studies and lots of practice, which enables students to enter the job market more quickly.

Photo: KLM UK Engineering

OVERVIEW

Graham Casbourne

Business Development & Sales Director at KLM UK Engineering, summarises the current training environment

In today's aircraft maintenance world, continuously training your engineers is a massive challenge, along with bringing in the next generation, especially with a workforce nearing retirement.

Part 147 training schools are creating new ways to allow people to enter the aircraft maintenance business or to attract those from other sectors with transferable skills. Sectors such as the Royal Air Force can study for their B1 or B2 licence via on-line modules with training schools, such as KLM UK Engineering, to gain the relevant qualifications to enter an MRO.

A further development is the use of Virtual Reality (VR) or Augmented Reality (AR), which allows engineers to experience scenarios without the need to be at the aircraft.

MIDDLE EAST

Gulf goes local

Gulf Air recently welcomed a new batch of 22 Bahraini aircraft maintenance technicians who have recently joined the airline and started their training programme. With this recruitment, Gulf Air has reached 90% Bahrainisation in the position of aircraft maintenance technicians.

Captain Waleed Al Alawi, Gulf Air's Deputy CEO, congratulated the newcomers, noting: "Today, 90% of our aircraft maintenance technicians are Bahrainis. This is a major milestone for us to be a leader amongst carriers from our neighbouring countries by having local, specialised and professional talents representing our beloved kingdom."

Photo: Gulf Air

Gulf Air is committed to invest in its Bahraini workforce and their career development, and provides opportunities for Bahraini nationals to take on senior positions in the company. The airline has a tailored programme in which it recruits and trains Bahrainis to become aviation professionals.

Progress Check

2Excel at Lasham has bounced back from almost going out of business in late 2015. ***Ian Harbison*** went to find out what has happened since then

All photos: 2Excel Aviation

When ATC Lasham went into administration on 2 October 2015, it closed its UK facilities at Lasham and Southend. One of the aircraft in the hangar at Lasham was a Boeing 727-200 owned by 2Excel Aviation. However, this was no ordinary aircraft. It was one of two that had been converted to spray oil dispersants at low level (see box story). As the contract called for 365-day availability to respond to a major oil spill anywhere in the world, it was imperative that the backup aircraft was available as soon as possible. Unfortunately, the very limited MRO capabilities for this type of aircraft in Europe meant that hangar slots were either unavailable or very expensive.

The solution, says Chris Norton, one of the two co-founders of 2Excel, was to join forces with TAG Aviation at London-Stansted to buy the defunct business. The reasons for its demise included a lack of investment over the previous four years in facilities, people and procedures. There were also concerns about regulatory compliance and customer relationships were poor. Many of those customers were small operators with older aircraft from far flung countries, bringing increased credit risk. However, he adds, it had been a profitable business and it could be possible to bring this back.

The immediate challenges were to secure the airfield and site lease, the people, the IT systems to run the facility and the aircraft tooling. Having understood the financial risk, there was a need to secure funding. Finally, there was a need to gain new CAA approvals to allow work to restart, and the deadline was 24 December 2015 or 2Excel would have to walk away.

Above: With its own strategy and plan, 2Excel Engineering can now stand on its own two feet. All photos: 2Excel

Physical improvements to the workshops have helped staff morale

The addition of the Airbus A320 Family to Boeing 727/787/757 approvals is providing a further boost to business

Oil Spill Response is another member of the "Excel group

To most people's surprise, all the challenges were resolved and the new company, 2Excel Engineering, could head into 2016 with a clear plan. One of the first steps was to re-motivate the 43 staff who had been retained (the original workforce was nearly 300). This was achieved by pay rises, paying for training, re-opening the canteen and investment across the site. Physical improvements were made, such as LED lighting, repainted hangar floors and reskinning of the main hangar doors. Workshops were refurbished and reorganised to make better use of space. The commercial target was to have up to 100 people by the end of the year and to deliver up to 12 aircraft, with at least one major operator as a customer. At the end of the year, the company was on track, becoming cash flow positive in November and having increased turnover by 68% in 2016.

By September 2018, staff had risen from 102 in December 2016 to 160 employees and 40 contractors and manhours/week had increased by 270%. By the end of that year, turnover had grown by a further 50%, the company was profitable and 63 aircraft were redelivered.

The investment has continued, including the construction of a store for ground support equipment, repairs to the hangar roof, replacing tarmac in car parks and repainting of the runway. He says some work, such as painting and reorganising the tool store, were carried out on a volunteer basis by staff, confirming that morale had improved. Organisational control has also been a focus in 2019, to reduce risk and protect quality and compliance. A Maintenance Support Unit sees representatives from engineering, planning and purchasing being located next to each other for the first time. As well as this making the turnaround process much smoother, this enables manhours, costs and charges to be more accurately monitored.

A major UK leisure carrier has become the leading customer, accounting for a significant proportion of the

270%

MANHOURS/WEEK INCREASED BY 270% FROM DECEMBER 2016 TO SEPTEMBER 2018

overall workload. That means customer representatives are permanently on site at Lasham and it is clear there is a good working relationship, both sides communicating closely to resolve any issues. Another customer representative, from a leasing company, said a good example of the trust between customer and MRO was an aircraft recovered from an airline that went out of business. While 2Excel underestimated the amount of work that was required, the maintenance records were not up to date, making it difficult for the owner to accurately define the workscope. An amicable compromise was reached on allocating the extra costs. He also commented that, unlike some MROs, he always had free access to his aircraft in the hangar.

Norton says these relationships reflect renewed trust and respect for the company. It means negotiations can now take into account realistic market rates rather than buying business.

Training is being increased, especially for Lead Technicians. Norton says he wants to develop a company culture where staff take greater ownership of their work and exercise greater management skills. An apprenticeship scheme has been started and expanded to ensure a future supply of technicians. Lasham is fairly remote, so retention rates are high. In fact, some of the former ATC-Lasham employees have now returned.

Progress has been good and the addition of the Airbus A320 Family to Boeing 727/737/757 approvals is providing a further boost to business, with an end of lease programme for a UK low cost carrier running to the end of 2020. He is confident that 2Excel Engineering can now take on heavy engineering projects such as lease transitions, IFE installations and 'pickle fork' repairs on 737NG.

Finally, he says the shareholders have had to have deep pockets but there is a definite improvement in the business. 2Excel Engineering is very important to the efficiency of 2Excel Aviation's business, but Engineering has its own strategy and plan and can now stand on its own two feet. In fact, having Engineering was a key part of Aviation's winning the development of a flying test bed for the Tempest future combat aircraft for the Royal Air Force. This will involve a highly modified Boeing 757 to test avionics, systems and sensors. While Aviation will carry out the test programme, the conversion will be completed by Engineering at Lasham.

Having staff take ownership of their work is essential

THRILLS & SPILLS

In 2005, Royal Air Force pilots Andy Offer and Chris Norton founded 2Excel Aviation. It was centred on the Blades aerobatic team, flying Extra 300 aircraft. Much of the work involved aerobatic experience flights, but the financial crisis saw City clients fall by the wayside, so the pair expanded into special mission aircraft, specifically using Piper Navajos as flying test beds for military sensor systems. Cheaper to operate than fast jets and flown by ex-military crew, this was attractive to electronics manufacturers.

The next step was to operate surveillance aircraft under contract to government agencies, providing search and rescue, border patrol and fishery patrol missions using specially modified Beech King Airs.

In 2013, it won a contract from Oil Spill Response, an industry organisation that needed a quick reaction aircraft to deploy at short notice to oil spills anywhere in the world. This was a reaction to the Deepwater Horizon disaster in the Gulf of Mexico in 2010.

Two former FedEx Boeing 727-200 freighters were acquired, suitable due to their rear engine layout and rugged structure. They are fitted with a dispersant delivery system with a capacity of 15,000l comprising internal tanks, pumps and a spray bar under the rear fuselage to deliver dispersant liquid (TERSUS).

The project was completed in 2016 but has never flown in an emergency. Norton said the conversion was a major challenge – the dispersant liquid was declared flammable by the UK CAA, so the whole system has to be compliant with the rules for flammable fluids.

The aircraft operates alongside a spotter aircraft with an IR/UV sensor to determine the location and size of the spill. Typical operating height on a spray run is just 150ft.

CHANGE IN BELGRADE

Avia Prime, the Czech–Polish aviation conglomerate, has won a Serbian Government tender to acquire 99% of JAT Tehnika

JAT Tehnika, based at Nikola Tesla Airport in Belgrade, boasts an EASA PART-21J certificate and a well-equipped engine shop. All photos: Avia Prime

Avia Prime was formed in 2014 as a holding company for LINETECH, which had headquarters in Warsaw. In November 2015, a 100% stake was acquired in Adria Tehnika, located in Ljubliana, Slovenia, which also joined Avia Prime.

LINETECH was founded in 2009. It has headquarters in Warsaw and two MRO facilities in southern Poland at Katowice and Rzeszów, some 270km apart. It was the first Polish MRO to install Aviation Partners Boeing winglets on a 737 and has also been involved in heavy repair schemes such as keel beam replacements. In March 2018, Hartenberg Holding, an investment company based in Prague, Czech Republic acquired a 50% stake in Avia Prime, which then moved to Prague.

LINETECH has a single hangar in Katowice that can handle four Airbus A320 B737 aircraft. It is currently being used for Airbus A320ceo Family, Boeing 737 Classic/NG/MAX and Embraer ERJ

Rzeszów has two hangers, the larger of which can accommodate one A350/777 or five A320/737s

The workshop in Belgrade's dedicated test cell can contain jet turbines rated for up to 334kn

135/145 and E170/175 190/195. There are dedicated workshops for structural repairs. In Rzeszów, there are two side-by-side hangars. The larger can accommodate an A350/777 or five A320/737s, the smaller taking two A318/737 Classics. The facility specialises in structural repairs, redelivery checks and end of lease parting out.

In October, Katowice completed a year-long base maintenance project with Lufthansa Group that included almost 50 Embraer E190 aircraft from Lufthansa CityLine and Air Dolomiti. Continuous exposure inevitably leads to reduced turnaround times and almost all the aircraft were delivered ahead of schedule, freeing up six additional slots.

Altogether, 80 Lufthansa Group aircraft were handled by Katowice and Ljubliana, the latter taking aircraft from Austrian, Brussels Airlines and Swiss. Further inputs from Air Dolomiti, British Airways CityFlyer, Edelweiss, Finnair and TUI brought the total to 90 E190s for the year.

EASA approval for 767/CF6 line maintenance was granted in July 2019.

In Ljubliana, Adria Tehnika has four hangars with a combined capacity of six A320/737 or 12 Bombardier CRJ aircraft, although it normally operates with nine CRJ lines. There is also an Airbus A330 line maintenance station.

It was originally called Adria Airways Tehnika, being part of Adria Airways, which was formed in 1961. It was spun out of the Slovenian national carrier in 2010 before being purchased outright by Avia Prime four years later. It has been a Bombardier Authorized Service Facility since 2002. Workshops include sheet metal work, NDT, composite repairs, interiors, component painting, A320/CRJ wheels & brakes.

Adria Tehnika's engine shop has capability on V2500, CFM56-5, CF34-3, CF34-8 and APUs.

JAT Tehnika is based at Nikola Tesla Airport in Belgrade and specialises in base and line maintenance

services for the Airbus A320 Family, ATR 42/72 and Boeing 737 Classic/NG and newly added MAX and a wide range of component services and backshops. One of the highlights of the company's capabilities is an EASA PART-21J certificate and a well-equipped engine shop, vastly enhancing the capabilities of the current engine maintenance at Avia Prime. The workshop in Belgrade specializes in CFM 56 engines and Honeywell APUs. It goes above and beyond just regular maintenance needs. One of the key advantages is a dedicated test cell, able to contain jet turbines rated for up to 334kN.

The company dates back to 1927, with the formation of Aeroput, the first Yugoslavian airline. In 1947, it became Jugoslav Air Transport (JAT). Over the years it built up its capabilities with aircraft such as the Boeing 707, 727 and McDonnell Douglas DC-9 and DC-10, and the ATR 42/72. In 2006, the technical department was spun off from the airline as JAT Tehnika by the Serbian Government, which has been the sole owner ever since.

JAT Tehnika recently received EASA Part-145 approval for various line and base maintenance activities on the Sukhoi Superjet 100 (SSJ100) regional jet, with SuperJet International providing personnel training, spares and technical services.

For Avia Prime, the acquisition brings two hangars with 14 maintenance lines, an engine test cell and additional workshops for landing gear; wheels and brakes; and electrical, pneumatic, hydraulic and mechanical components. Additional services include maintenance training and CAMO. Finally, JAT Tehnika has EASA and FAA certification – the sister companies are EASA only.

Q&A

MRO Management asked **Piotr Kaczor**, CEO and co-founder of Avia Prime Group to give his views on the development of Avia Prime and future trends in the industry

What made JAT Tehnika attractive as an acquisition?
Avia Prime has many more customer inquiries than it was able to service. We wanted to enhance our capabilities. Now we can offer 14 new maintenance slots, adding to a total of 34 production lines overall. There are also completely new opportunities opening up for the Avia Prime group.

We have entered the engine maintenance market, with full overhaul capability for CFM engines that we plan to enhance in the near future. On top of that, we can support airlines and operators with our EASA Part-21J Design Organisation Approval certificate. We have also obtained the ability to paint the entire aircraft, thanks to our paint shop in Belgrade.

To what extent will the JAT Tehnika operation be integrated into the operation?
For many years we have done what we can to provide our customers with complex solutions. We already look after airlines with mixed fleets in our facilities, such as SAS with CRJs at Adria Tehnika and 737s at LINETECH. The same goes for Lufthansa where, in different bases, we are working on either A320s, CRJs or E190s.

We have learned over the years that we have to strive for operational excellence. We are sure that in a relatively short period of time we will be able to offer the same service in all of our bases, so the customer would not have to screen the different companies – rather they will just deal with the entire group offering the same product in every facility.

Will this require additional training or tooling to standardise procedures?
For now, every facility works only with the aircraft it is certified for. However, we are constantly trying to look for new ways to improve, even on small issues, so that every day our operations are more efficient and run more smoothly. That way, we won't make a 'revolution' overnight when it comes to our methods. We are now in the process of unifying tools and looking into new technologies to use in our day-to-day operations.

Will ERP systems be integrated?
We use our dedicated systems for maintenance, tools, and stores, as well as R&D and financial elements. We constantly look for new opportunities. Obviously, a common system is necessary to provide the customers with even shorter turnaround time and ensure good communication between facilities.

How will FAA approval at JAT be exploited?
JAT Tehnika works with US customers and we will try to enhance its presence in Central Europe, offering American carriers the service they will be interested in. We are sure that we can keep up with the pace of the big US airlines and provide them

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Avia Prime aims to maintain a healthy balance between servicing narrow and widebodies

with full support on their development and plans. In our opinion, the FAA certificate really enhances our capabilities and helps us to use our full potential.

Presumably, any liabilities have been taken by the Serbian Government?
We try to respect the wish of the Serbian Government by directing questions regarding their affairs to them directly. Avia Prime bought more than 99% of the JAT Tehnika stake, becoming the sole owner of a now private company. We have to say that it was a long and demanding process. The government was making sure it was dealing with a competent partner that will help JAT Tehnika grow further and contribute to the economic growth of the region and Serbia itself.

Will the Superjet work be continued, given the problems with the aircraft?
Many of the newer aircraft have significant problems, and even design flaws, at the beginning. We are sure that Sukhoi will be able to find and fix any potential problems, but SuperJet is a plane with a lot of potential and we will be happy to maintain those jets for our customers.

Will any JAT Tehnika capabilities be introduced to Adria and LINETECH? Will this require additional training or tooling to standardise procedures?
Initially, we plan to retain the brands and capabilities of all companies as they are. That does not mean that we are not going to use the full potential of all three MROs. As we have mentioned before, we are constantly pushing forward to become better and to maintain operational excellence. Over the last five years, we have been working towards unification in Adria Tehnika and LINETECH. We see how it helps to run the business smoothly and win customers. We see the benefits of this, and we will unify all three companies to the furthest extent. On the management side, it's obvious that certain departments need to either work closely together or become unified as well. We already did this with LINETECH and Adria Tehnika's HR, Planning and (partly) Sales Departments. We hire the best people around so we naturally see their potential and we want to give them opportunity to grow and become even better. This is the perfect moment to do it.

Will this acquisition change the marketing strategy, in terms of aircraft types or areas?
The acquisition serves as a significant enhancement to our capabilities. For now, we are able to completely fill all four facilities in three countries. The scope of our services will change according to the needs of our customers. We believe that the growth has to be completely coordinated and well thought out since the European market is in constant motion. Only through good experience and insight can we become better and profitable.

LINETECH has hangars capable of handling widebodies but is concentrating on narrowbodies. Will this change?
The most important reason is simply the vast number of narrowbody aircraft in Europe. There is a lot of work in the single-aisle market. Let us not forget we have to look into the financial side of things as well. Avia Prime has to make money to invest and continue. We talk about over 80% of the current global fleet when we count regional jets, turboprops and 'traditional' narrowbodies according to ICF. Hangars that can accommodate the widebodies are the best solution for us – we can maintain a lot of smaller planes or change to four simultaneous widebody maintenance lines quickly. We are certain that we can maintain a healthy balance between servicing narrow and widebodies.

> **The FAA certificate really enhances our capabilities and helps us use our full potential**

Left: LINETECH's single hangar in Katowice is used for Airbus A320ceo Family, Boeing 737 Classic/NG/MAX and Embraer ERJ 135/145 and E170/175 190/195 **Below:** Adria Tehnika's engine shop In Ljubliana has capability on V2500, CFM56-5, CF34-3, CF34-8 and APUs

The distances between all the facilities are quite short. Will this help with slot allocations at busy times as there is no real effect on ferry flight distances from customers?
Definitely yes. On top of that, we can use different capabilities of certain bases according to the check needs.

Will the 737 MAX be part of future plans? Has any work started on acquiring this capability?
Yes, we did work on the 737MAX before the grounding, and now we patiently await the return of the aircraft. There's a lot of MRO hours to be performed on the aircraft directly prior to recertification. With 34 slots and four bases, Avia Prime is more than ready to accommodate and maintain the MAX. As a result, we are certain that even the biggest operators could use our help in order to bring the plane back into service. We are looking closely at how the situation is unfolding.

How do you expect the Boeing/Embraer takeover to affect the E-Jet work?
We have been working with Boeing and Embraer since the very beginning of LINETECH, which currently holds the certificates for 737 Classic, NG and MAX along with E170, E190 and ERJ 135/145.

We know what we can expect from both OEMs. The two companies coming together will boost the supply chain so we will be able to further shorten the turnaround time, which is obviously very profitable for the operator's perspective.

Are any changes expected with the acquisition of the CRJ program by Mitsubishi?
At this early stage of the confirmed acquisition, we do not have information about any changes on the CRJ programme yet. For the purposes of a smooth transition, all the existing agreements are valid with Mitsubishi as well. In short, we'll wait and see. Both companies have a lot to work on, but there is also big money on the table.

We have to wait to mid-2020 to see the last CRJs delivered, and we have to look at how the backlog for the SpaceJet will change. Mitsubishi Heavy Industries have to perform a perfect transition, since there's a lot at stake for both the SpaceJet and CRJ families, especially in the US market. We are sure that, just like Boeing and Embraer, those companies are mature, well-organised and respected, so we expect a flawless transition and gradual changes in the future to fit the Mitsubishi business model.

Were there any particular areas where the turnaround time on the Lufthansa CityLine was reduced? How was this achieved?
On some of the aircraft that we serviced – not only for the Lufthansa Group – we had to implement important SBs. Our extraordinary and highly experienced team performed the work faster than calculated by OEM. As we have stated many times now, working for the big customers showed us that we have to look for the opportunities to change for the better every day.

The short turnaround time was achieved by the seamless work of our mechanics, engineers, planning, and other departments. We achieved this on Finnair's E190s as well, saving time and having freeing additional slots. For Lufthansa, there were additional aircraft to maintain and we saw an opportunity to receive extra heavy maintenance work.

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MOVING IN

The departure of the UK from the European Union has not put off STS Aviation Group from increasing its presence there and increasing its footprint on the continent. Ian Harbison recently spoke to Mick Adams

STS Aviation Group started out as a staffing company in 1986, before branching out into line maintenance in 2007, developing a network at airports throughout North America. In September 2017, it acquired the assets of AeroMod International taking over a 10,640m² widebody hangar in Melbourne, Florida. Renamed STS Mod Center, it has become a major provider of airframe modifications, especially connectivity and cabins, with a reputation for very short turnaround times through very efficient processes.

The recently acquired aircraft maintenance facility in Birmingham has 16,000m² of total space. Photo: STS Aviation

The new UK operations will join an established European presence. At Shannon, Ireland there is UJet, an EASA Part-145 operation supplying seats and cabin interior parts for all aircraft types, as well as kitting services, while a separate organisation provides engineers and technicians under contract worldwide. In Bordeaux, France there are aircraft structures specialists on call for projects as required, and a Tank Tigers team responding to aircraft fuel system problems. A Tank Tigers team is also based in the UK, as well as several locations of STS Component Solutions.

On 23 September last year came the announcement that the latest step in moving into the UK was the acquisition of Apple Aviation, based in Newquay in the far west of England with a 1,400m² facility (including a 370m² parts processing facility). Its remote location reflects its quiet success over the years, establishing a reputation for line and base maintenance, engine services, AOG support, aircraft storage, parts processing and teardown/recycling. For the latter, it holds a UK Environment Agency permit and is a member of the Aircraft Fleet Recycling Association.

The latest step in moving into the UK was the acquisition of Apple Aviation

Development plans include EASA Part-147 training approval, Part 21J Design Approval to support modification activities (supported by US design approvals in the interim), and B1 engine shop approvals allowing off wing work (to be replicated at Birmingham later). NDT capabilities will also be expanded.

The civilian Newquay airport is co-located with RAF St Mawgan and Apple's existing military business will again complement STS activities in this area.

The Apple acquisition was followed on 14 October by confirmation of the purchase of the former Monarch Aircraft Engineering Limited (MAEL) aircraft maintenance facility in Birmingham, UK. This has 18,600m² of total space, including ramp area, and the hangar, opened in 2013, can house two widebody or 10 narrowbody aircraft at the same time.

The following day came news that Mick Adams had been appointed as Senior VP of Maintenance, Engineering and Modifications to take over the

Photo: Cornwall Airport Newquay

Left: Apple Aviation is located in the far west of England at Newquay **Below:** The hangar in Birmingham can house two widebody or 10 narrowbody aircraft at the same time

Photo: STS Aviation

European operations, to oversee the new developments and become CEO of Apple Aviation. He moved from Etihad Airways Engineering but had formerly been Managing Director of MAEL, so he had first-hand experience of the UK MRO industry and the Birmingham hangar.

In fact, he was in charge at the time the hangar opened but he says the new operation is not looking at nose-to-tail heavy checks (unless, of course, a multi-year contract for an entire airline fleet comes its way) but will adopt the STS philosophy of responding to airline needs in a short space of time. This approach will enable the facility to be on the market much more quickly, as the primary driver will be basic C checks, Next Generation aircraft, modification and structural repair approvals.

Having said that, despite retaining much of the original MAEL tooling, there has been a further investment in additional equipment. There is now a process of carrying out a complete inventory check and establishing tooling control processes.

Services to be offered include entry into service, lease returns and light C checks.

MAEL also had a healthy line maintenance business at the airport and this is another target, to regain customers who were forced to go elsewhere. The aircraft types will inevitably be Airbus A320 Family and Boeing 737, but Adams says A330ceo/neo, A350 and 787 are also in the mix. He adds that a successful line maintenance operation is the 'front window' of an MRO business and can lead to valuable additional work. This may also be another spearhead for an increased STS presence in Europe in the future, through growth or acquisition.

A recent two-day recruitment drive produced more than 100 candidates

The MAEL influence is not to be underestimated. The Birmingham staff may have been dispersed but a recent two-day recruitment drive produced more than 100 candidates, including former employees. The target is 100 staff by this year's end, and between 200 and 250 by the end of 2021.

Coming back to the overall picture, Adams says he is impressed with the STS approach and this is a vital part of the future success of the Europe facilities. Collaboration seems to be an integral part of the operation, bringing together the various parts of the company and exchanging best practices. This will be very important in the development of Newquay and Birmingham, but he notes that it is also a two-way process – UK personnel will soon be visiting STS in the USA, to advise on the nuances of EASA and FAA regulations and how these can be aligned for greater flexibility and efficiency.

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From the GROUND UP

Building a brand new engine MRO facility on a green field site brings challenges and opportunities. ***Ian Harbison*** reports from Wrocław

A pool of skilled labour and good road connections led to the decision to launch XEOS's venture in Poland. All photos: XEOS

XEOS is a 51/49 joint venture between Lufthansa Technik and GE Aviation, based in the Legnica Special Economic Zone in Środa Śląska, near Wrocław in Poland. It will handle the GEnx-2B engine for the Boeing 747-8 and the GE9X engine for the Boeing 777X. The partners are investing about $250 million in the new 32,500m² facility. The project was formally launched in December 2016 and construction started in August 2017. The first GEnx-2B engine was inducted into the new facility in April 2019 (see MRO Management, June 2019), although the formal opening took place in September that year.

Selection of the Legnica Special Economic Zone in Środa Śląska was aided by incentives from Invest Wrocław, a pool of skilled labour and good road connections to help with moving engines through the cargo hubs of Dresden (235km) and Leipzig/Halle (360km).

The need for such a facility comes from capacity shortages at GE Aviation. As well as high production rates for the CFM56 and LEAP engines, the MRO market is growing for the CFM56 and CF34, shop visits of the GEnx-1B, used on the Boeing 787, are beginning to build. With a much smaller customer base for the GEnx-2B and the GE9X not yet in service, XEOS is a niche operation with capacity to grow to meet the future market.

The 747-8 order book consists of 47 aircraft for the passenger version, of which Lufthansa has 19, with other customers including Air China, Korean Air and VIP/government operators. The 747-8F freighter has been more successful, having racked up 107 orders, with 90 aircraft delivered. Customers include AirBridgeCargo Airlines, Atlas Air, Cargolux, Cathay Pacific Airways, Korean Air, Nippon Cargo Airlines, Silk Way Airlines, UPS and Volga-Dnepr. The freighter continues in production at a rate of just six a year.

The 777X order book currently stands at 309 aircraft, including 20 for Lufthansa. Other customers are ANA Holdings, British Airways, Cathay Pacific Airways, Emirates, Etihad Airways, Qatar Airways and Singapore Airlines. Development was delayed when a durability problem was found in the high pressure compressor of the GE9X engine. This has now been resolved by GE Aviation and the aircraft flew for the first time on 25 January. Boeing says entry into service will be in 2021 but, in the wake of the 737 MAX crisis, it remains to be seen whether certification authorities will view the 777X as simply a derivative of the original design – it has a new composite wing with folding wingtips, for example.

That could mean a delay in the arrival of the first GE9X in Poland but, in the meantime, XEOS has been building capability on the GEnx-2B, especially with a Quick Turn programme on outlet guide vanes for the high pressure turbine (HPT).

The teaming of an MRO and an OEM might seem to generate differences in the approach to customers – one wants to repair, one wants to sell new material

The increased weight and power of the GE9X has required a number of modifications to the building

– but XEOS has adopted an unusual business model. Any engine arriving at the facility will be from one of the two but this is completely irrelevant. Instead, it is simply a matter of following the workscope as required. All contractual matters are dealt with by the sending partner. There is one exception – the GE Material Logistic Center is a self-contained unit with no XEOS staff and operates outside XEOS procedures.

Layout

XEOS has been able to draw on the experience of the partners in developing other MRO facilities, particularly from N3, the Lufthansa Technik/Rolls-Royce joint venture in Erfurt, Germany. That means the facility layout has been designed using Lean principles, as have all the processes. However, during start up, a number of experiments were made, leading to further developments and improvements. Some of these came from the staff, encouraged by an open feedback structure that is an important part of the XEOS corporate culture.

An engine arrives at the western end of the building, where the fan case is removed and put into storage, although minor repairs might be carried out on the abradable strip if required. It then moves to the disassembly area. This has recently been redesigned as a result of input from the staff, who found it very crowded. The number of bays has been reduced from four to three, and the size of access stands and component trolleys has been reduced. Following a tool census, only those directly needed in disassembly are allowed in the area.

The engine is reduced to modules – booster, gearbox, low pressure compressor, high pressure compressor, combustor, high pressure turbine and low pressure turbine – which are then moved to dedicated bays for further disassembly to component level. These bays are mirrored by assembly bays on the other side of the area, with shared tooling in between. There is no distinction between the two engine types; each bay will be equipped to handle both and will simply work on whatever the next engine happens to be. That means cross-training will be very important at each level of work, but this can be handled by the XEOS

Left and right: Trainees at the XEOS Specialty Training Centre must pass a 15-month course **Below:** The XEOS team, a 51/49 venture of Lufthansa Tecnhik and GE Aviation

Specialty Training Centre (see separate article).

Another staff initiative can be found in the high pressure turbine disassembly area – the busiest at the moment because of Quick Turn work. The layout has been changed with two bays and the tooling located in the middle. That means they cannot be shared with the assembly bay, but it also reduces the risk of a tool being used that has been damaged by extra force needed to take the turbine apart. The central location also happens to be in an area between two overhead cranes, so there is no lift capability for the turbine modules. Incidentally, there are bridges in the roof structure that allow cranes to move sideways as well as laterally.

An Operational Support Unit (OSU) is responsible for logistics, making regular collections from the bay and directing components to storage if serviceable; or to the automatic cleaning line, inspection and NDT and then to internal repair sections; or to external repair organisations. Repair capabilities are building steadily, using OEM-approved tooling and equipment technology and the repair capabilities of Lufthansa Technik. Thomas Böttger, Managing Director of Business, says the introduction of the GE9X will see a large increase in the amount of composite work.

In the reverse process, the OSU delivers components to the assembly bays in kits at the appropriate time in the process. For the future, the kits will be on shadowboards to ensure there are no missing parts.

Test cell

At the moment, engines requiring a test run are trucked to GE Caledonia in Scotland – a two day journey in each direction – but a 13m diameter test cell is being constructed to the east of the MRO facility. It will be equipped by Aero Systems Engineering (ASE). However, says Böttger, some Quick Turn customers have been so satisfied with the quality coming out of XEOS that they are happy to receive engines directly, only carrying out propulsion checks when they have been installed on an aircraft.

XEOS is located in open countryside but the nearest village is 1.6km away. To clear the test cell for 24/7 operations, a double walled structure has been used, with noise insulation material between.

The increased weight and power of the GE9X has required a number of modifications to the building. A reinforced roof structure takes account of the weight (over 8 tonnes), along with a reinforced thrust frame which is used to move the engine to and from the cell and hold it in place while test runs take place. The GE9X has achieved a thrust of 134,300lb, beating 127,900lb set in 2002 by GE's GE90-115B engine. Structural reinforcement has also been required to contain a 'blade out' incident.

This will be the very first test cell designed for the GE9X from the outset. Those used in the development programme have been upgraded to handle the new engine.

A preparation building is being constructed alongside the test cell, with eight GE9X-sized bays. An overhead rail system will move engines in and out of the test cell. Again, there is a reinforced roof, this time to support the weight of the GE9X. A covered link to the main building will provide complete protection for engines as they move around and will also provide additional storage space. This will be augmented by a simple storage bay located nearby.

Future plans

In 2019, 21 engines were inducted, with 56 expected this year, rising to 130 in 2023. Eventually, this will reach up to 220 shop visits annually, corresponding to a total working time of around 800,000 hours each year. However, the western wall of the facility can be removed to allow an extension to be built that would add up to 50 more shop visits a year.

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Aerfin is capitalising on demand for used serviceable material with its bespoke services. All photos: Aerfin

Breaking Good

AerFin is generating good revenues from the sale of used serviceable material. ***Ian Harbison*** reports from Cardiff

AerFin has developed bespoke services ranging from whole aircraft and engine sale or lease, through to tailored flight-hour component support solutions covering Airbus A320 Family, A330/340, Boeing 737NG and Embraer E-Jet as well as CFM56-5B/5C/7B, RB211-524 and V2500-A5 engines.

BeyondAircraft offers complete aircraft services including end-of-life asset management for fleet transition, including fleet acquisition, sale and leaseback as well as aircraft consignment solutions to provide flexibility for airlines going through a fleet renewal programme.

Asset acquisitions also provide inventory for the company's Cost Per Flying Hour (CPFH) contracts. BeyondEngine includes purchasing and trading of commercial engines, with a focus on narrowbody and regional aircraft types. It also involves short to medium-term engine leasing packages. BeyondComponents is run by the AerFin Airframe Service solutions unit located close to London-Gatwick Airport, offering the sale, exchange or loan of airframe rotable components on a 24/7 AOG basis.

These components are primarily sourced from AerFin's own tear-down activity, but inventory is also purchased from the market. The final service, BeyondPool, is based on fixed price component support contracts, either Cost Per Flying Hour (CPFH) or, for wheels & brakes, Cost Per Aircraft Landing (CPAL).

BeyondPool was launched after AerFin purchased the entire fleet of 15 Embraer E170-LRs from Saudi Arabian Airlines in May 2017. In addition, it acquired 10 spare GE Aviation CF34-8E engines, a spares inventory with some 24,000 line items, tooling and equipment from the airline's engine shop and line maintenance equipment.

For the CF34-8E, Bob James, CEO of AerFin, says it is very popular and engine shop visits are beginning to ramp up. On the airframe side, the company has won several long-term Flight-Hour contracts, branded as BeyondPool. Perhaps the most significant was a 2018 award from BA CityFlyer to support its fleet of six E175s and 18 E190s.

Other factors driving demand for used serviceable material (USM) for the engine have included an SB on HPT turbine blades and some 'juggling' on engine shop visits. The engine is due a shop visit after 15,000 flight cycles (FC) but that leaves only a further 10,000FC, as some life limited parts are limited to 25,000FC. Instead, some airlines are removing an engine at 12,000FC, retaining the LLPs and carrying out a full performance restoration, maximising the 25,000 LLP lives.

Of the 40 engines, 10 were sold to support an OEM program, eight have been parted out, nine are in the lease pool and the rest are in AerFin pending disassembly and sale. AerFin is also building engines tailored to meet requirements of their lease pool.

Much of the fleet is in North America and, in March 2019, AerFin commenced

providing 24/7 logistics from facilities close to Atlanta Hartsfield-Jackson International Airport, with more than 200 E-jet rotable part numbers including actuators, valves, avionics and a large selection of high demand component LRUs. A month later, it announced a long-term support contract for both CF34 and CFM56 engine parts overhaul with BP Aero in Irving, Texas and with Barfield, a subsidiary of AFI KLM E&M, for approximately 170 component part numbers.

Back in the UK, in June, the company received EASA Part-145 maintenance organisation approval, which allowed it to extend its CF34 engine capabilities to include engine piece part component inspection, testing, certification, borescope inspections and engine module swaps.

E190/195

In contrast to the smaller models, James sees the E190/195 market as much more challenging. These aircraft are both powered by the CF34-10E engine, which incorporates CFM56-7B architecture. This engine has the resulting higher engine maintenance cost at levels similar to the Airbus A319. On the airframe side, he points out that there is 70% commonality between the E170/175 and E190/195.

A significant number of E190/195 fleet transitions are expected over the next three years, which will see increasing demand for spare engine support and a lowering of the operating costs necessary for effective remarketing and continued operation of the aircraft. Sales and deliveries of the replacement E195-E2, powered by the Pratt & Whitney PW1900G, have been slow, and it remains to be seen how the airline and lessor market will succeed in placing the aircraft and the extent to which the Boeing acquisition of Embraer commercial aircraft will support the placement of new aircraft. Embraer's 3Q19 results, published at the end of October, showed a single E195-E2 delivery for the year (to Azul in Brazil) and just three E190-E2s, compared to 45 E175-E1s.

The business got a kick start from the purchase of 15 Embraer E170-LRs from Saudi Arabian Airlines, plus engines, spares and tools

Recognising the number of E190 fleet transitions, AerFin has only a single E190 for part out. James says the company will wait to see how the lessors develop the second-hand market before increasing exposure to E190 inventory. One sign of successful transitions has been the recent decision by Azul to sublease its entire fleet of 53 Embraer E195 E1 aircraft to LOT Polish Airlines and Breeze Aviation Group as part a strategy to accelerate their replacement by the E195 E2. LOT, which previously acquired seven E195s from Azul, has signed an LOI for 18 firm aircraft and up to 14 options. Breeze, a US start-up founded by Azul's controlling shareholder, David Neeleman, is expected to sublease up to 28 aircraft. All the E195sE1s are expected to be phased out by the end of 2022 and will be subleased at least until the end of the original operating lease term.

"E190/195 fleet transitions will see growing demand for spare engine support"

The final engine model is the CF34-3, which powers Bombardier CRJ200 but, says James, this a declining market as retirements increase.

SUSTAINABILITY

James says AerFin is committed to delivering environmentally friendly and sustainable aircraft and engine recycling solutions and has joined the Aircraft Fleet Recycling Association (AFRA). This is a collective of manufacturers, disassemblers/parts distributors, recyclers, financers/lessors and MRO facilities that have created a Best Management Practices (BMP) Guide for aircraft materials recycling. Members work to very high standards and one, TARMAC Aerosave, with facilities at Tarbes in France and Teruel in Spain was selected to break two of the E170s for that reason.

He adds that AerFin now segregates all scrap from engines by metal type. This not only makes recycling easier but also generates more money than mixed metals.

In October 2019, Danish private equity firm CataCap acquired a majority share-holding in AerFin from US-based CarVal Investors in partnership. CataCap also has an investment in TP Aerospace, which has launched its Green Sunrise project to develop a paperless network across its facilities. He says AerFin's environmental policies was one reason for CataCap's interest, but it is too early to say whether any joint initiatives will be developed.

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Leglslation requires employers in the aviation sector to provide equipment such as access stairs and platforms. All photos: Semmco

HEAD FOR HEIGHTS

Working on top of an aircraft is a dangerous place. Mario Pierobon talked to a leading UK manufacturer of safety equipment

Every year, the United Kingdom (UK) Health and Safety Executive (HSE) receives reports of workers in the aviation industry who injure themselves after falling from height. These include incidents occurring during aircraft maintenance when entering or exiting the aircraft, and working on or from service equipment. Clearly the most serious accidents tend to occur during aircraft turnaround, where increased activity is needed due to time pressure.

Regulations

Stuart McOnie, Founder and Managing Director of aircraft access solution and ground support equipment manufacturer Semmco, understands that employers within the aircraft maintenance industry are required to observe regulations when it comes to Personal Protection Equipment and safe working at height. Namely, they must abide by the same local or national regulations as employers across all other sectors. "For example, in the UK, the Work at Height Regulations 2005 features legislation that requires employers to provide 'the right type of equipment for working at height', which would include access stairs and platforms in the aviation sector", he says. "Our customers and end users respect UK, European and other international standards when buying equipment, and expect Semmco as the manufacturer to supply equipment that meets the correct standards. This a responsibility we take very seriously."

PPE and safety at height precautions

Aircraft maintenance can be major work, involving significant production processes, or minor checks and repairs between flights. "In every case, it is important that the engineering or operations managers ensure their teams of maintenance technicians and engineers are suitably equipped for all tasks that could be required, including working at height. Employers and managers alike need to understand that even a relatively small fall from height wcan result in significant injury, production loss or fines," says McOnie.

The current state of affairs regarding the use of Personal Protection Equipment and the maintenance of safety at height precautions in the aircraft maintenance environment is such that the majority of operators are using fall arrest systems, including wing grip systems, to ensure safe working at height. In some cases, however, they are using older steel system equipment, which is heavier to move around and may cause potential manual handling issues. "Nonetheless, operators are making a conscious choice to protect their employees as much as possible and they carry this through by requiring workers to wear full PPE, including safety shoes, gloves, and glasses," says McOnie. "Our technicians and engineers have to be suitably dressed in the correct personal protective equipment (PPE) for installations in client hangars and some operators request full method statements prior to hangar entry."

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Promotion of safety

Today, the aviation industry has a wide range of access and ground support equipment enabling aircraft engineers to conduct their maintenance work safely. However, design with the user in mind and manufacture with quality materials is beneficial to maximise safety. This includes ease of operation and positioning, limiting manual handling and improving efficiency.

"We believe that there is always more to do to increase the safety of teams across the industry. It is the responsibility of customers and suppliers to work together to provide more flexible safety-focused products that, when used consistently and correctly, ensure the personal safety of technicians working around aircraft," says McOnie.

"Each manufacturer should understand what needs to be achieved by aircraft maintenance teams, so that products can be designed with safety, flexibility and task requirements in mind. The customer's needs should be challenged regarding their safety processes, and reminded that there may be a safer way to do things than the way they have always done, making them think about potentially reviewing their safety methodology."

Indeed, airlines are constantly upgrading their fleets to meet passenger demand and new aircraft are being phased in with new maintenance requirements, such as maintaining WiFi in crown access. "This means more tasks are required to be completed in the same amount of maintenance time, resulting in tight turnarounds," says McOnie.

"Safety focuses on risks to workers, but there's also the risk of damaging the aircraft"

Safety procedures are a constantly changing process and there is always room for improvement. "We encourage working practices that require technicians to perform fewer manual handling tasks, but some tasks mean it is necessary; handling of large, heavy wheels is still an issue and we are working closely with customers to develop the best solutions for optimum safety," says McOnie.

"We are incredibly conscious of the welfare of workers and protecting them against the potential hazards they may face at work. We want to create equipment that will support them in what they do, not hinder or harm them. For this reason, we use lightweight materials in our access steps and platforms and ensure our ground support equipment is innovatively designed and is easily manoeuvrable and height adjustable."

Top and left: Semmco ensure their access equipment is built with lightweight materials so it is easy to manoeuvre

Human factor consideration

PPE is a very important part of work safety culture and there are risks inherent in an aviation maintenance environment that require PPE to ensure worker safety – dropped tools, slip hazards, working at height, high noise and low visibility. "Whilst airlines ensure their teams are educated on these risks and provide them with all the necessary PPE, we believe that prevention is better than cure when it comes to workplace hazards," says McOnie.

Although safety normally – and rightly so – focuses on risks to workers, when working around aircraft there is also the risk of damage to the aircraft itself – fragile or sensitive components are vulnerable and any accidental damage causes more maintenance and refit work, loses time and costs more.

"Our design aims to minimise risks to aircraft; we use lightweight metals such as aluminium and include padding in our designs to ensure that risk is minimised should access equipment come into contact with the aircraft," says McOnie. "Making our access equipment easier to manoeuvre and including braking systems minimises the risks of accidental movement into aircraft, and the flexibility of our variable height systems makes sure the right access level is use, so operators do not cause any damage using a system at the wrong height in the wrong role".

OBTAINING OPTIMISATION

After two years on the market, AVIATAR is bringing real benefits to customers as it streamlines and optimises their digital solutions. Gerold Schierholz, AVIATAR Product Owner, Maintenance & Fulfilment, describes the system's evolution to Paul E Eden

All photos: Lufthansa Technik

Above: The data garnered by AVIATAR is visualised in a state-of-the-art user interface

Lufthansa Technik (LHT) launched AVIATAR in 2017 as an 'independent aviation platform', designed to optimise a customer's 'entire operation'. By then, the market was already rich in maintenance and engineering (M&E) systems from the likes of Commsoft, Swiss-AS, Trax and others, as well as aviation ERP and other applications, and one might ask why Lufthansa Technik felt an 'independent platform' was required. In fact, AVIATAR plays an important role alongside those existing systems, as Gerold Schierholz, AVIATAR Product Owner, Maintenance & Fulfilment, explains.

"AVIATAR takes the concept of airline IT further. Traditional M&E systems focus on maintenance and engineering requirements only, while AVIATAR, as the Digital Operations Suite, connects other (big) data sources within an airline, its partners, suppliers and providers. This includes flight and ground ops information, and aircraft data. It allows not only asset monitoring, but also offers predictive solutions and (semi-) automated fulfilment, as well as access to marketplaces.

"Depending on the digital solutions our customers choose, different business models are applicable, some of them requiring a licence fee and onboarding fee. Most of our partners are airlines, but some solutions are also beneficial for MROs and other players in the aviation industry sharing the same goals of becoming more efficient and reducing costs."

The concept of interfacing IT systems for optimised operations has always been attractive, but the practicalities of ensuring the accurate and timely transfer of data between them, and of training staff to enter data through different dashboards, was frequently a complicating factor. All of which has been carefully considered during AVIATAR's design.

"We work closely with different M&E system vendors and other airline IT providers, including Netline, to make AVIATAR a plug-and-play solution," Schierholz says. "An airline's existing M&E solution remains the primary system ensuring compliance with regulatory requirements. That's why data transfer between AVIATAR and M&E systems is not a one-way street, and why the M&E component may be connected to other airline IT systems via AVIATAR, where all the data can be displayed on one screen."

Controlled Sharing

And, just as M&E systems can play an important, cost-saving role when it comes to returning aircraft off lease, so AVIATAR has the potential to add to that functionality, through customer-controlled data sharing. "We are in close contact with lessors and many other partners in the industry. It is up to our customers how they use the data or provide access to it." Recognising that there are still plenty of paper and other record formats, Schierholz notes: "We also support them in all areas of digitalization and we're working closely with other Lufthansa Group companies and AMOS." Lufthansa German Airlines and Lufthansa Cargo are scheduled to go live with AMOS this autumn.

AVIATAR users may choose to share data, as is the case with the Lufthansa Group, but every customer and data owner has control of their operational data and decides exactly what is shared. Thus, there is no requirement to share data, but individual experiences nonetheless feedback into the development cycle, potentially improving AVIATAR for all.

The product is modular, comprising a growing number of digital solutions or applications from which customers select the most suitable for their operation. AVIATAR developed many of these applications alongside the product's

The M&E component may be connected to other airline IT systems via AVIATAR

launch customers, who contributed to their features and functionality. "And with our innovative feedback process," Schierholz enthuses, "all customers can contribute to the product development roadmap later on. In addition, the innovation teams within AVIATAR and Lufthansa Technik's product divisions are in close contact with all our customers and partners, identifying new digital and physical solutions for development."

Data Gathering

AVIATAR gathers data from multiple sources, both inflight and on the ground, according to customer requirements. In many cases, data is sent via ACARS in flight and Wi-Fi/GSM on the ground, again as defined by the customer and based on the requirements of their chosen solutions. Schierholz notes: "It can be very helpful for engineers and troubleshooters to receive fault messages while the aircraft is in the air, since manpower, tools and spare parts can be ordered before it lands. This helps reduce costs by avoiding or minimising AOGs. Of course, if an operator is taking advantage of AVIATAR's predictive maintenance capability, then the inflight fault might never have occurred.

"Predictive maintenance is a key AVIATAR objective and we are proud that we have already been very successfully helping our customers avoid unscheduled AOGs. Together with our customers and partners, we are looking for trends and solutions in the fulfilment process to minimise operational interruptions. The customers' pain points are very important to us and, since Lufthansa Technik has technical experts worldwide, we can not only predict, but also solve issues at the earliest opportunity.

"Some of the predictors are specific to an aircraft or engine type, but others apply regardless of aircraft type. That's the beauty of AVIATAR as an OEM-independent platform; we can interface with any aircraft that's sending the required data, enabling all the aircraft in a mixed fleet to be displayed on a single screen."

Predictive maintenance may well be important, but there are actually multiple ways to access and exploit AVIATAR information. The process depends on the users' role – they may want to see the whole fleet, or only part of it, a single aircraft type or even an individual aircraft approaching a certain destination. In addition, similar data may be useful from different perspectives, a quality especially useful for material or work package planners.

Additional value comes from the ability to connect AVIATAR's digital solutions to data sources other than those purely aircraft based, raw or otherwise. Schierholz confirms: "Besides component, aircraft maintenance data and knowledge databases, we are also using data from our workshops, which can be useful for engineers, technical and operational experts."

Schierholz says that customer feedback two years after product launch is very positive. "Our development teams use agile methods to ensure our solutions meet customer needs. We are also seeing possibilities for joining forces with partners, as we've recently announced with Honeywell. We are even discussing certain issues with experts from competing airlines within our customer community, helping us define product developments."

The partnership with Honeywell is enabling AVIATAR to offer digital solutions to its customers more rapidly. "In combination with the right data, visualised within our state-of-the-art user interface and with our experts, both airline technicians and data scientists, the partnership with Honeywell makes AVIATAR even more attractive," Schierholz believes. "And we're looking forward to welcoming additional partners. Digitally connected to physical MRO services for components, engines and maintenance, AVIATAR allows airlines to turn data into valuable action. We think prediction is nothing without fulfilment, and that's our key objective as we build on big data solutions."

Top: Data can be sent via ACARS inflight, so manpower, tools and spare parts can be ordered before the aircraft lands. **Right:** AVIATAR users can view the whole fleet onscreen, a single aircraft type or an individual aircraft en route


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MRO Meets BLOCKC

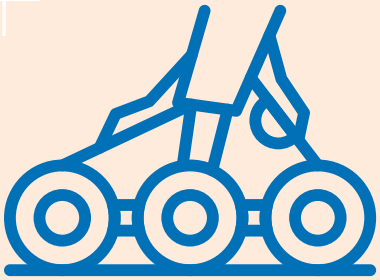
SITA and a number of partners have just launched a new alliance to investigate the use of blockchain to track, trace and record aircraft parts

The new alliance comprises leading organisations covering every aspect of the MRO chain, from part manufacture and repairs to logistics and smart contracts. Members currently include Bolloré Logistics, Cathay Pacific, FLYdocs, HAECO Group, Ramco Systems, SITA, and Willis Lease Finance Corporation, supported by Clyde & Co. The alliance was first mooted in 2019 at a HAECO Group event with the aim of bringing the various stakeholders together to set a global standard around the use of blockchain to trace parts.

Currently there is no global database, incomplete data sharing, and only partial digitalisation

In the coming months, the alliance will launch a proof of concept to demonstrate the use of blockchain to digitally track and record the movements and maintenance history of parts across a wide number of players. These include airlines, lessors, OEMs such as engine producers, logistics suppliers and maintenance providers.

This tracking information will be vital to managing a complex logistics value chain that can span several stakeholders over the lifetime of each individual part. Currently, there is no global database, incomplete data sharing, and only partial digitalisation. The alliance believes



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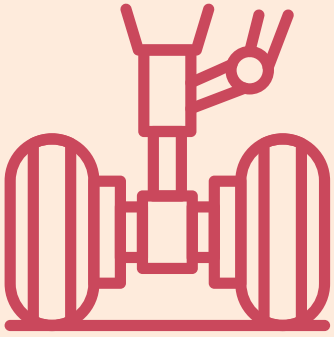


25

BILLION

AMOUNT OF PARTS MRO INDUSTRY PROCESSES EACH YEAR

that the use of blockchain will simplify and speed up parts tracking while enabling the secure sharing of information between industry stakeholders.

PwC, in an April 2019 report called 'Data for the life of the aircraft', estimated that the use of blockchain could increase aerospace industry revenue by as much as 4%, or $40 billion, while cutting MRO costs globally by around 5% or $3.5 billion. Savings will be derived from secure document storage, ensuring confidentiality and data privacy, improved insights on repair time and inventory, automated workflows and more efficient record reconciliation.

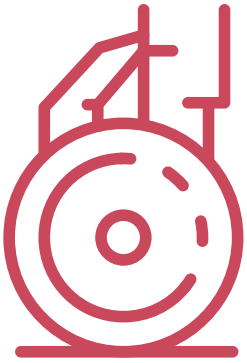
The alliance will use blockchain to record and track two separate strands of information for each aircraft part: a digital thread and a digital passport. The digital thread provides the real-time status, chain of custody and back-to-birth track and trace of the part over time. The digital passport – like a human passport – provides the indisputable identity of a part and contains other vital data such as certification of airworthiness to prove ownership.

SITA's role, as the air transport community's IT provider, is to manage governance for the global alliance, support the working groups, deliver all required blockchain technology components compliant with SPEC2000 and SPEC42 standards and ensure proper alignment and validation with regulators and international standardisation bodies.

Each year, the MRO industry processes 25 billion parts, while adding three billion new parts. There are 20,000 suppliers, covering 144,000 flights every day for an overall industry market representing around $100 billion every year.

The alliance will spend the next few months in the planning phase, with the aim of going live with the first proof of concept in the second quarter of 2020. The MRO Blockchain Alliance is a key element of SITA's Global Blockchain Alliance, a wider SITA-led forum that is focused on the development of key blockchain-based applications for potential use in the air transport industry, including MRO, passenger identity and flight data.

The alliance will spend the next few months in the planning phase, with the aim of going live with the first proof of concept in the second quarter of 2020



$40

BILLION

ESTIMATED THAT THE USE OF BLOCKCHAIN COULD INCREASE AEROSPACE INDUSTRY REVENUE BY AS MUCH AS 4%, OR $40 BILLION

FULL STEAM AHEAD

Forward planning has been essential for XEOS to establish a skilled workforce ahead of the opening of its MRO facility. ***Ian Harbison*** reports from Wrocław

Photo: XEOS

One of the attractions to the Wrocław area of a company like an aircraft engine maintenance facility such as XEOS (see separate story) was the promise of highly skilled jobs created as part of a long-term investment. While there has been inward investment, much of it has been service centres for financial companies, which can be moved at short notice if more attractive incentive packages and labour rates become available elsewhere. Mercedes Benz and LG are also present, but have highly automated assembly lines for truck diesel engines and household appliances respectively, with very short training periods of just a few weeks for new staff.

In contrast, says Kieran O'Kane, Head Of Training, XEOS, a new technician at XEOS must pass a 15-month training course. That obviously required an early start to the programme. In fact, partners Lufthansa Technik and GE Aviation formally announced the establishment of XEOS in December 2016 and the first trainees were inducted a month later, being sourced from Wrocław University of Technology and local technical schools. Lufthansa Technical Training (LTT) was chosen as the training supplier.

In April 2017, the XEOS Specialised Training Centre was opened in Bielany Wrocławskie, just over 35km southeast of the MRO facility at Środa Śląska. Converted from a warehouse in the Prologis Park logistics facility, it has 600m² of classroom areas for theoretical training and a practical training area of 2,500m². This has the same specialised equipment, standards and conditions as in the real plant. Three CF6-80 engines are used for hands on training.

$15.5 MILLION
Total amount being invested in training

The first nine months of the course are spent in Bielany Wrocławskie. Usually, groups of approximately 25 people are involved. Conversational and aviation technical English are important elements, alongside basic training that includes theory fundamentals and practical handskills. This compensates for a lack of apprenticeships and relevant trades certificates in Poland. Engine work starts with a CF6 theory/practical course, followed later on by a GEnx-2B theory/practical course. All the training is carried out under Part 147 conditions, including exams and practical assessments. This also means that students get used to real working practices at an early stage, for example, if a tool is lost, all work stops until it is found.

The next 26 weeks see candidates carry out on-the-job training (OJT) at Lufthansa Technic in Hamburg or Frankfurt or at GE Aviation in the UK. Trainees are now divided between engine

and workshop specialities, depending on their aptitude and the workload at XEOS. At a later stage, GE9X will be introduced as shop visits get closer and there will be cross-training between the two engine types. Returning to Poland, there is a four week course on processes and IT covering XEOS and the customer base.

After graduation, students become Level A Mechanics. They can perform all tasks under supervision (subject to inspection) and to sign off trained tasks without supervision. After a further 12 months, they can become Level B Mechanics, able to supervise Level A and sign off complex tasks. After another year, Level C awaits, with the ability to supervise Level A/B and sign off final inspections on safety critical tasks. The final step is Certifying Staff, specialising in either engines or components, and conforming with Lufthansa Technik Group Approval Standards.

Authorisations at Level A cover a wide range of activities, such as NDT, tool inspection/calibration, welding and thermal spraying. At Level B, options include borescoping, bearing inspection, grinding and heat treatment.

A total of $15.5 million is being invested in training, with each mechanic costing about $100,000, so a loyalty bond is involved. However, he adds, the company also wants to keep people through favourable terms and conditions, such as a subsidised canteen and, unusually, airline benefits with Lufthansa. He also notes that some of the candidates at other locations for OJT have been asked to stay, so standards at the XEOS Specialised Training Centre are clearly high.

Of course, a core of highly experienced personnel was needed to help with the initial setup and a number of people have moved from other Lufthansa Technik facilities to develop their careers with a new challenge.

While the current focus is on the build-up of skills for Wrocław, Thomas Böttger, Managing Director of Business, says it is possible the Specialised Training Centre could offer its services to other parts of the Lufthansa Technik Group, or to outside engine maintenance companies.

E FUEL F FOR THE FUTURE

Interest in sustainable aviation fuel is growing, with a new plan being announced by the UK aviation industry

Photo: Neste

Sustainable Aviation is exploring ways to cut UK aviation net carbon emissions to zero by 2050

Sustainable Aviation is a long term strategy which sets out the collective approach of UK aviation to tackling the challenge of ensuring a cleaner, quieter, smarter future for the industry. It claims 90% of UK airlines, airports and air navigation service providers are represented, as well as all major UK aerospace manufacturers and key business partners.

On 4 February, it launched the Decarbonisation Road-Map report, setting out how aviation net carbon emissions could be cut to zero by 2050, in line with UK Government targets. At the same time, it issued a Sustainable Aviation Fuels Road-Map report.

This updates a 2014 study to identify and forecast the potential for sustainable aviation fuel (SAF) production to 2050. Its specific objectives are:

- To highlight the potential contribution that sustainable aviation fuels can make to supporting the decarbonisation of the UK economy
- To outline the potential for job creation and economic growth in the sustainable fuels sector both in the UK and globally
- To build on the UK Government's existing support to develop a strategy for UK sustainable fuels, and to provide a cross-departmental focus on SAF to progress development and commercial deployment, through a new Office for Sustainable Aviation Fuel (OSAF) or similar cross-departmental body with appropriate governance structure, membership and resources.

The report says sustainable aviation fuel is now at a global tipping point, with a number of projects on the verge of commercial-scale production due to technological, political and commercial developments. Globally, 14 airports now supply sustainable aviation fuels, although at low volumes.

A number of airlines and some fossil fuel companies are now making investments in sustainable aviation fuels through joint ventures. There is also more optimism than the previous Road-Map about the potential of integrated carbon capture and storage, and the possibility of this being deployed alongside fuels production increasing overall carbon reductions significantly.

It says the UK is well placed to seize this opportunity and benefit from the economic, environmental, fuel and food security benefits

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***Leandro Rodrigues Oliveira**, Engine Module Technician*

AFI KLM E&M has extended its capability list to include maintenance for the LEAP* engine, with an MRO service offering that covers both On Wing/On Site support and shop visits. AFI KLM E&M, which has provided support when new engines go into service on a number of occasions in the past, is capitalizing on the know-how of its teams to support early-stage operations on the LEAP worldwide. We are ready to meet the needs of the airlines with services that are always the **Best4You.**

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Photo: Air BP

Introducing aviation into the Renewable Transport Fuels Obligation has been an important first step for the UK

that the increased use of sustainable aviation fuels will bring. Through the introduction of aviation into the Renewable Transport Fuels Obligation (RTFO), the UK took an important first step towards establishing itself as a global player in the emerging sustainable fuels sector. However, the UK currently follows, rather than leads, on sustainable fuels. The US (particularly California), Norway, Sweden, Finland and the Netherlands are moving further, faster on sustainable fuels. The UK cannot afford to be left behind.

The Renewable Transport Fuel Obligation (RTFO) is the Government's policy to reduce greenhouse gas emissions from fuel by providing incentives for sustainable fuels. To encourage investment in fuels manufactured from wastes and residues in line with the UK's long-term strategic needs, a 'development fuels' target was set as part of the RTFO from 2019. This includes sustainable aviation fuels. The RTFO only extends to 2032 at present.

Future opportunities

Sustainable Aviation is committed to the development of sustainable fuels that meet strict safety conditions, significantly reduce life cycle greenhouse gas (GHG) emissions over conventional fossil fuel, meet stringent sustainability standards and avoid direct and Indirect Land Use Change (ILUC). The UK can establish a leadership position in Recycled Carbon Fuels (RCF), which are manufactured from waste materials such as waste industrial gases and municipal solid waste (MSW).

An analysis commissioned by Sustainable Aviation from independent consultants E4tech estimates that in 2035 there may be between 14.5 and 30.9 million tonnes of SAF produced per year, 4-8% of global use.

If UK production were to grow in line with global production, SAF produced

A number of sustainable fuel projects are on the verge of production on a commercial scale

DELTA TO BUY SAF

Building on its $2 million investment for an ongoing feasibility study with Northwest Advanced Bio-Fuels (NWABF), Delta has entered into one of the largest airline offtake agreements of its kind to purchase sustainable aviation fuel (SAF), if produced, from NWABF.

The feasibility study, announced in October 2019 and currently underway, is expected to determine the potential for a facility in Washington state that could supply sustainable aviation fuel for Delta operations in Seattle, San Francisco, Portland and Los Angeles by mid-2020.

Photo: Delta Air Lines

In parallel with the study's goal to produce sustainable aviation fuel for West Coast operations, Delta has signed an offtake agreement for sustainable aviation fuel that may be produced from the facility, which would reduce lifecycle emissions up to 80% compared to that of conventional jet fuel. This complements the airline's recent offtake agreement with Gevo for biofuel production in Minnesota, expected to be available between 2022-2023.

The NWABF offtake agreement would anticipate fuel production by the end of 2024, while the advanced planning study will conclude later this year.

SHELL SEEKS SAF SUPPLY

Shell Aviation and World Energy have announced a collaboration to develop a scalable supply of sustainable aviation fuel (SAF). The agreement is intended to be a multi-year collaboration, with both companies acknowledging that the path to lower carbon emissions in aviation requires long-term commitment and collaboration.

As part of the collaboration, Shell Aviation and World Energy also announced that they have initiated the supply of up to one million gallons of SAF to Lufthansa Group at San Francisco International Airport. The supply will reduce carbon emissions on intercontinental flights on three routes operated by Lufthansa and Swiss International Air Lines from San Francisco to Frankfurt, Munich and Zurich. This is the largest contracted SAF volume to be delivered to SFO since the airport announced its ambition to expand the use of SAF in its operations last year.

Photo: Lufthansa

The SAF is produced by World Energy at its refinery in Paramount, California from a feedstock of agricultural waste fats and oils. This CARB-certified Low Carbon Fuel and RSB-certified fuel meets strict sustainability standards and is blended with conventional jet fuel at a ratio of up to 30%, resulting in a fuel that has significantly lower lifecycle carbon emissions. In general, lifecycle carbon emissions from SAF can be at least 80% lower than conventional jet fuel. SAF is supplied to airports through existing airport infrastructure and can be used by airlines without requiring technical modification to their current fleets.

In November 2019, Shell announced that it will support SkyNRG to develop Europe's first dedicated sustainable aviation fuel (SAF) production plant at Delfzijl, Netherlands.

The DSL-01 production facility is on schedule for commissioning in 2022, representing the earliest dedicated commercial supply of SAF to the aviation market in Europe. The plant will annually produce 100,000 tonnes of sustainable aviation fuel, corresponding to a reduction in lifecycle CO_2 equivalent emissions of approximately 270,000 tonnes. The plant will also produce naphtha, and 15,000 tonnes of bioLPG annually as a by-product. Earlier, KLM committed itself for a 10-year period to the development and purchase of 75,000 tonnes of sustainable aviation fuel a year.

The feedstocks used for production will be waste and residue streams, such as used cooking oil, sourced predominantly from regional industries. The facility will run on sustainable hydrogen, produced local to the site in the Groningen Seaport. The combined benefits of the feedstocks, sustainable hydrogen and use of low carbon energy to power production will contribute to the production of SAF with lifecycle carbon emissions approximately 85% lower than conventional jet fuels, as estimated by the Roundtable on Sustainable Biomaterials.

"In 2035, there may be between 14.5 and 30.9 million tonnes of SAF produced per year, 4–8% of global use"

in the UK could provide between 3.3% and 7.8% of the UK's 2035 aviation fuel demand. In 2050, 32% of the UK demand for kerosene could be met by domestically produced SAF, requiring 4.5 million tonnes/year of SAF production. This corresponds to an annual growth rate from 2035 that is not dissimilar to historic growth rates in global biofuels production.

By 2035, the development of a domestic industry to produce sustainable fuels could generate a Gross Value Added (GVA) of up to £742 million annually and support up 5,200 UK jobs. A further 13,600 jobs could be generated from the growing market for SAF through global exports.

This export market is worth up to an additional £1.952 billion to 2035, bringing the full value to the UK of £2.7 billion from UK production and global exports. In addition to this, UK manufactured fuels could deliver a £550 million per annum benefit to the UK's balance of payments.

Making it a reality

Given the global climate change challenge and UK plans to cut emissions, supporting the uptake and commercialisation of SAF should be a strategic UK priority and industry is

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The UK must make significant progress in the next decade if aviation is to play its full part in achieving a net zero future. photo: British Airways

"SA members collectively plan to invest £3.5 billion in sustainable fuel initiatives over the next 20 years"

rising to the challenge. SA members are currently committed to developing a number of sustainable fuel initiatives and are collectively planning to invest £3.5 billion in supporting new plant construction, fuels testing and R&D, as well providing bankable fuel offtake agreements, over the next 20 years.

However, the success of these and future projects is dependent on industry continuing to work with the UK government to create a shared vision for sustainable fuels. In July 2019, the Department for Business, Energy and Industrial Strategy (BEIS) unveiled an £80 million investment to help develop the next generation of electric vehicles and new hybrid aircraft. Sustainable Aviation says SAF, requires a similar kind of investment. Long-term policy stability and financial support for the scaling-up and rollout of sustainable fuel production capacity is needed to deliver on the opportunity outlined in the Road-Map.

To achieve this, it is calling for:

- An Office for Sustainable Aviation Fuel (OSAF) or similar body which has appropriate governance structure, membership and resources. This is vital to provide the essential cross-government co-ordination and visible support necessary to progress the development and commercial deployment of SAF. This could be based on the successful Office for Low Emission Vehicles (OLEV) or the public-private partnership success of the Aerospace Technology Institute (ATI).

- £500 million of matched public/private funding over five years (totalling £1 billion) would support a flagship first-of-a-kind commercial plant across the UK, utilising wastes and residues to manufacture SAF, as well as a UK centre of excellence for SAF development. This funding will also support additional fuels development and testing to utilise the UK's considerable expertise on this area to expedite the approvals process for new aviation fuel technologies, helping to attract investment and anchor new fuels technology providers in the UK.

- SAF fall outside the remit of the Aerospace Growth Partnership (AGP) and ATI, and other dedicated funding streams that exist for electrification and hybrid aircraft. UK Government needs to take a similar strategic approach to SAF as investor confidence is critical to what remains a nascent industry.

- Applying the Renewable Transport Fuels Obligation (RTFO) to sustainable, waste-based feedstocks could give a major boost to SAF development, and recycled carbon fuels should now be included to remove barriers to these ground-breaking technologies. There are several areas where the RTFO could be strengthened and provide more certainty for investors, notably regarding revisions to the development fuels sub-target as fuel volumes increase over the coming decade.

- Applying at least a multiplier of 1.2x for developmental SAF would provide a signal to fuel producers to invest in aviation fuel production instead of using the same feedstock to produce road fuels, which currently provide more return for investors. This is in line with the Renewable Energy Directive II (RED II), which will be supporting fuels providers in the EU, and the UK outside of the EU needs to remain competitive.

- Sustainable Aviation says the next decade must be a decade of significant progress if aviation is to be able to play its full part in a net zero future for the UK. There are excellent research capabilities in UK universities and aerospace but limited facilities to test and approve new fuels and a patchwork of support for commercialisation. This can change with Government support.

SOUTHWEST'S GRAND REVEAL

All photos: Southwest

Southwest Airlines' new maintenance facility can hold six Boeing 737 MAX aircraft

Southwest Airlines recently opened its largest-ever hangar at its Houston base. *Keith Mwanalushi* takes a closer look inside the new maintenance complex

Southwest Airlines started the year with the grand reveal of its new maintenance facility at William P Hobby International Airport, in Houston, Texas. The new facility highlights the importance that Houston holds for the low cost carrier which is the largest domestic airline in the US.

The hangar is a hybrid pre-engineered metal building totalling 22,300m². Approximately 1,300m² of the facility is hangar space to accommodate six Boeing 737 MAX aircraft for simultaneous maintenance, the remaining 9,300m² of facility space encompasses offices, parts storage and other support areas. Outside the hangar is 42,000m² of apron paving and two aircraft wash racks, as well as locations for four future wash racks. Additionally, a 630ft taxiway connects the apron paving to the taxiway.

Kelley Agrella, Director Tech Ops Production, Technical Operations at Southwest Airlines tells MRO Management that the previous facility was designed and built when the airline was flying the 737-200/300s, and the aircraft being flown today had outgrown that space.

"As we began designing the facility, we looked for ways to enhance the employee experience, which included a number of new features including a new hangar door made from strong fabric which allows for

The airline represents $3 billion in economic activity for Houston each year; the hangar more than doubles previous maintenance operations

more natural light, ensuring all hook-ups (including pre-conditioned air) for the aircraft now come up through a pit in the hangar floor, instead of from the ceiling or wall, and more than doubling the hangar capacity," Agrella explains.

The airline represents $3 billion in economic activity for Houston each year, and the hangar is significant as it more than doubles the previous maintenance operations it had in Houston. "Additionally, as we grow our fleet and destinations from Houston, there's a greater need to have a facility that can handle the work that's needed to keep our operation running at the highest efficiency. We have long-term growth plans for Houston, and this will help us achieve that goal," Agrella continues.

Above: The hanger envelope and orientation meet functional needs while integrating with the site and airfield conditions
RIght: The new facility will accommodate almost 400 Tech Ops employees working simultaneously

Design and engineering

Architecture and engineering firm Ghafari Associates led the facility design, working closely alongside Southwest and aviation consulting firm AvAirPros.

Primary factors in the design included provisions to support new and larger aircraft variants than Southwest has historically flown. Whereas to date Southwest limited its fleet models to 737-700s and -800s as well as the -8 MAX, architects at Ghafari took into consideration provisions for stretched variants and ultimately any Code C aircraft (wingspan between 24-36 m), affording flexibility for foreseeable changes and evolution in the fleet – even to larger category airframes.

Ted Oberlies, Senior Vice President, Aviation Group at Ghafari Associates says the hangar capacity and geometry was planned to provide efficiency and scheduling simplicity, supporting a mix of light and heavier base checks. "Four of the six service positions under cover enable independent entry and egress. The material stores and critical shop areas are configured to provide direct access to the hangar areas, thus reducing circulation and clutter and effectively improving workspace utilisation."

In addition, he says the design team, working with Southwest's Tech Ops leadership, included features and provisions for better point-of-use service utilities and equipment to streamline work processes and support a safer, technician-centric workplace: "It's a combination of applying today's proven equipment and building technologies while anticipating adaptation for future advancements."

Ghafari provided the architecture and engineering services for the development. The hangar bays and support shops were designed with specific focus on Southwest's base and heavier aircraft maintenance. The hangar envelope and orientation were carefully confirmed to meet functional needs while effectively integrating with the site and airfield conditions. Key features of the design include the use of LED lighting and daylight harvesting, which should conserve energy and reduce costs.

Oberlies explains that the highlight of this project can be summed up in a design that epitomises form following function. From the organisation of space, to the architecture and building materials, the Houston maintenance base is a practical manifestation of Southwest's vision for its aircraft service centres of the future. It combines best practices thinking for modern aircraft MRO and standardises the physical platform for that work.

As for challenges, well, for one, the location is Houston. "The severe weather events of recent years prompted the design team to prioritise building resiliency in the design criteria. The base elevation of the building was actually crowned 45cm above the surrounding grade to avoid flooding and undue impacts to operations," Oberlies highlights.

Another challenge arose with the integration of the maintenance centre on the airport property. Oberlies explains that hangar facilities of this scale often pose potential impacts to the airport and airfield operations or navigational systems.

Ted Oberlies from Ghafari Associates

As a pre-requisite of the facility construction, the FAA and airport had to relocate the Airport Surveillance Radar (ASR) installation. "The contractor could not erect steel or the building envelope systems during the original phased construction plan. This led to significant resequencing of the work across the building assembly. Ultimately, the design team developed options to accommodate the alternate erection approach and keep the project delivery on track."

Embracing technology

Aircraft maintenance facilities globally are now increasingly designed with technologies that make for more cost-effective use of the facility as well as reducing the environmental impact. Oberlies confirms that the design in the facility applied some of the latest, cost-effective building systems for modern industrial and service hangars. The Ghafari design team specified high-efficiency heating and cooling systems, along with economical passive cooling systems for the large hangar envelope. "The Houston climate primarily warrants mitigation of heat and humidity, especially for intensive work areas. To improve conditions for the airframe maintenance, spot and interior cabin cooling are achieved through conventional pre-conditioned air systems, along with power provisions for portable evaporative cooling, on demand."

In electrical systems, the primary gain in this facility was in lighting, Oberlies continues, where the latest LED lighting fixtures and control systems were installed, greatly improving the quality and visual characteristics of the artificial light while reducing the energy consumption, both independently and when coupled with natural light during daytime operations.

From an operations perspective, paperless maintenance and the use of drones are just two new technologies taking hold in MRO processes.

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The latest LED lighting and control systems improve the visual characteristics of the artificial light

Southwest say the airline is always looking at ways to utilise new technologies, but there are no current plans to use drones or change the way the Tech Ops teams operate.

The new facility will accommodate almost 400 Tech Ops employees working simultaneously on up to six 737 aircraft indoors and an additional eight aircraft outside the hangar bays.

Finding adequately skilled technicians has been an ongoing dilemma for the global MRO industry, and Agrella says some of the new hire talent has come from other MRO facilities: "They come with a wealth of knowledge and are very eager to learn in making the switch to the airline side of maintenance."

Southwest is also investing in other maintenance buildouts at other locations in the USA. Currently, the airline is building a 9,300m² facility in Denver (first Southwest Hangar in Denver), a similar-sized facility at Baltimore/Washington (BWI), and an expansion project for the Phoenix Sky Harbour maintenance facility is underway: "We are aiming for both Phoenix and Denver to be online by early 2021, and Baltimore will follow," reveals Agrella.

Trend watch

The team at Ghafari see several trends in the design and engineering of aircraft maintenance hangars today. "We continue to see a greater emphasis on transformative work environments and the airlines and leading MRO providers are focusing more on the employee of tomorrow," Oberlies observes. He says the mindset is a significant departure from the maintenance centre designs of the last generation. The objectives now are not unlike those seen in several other industries, where the attention has shifted from the bottom line towards worker wellbeing. "In the realm of aircraft maintenance centres, that translates to more inviting workspaces in hangars, shops, and offices.

Architects took into account provisions for stretched variants and ultimately any Code C aircraft, affording flexibility for fleet evolution

"We're including more daylighting as well as brighter, durable interior designs that are sustainable and maintainable. We're also incorporating more amenities such as fitness centres, recreational rooms, and more open, convertible work and break areas."

There is also greater emphasis on designing for more integration of technology in both hangar and tech ops functional spaces. Oberlies adds: "5G communications integration, digital task cards and UAV inspection are just some of the current developments, but we anticipate applications for advanced materials and tooling management, as well as task assistance with collaborative robots in the coming years. Tomorrow's MRO workforce will be more sophisticated, and the workspace will follow suit."

In the meantime, over at Southwest's new shiny maintenance complex in Houston, the goal for the facility is to provide the most value-driven workspace to promote quality, productivity, and safety in aircraft maintenance.

Q&A

New start in Lithuania

Ian Harbison spoke exclusively to **Arturas Liudkevicius**, CEO of Aviatic MRO

What is the background of Aviatic MRO as a company?
Aviatic MRO is managed by a team that has extensive prior experience across the aviation sector. The shareholder of Aviatic MRO is the company Completec OÜ.

Invest Lithuania has been promoting MRO developments at Vilnius and Kaunas. Why did you select Šiauliai?
The substantial infrastructure of this international airport is a major advantage. Located only three hours flight from major aviation hubs, Šiauliai airport has the longest runway in the Baltic States (11,500ft), which is able to accommodate all types of aircraft, is operational 24/7 with no noise restrictions, and has all the necessary maintenance equipment.

Is Invest Lithuania providing any assistance?
We are maintaining a close relationship with the Lithuanian Business Support Agency and with respective ministries in Lithuania.

When is construction expected to start?
We are at the stage of finalising general agreement terms with our main construction contractor, physical works such as the installation of bored piles will start in March.

Have you selected suppliers for the hangar?
Some of the major suppliers have been selected, but we are still tendering the remaining parts of the hangar.

Photo: Aviatar

"Aviatic MRO is a team of aviation professionals with a background in airlines, MRO, and other related businesses"

Will any other infrastructure have to be built at Šiauliai?
It is a fully functioning international airport, but the municipality of Šiauliai, our main strategic partner, plans to update the infrastructure of the airport and expand its parking, fuelling, and other capabilities.

Will World Star be the lead customer?
We have signed an LOI that as an MRO we will be able to support WSA in different maintenance fields such as CAMO, base maintenance, redelivery projects, and other areas where we have the synergy. WSA is one of our potential clients, but we are open to all airlines who would be interested in our services.

Is this an exclusive contract?
Yes, it is. We are also discussing some wider collaboration opportunities.

The press release says orders for minor repairs will be taken in the next few months. With no facilities at Šiauliai, will this work be subcontracted elsewhere in the interim?
We will carry out minor repairs within Šiauliai and other airports in Lithuania, off-season parking, and the servicing of parked aircraft.

What are the target markets – countries and operators?
Aviatic MRO is a team of aviation professionals, with a background in airlines, MRO, and other businesses related to aviation. We understand the market, and the demands of airlines. The initial target is to cover the needs of customers with whom we have signed LOIs, and later to accept all interested airlines or lessors. We are able to park aircraft during low season periods, which is critical due to the lack of space at other airports in Lithuania. We intend to cover customers who are within 2-3 hours' flight, but if someone knocks on the door from a different continent we will be happy to support.

I understand the original design was larger, and included a paint facility. There is a reference to 'painting areas' in the release, but that seems to suggest components rather than aircraft.
Yes, when we refer to painting areas, we mean areas related to aircraft components within the hangar. We have the opportunity to build three additional similar-sized hangars close to the main facility. There is no decision at the moment to construct them, however. Our goal is to develop Aviatic MRO into a one-stop shop MRO, providing all the necessary services that a client would require.

Will A320 approvals include ceo and neo?
Customers that we are targeting now mostly use the A320ceo family. This means our concentration on developing neo can be considered only one or two years after operations begin.

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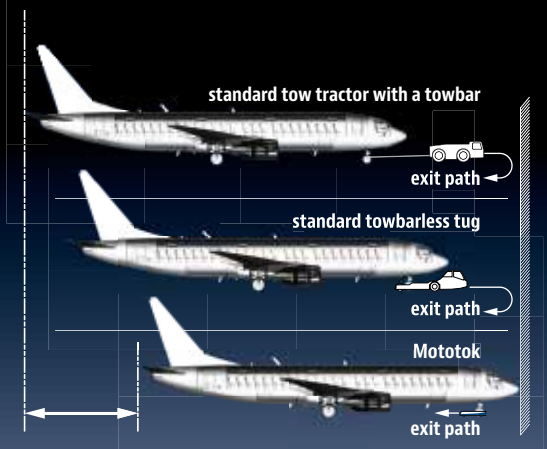

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