

AVIATION MAINTENANCE

Spring 2021



The World's Leading Aviation MRO Publication

Widebody Engine Care

RETURN TO SERVICE

THE COMPLICATED
PROCESS OF STORING
AND RETURNING
AIRCRAFT TO SERVICE

BIZJET CONNECTIVITY

THE INSATIABLE
DEMAND FOR MORE

**ONE ON ONE
WITH EMPOWERMX CEO**
DINAKARA NAGALLA SHARES WHAT
HIS COMPANY HAS LEARNED IN THIS
UNUSUAL YEAR

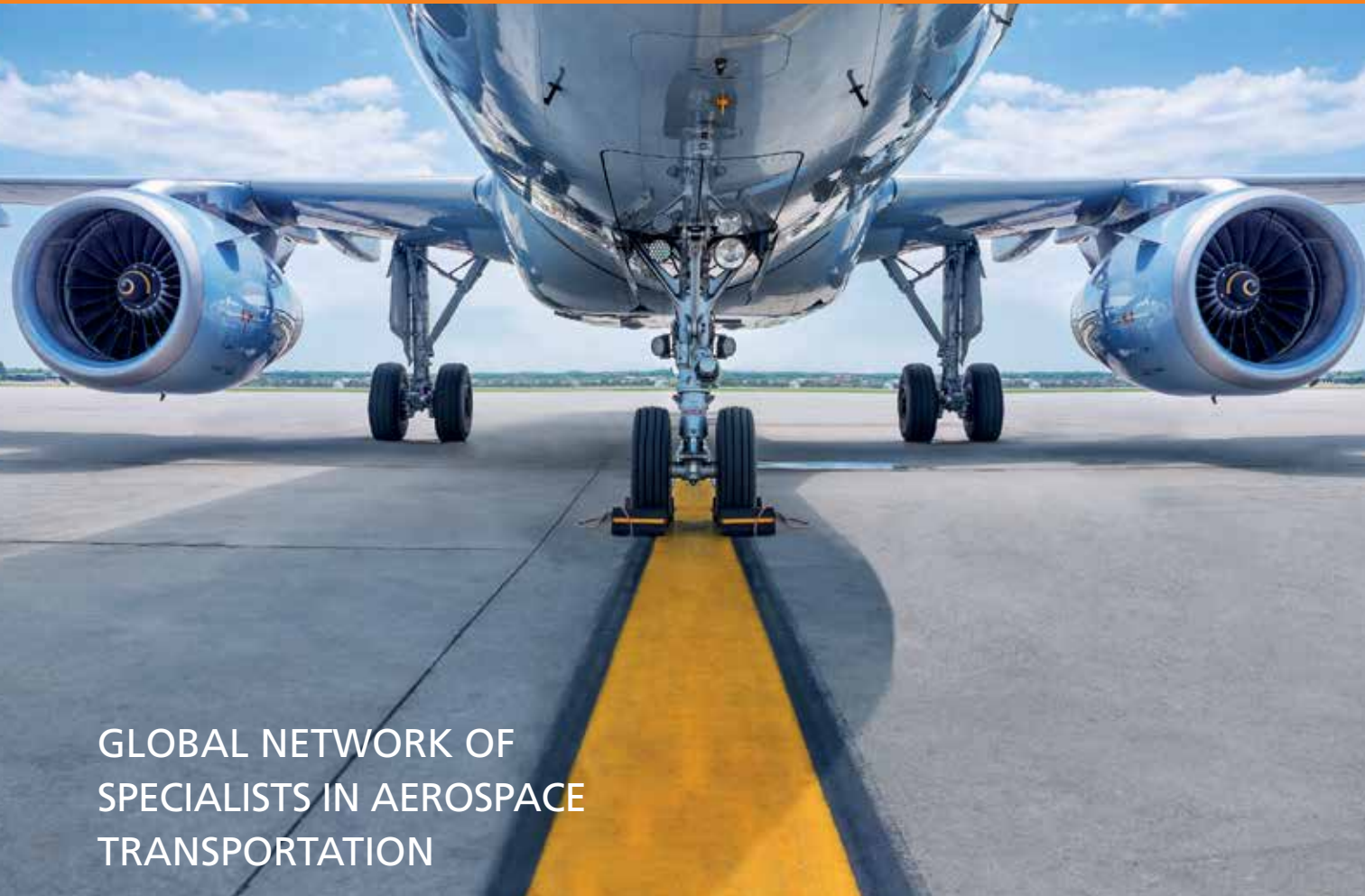


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CONTENTS

The World's Leading Aviation MRO Publication

SPRING 2021 VOL 40 ISSUE 1

NEW DATES
AEROSPACE
TechWeek.com
3-4 NOV '21
TOULOUSE

DEPARTMENTS

- 04 Editor's Notebook
- 06 Intelligence: News
- 46-47 Classified
- 50 Legal Spin

14

COVER STORY

Widebody Engine Care

Large engine operators were impacted more severely than operators of small engines. We take a look to see how OEMs and MROs responded to that situation.

Cover shows an RB211-535 from a Boeing 757. Image courtesy of AAR



28 Return to Service

What does it take to pull a mothballed aircraft out of the desert and put it back into the operational rotation? We found out about this complex and time-consuming process in our story about returning aircraft to service.

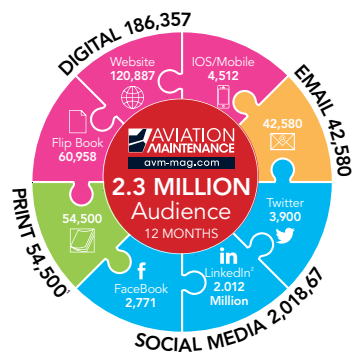
36 Connected to Your Purpose

With Zoom calls de rigueur and the desire for rapid internet across the board, what offerings exist to help? We asked about the latest in connectivity options for business jets.

42 On Guard

The next piece in Jeff Guzzetti's series on accidents examines a B767 fuel leak and fire and how the lessons learned from that event can help now as many aircraft are put back into service after months of storage.

48 Q&A with EmpowerMX CEO Dinakara Nagalla



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- GENERAL AVIATION
- COMMERCIAL
- BUSINESS JET
- MILITARY
- ENGINES
- TECHNOLOGY
- PRODUCTS/ TOOLS
- SPECIAL REPORT
- AFTERMARKET

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Are We Out of the Woods Yet?

BY JOY FINNEGAN
EDITOR-IN-CHIEF



In early 2007 (doesn't that seem like forever ago?), I recall attending a conference where a leader in the business jet MRO sector was raving about the boom times. In that time period, the business aviation market was truly booming with multiple multi-aircraft orders at all the shows and backlogs at the business jet OEMs that made it seem impossible to get a slot for an aircraft order in anything close to a timely manner.

This gentleman had been in the business for at least 30 years — likely more. He was considered an expert — a trusted leader and was well-liked and respected. He was sitting on a panel at the conference where he was asked about the potential for the next few years and whether he saw a slowdown coming or more good times. The question was phrased, "When do you predict the boom will end?" The hubris of his answer has stayed with me all these years. He replied, "I don't see it ending. Ever." He wasn't alone. The entire panel — all big name leaders in the business — agreed.

I'm not here to dis that guy or the panel, but even then, I remember thinking, doesn't he remember the economic recession of the early 80s? Or the hard times of the early 1990s? Or what about the rough patch right after 9-11 exacerbated by the dot com bubble bursting? Those quickly popped to mind and made me recall layoffs and furloughs and green tails stacked up on the ramp — oh my!

Shortly thereafter, towards the end of 2007, the real estate bubble burst. Then, the car manufacturers started suffering hard times and several of them flew into Washington, D. C. in their company business jets to ask Congress for financial assistance in keeping their factories afloat. This act of using business jets to beg for money was seized upon as the ultimate disconnect between those executives and the reality of the impact of the economic downturn on the average person during the Great Recession. Consequently, many business jet operators were shamed into selling or underutilizing their jets and cancelling jet orders.

Just a few months later, by early 2008, that overly optimistic guy I mentioned above, who didn't see an end to the boom times, was offered early retirement from his very high visibility position at a leading business jet manufacturer and we haven't heard from him since. Such an incredible domino effect of events, in hindsight.

A year and a half ago, who could have predicted what was to come in 2020 and beyond? Truly no one, which is one of the reasons industry forecasts and overly optimistic experts bother me. I can see why they are necessary but, aside from putting in a statement to the effect, "Pending any 'black swan' events..." no one could have foreseen a pandemic

that would nearly cripple the industry negating any forecast published in the 2018-2019 time frame.

In case you don't know, a black swan event is an unpredictable event that is beyond what is normally expected of a situation and has potentially severe consequences. Black swan events are characterized by their extreme rarity, severe impact and some would even say they were obvious in hindsight. Truly, this pandemic is a black swan.

On the spectrum of optimism and pessimism, I like to think of myself as right in the middle, a realist. I've been around long enough to see the cyclical nature of the aviation industry. The ups and downs make it like a thrill ride and whenever I see the boom days I think back to those downturns and wonder how businesses are preparing for that inevitability.

In any case, I am now asking the question, "Are we out of the woods, yet?" with regards to the pandemic and my realism is telling me not quite yet. What do you think?

To that end, in this issue we have some great stories that take a look at various segments of our industry and what is happening now. For example, large engine operators were impacted more severely than operators of small engines so we wanted to see how MROs responded to that situation. See the story on widebody engine MRO starting on page 14.

Next, we are surely seeing some light at the end of this very long tunnel of the pandemic. Many aircraft were sent to storage in the Arizona desert (and other places around the globe) to ride out the slowdown in airline operations. Now that COVID cases are decreasing, vaccinations are preventing the spread and pent up demand for travel is reaching new heights, we are seeing those aircraft being returned to service, especially for the busy summer travel season. What does it take to pull a mothballed aircraft out of the desert and put it back in the operational rotation? Great info on this process in our story about returning aircraft to service starts on page 28.

We also wanted to check out the latest in connectivity options for business jets. With Zoom calls de rigueur and the desire for rapid internet across the board, what offerings exist to help? We checked in with leaders in connectivity solutions for business jets, to see. That story starts on page 36.

Finally, in our ongoing series, On Guard, written by safety expert Jeff Guzzetti, he takes a look at some lessons learned prior to COVID for Post-COVID Returns to Service. The piece examines a B767 fuel leak and fire and how the lessons learned from that event can help now. Read it on page 42.

I'm excited about the light I'm seeing in the tunnel and I'm ready to get back in the air. But the realist in me thinks — as the old joke goes — hopefully it's not another train. **AW**

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Delta Regrouping Multiple Businesses into Delta TechOps Services Group

Delta TechOps, Delta Material Services and Delta Flight Products have announced they are realigned under the brand, Delta TechOps Services Group (DTSG) to offer "streamlined service and enhanced capabilities" the company says.

"This move allows us to offer stronger service and deeper partnership with our customers. Together, we can provide you solutions for the entire spectrum of fleet management, from on-going maintenance to aircraft transitions and end of life management," says Robert Schultz, Delta Material Services president.

"Together, our teams can supply a seamless, integrated solution for your most complex cabin interior upgrades while your aircraft undergo engine repair and routine maintenance," adds Rick Salanitri, Delta Flight Products president. "You can enhance your passenger experience by upgrading your aircraft interior, while undergoing innovative and efficient solutions for your aircraft needs. The combination of our skills expands the unique and efficient ways we can give your fleet the enhancements it needs."



Mike Moore, Delta TechOps senior vice president, Maintenance Operations & MRO Services says they are "constantly looking for new ways to innovate and provide more value" and stresses that now the group can assist with enhancements across the complete aviation maintenance, material and interiors landscape. "We'll continue to evaluate new capabilities to bring you the most creative, comprehensive solutions in the industry," Moore adds.

Rolls-Royce Opens World's Largest Indoor Aerospace Testbed



Rolls-Royce officially opened Testbed 80, the world's largest and smartest indoor aerospace testbed, in a ceremony that included the Rt Hon Kwasi Kwarteng, Secretary of State for the Department of Business Energy & Industrial Strategy, in Derby, UK.

The company says the completion of the project is a major milestone after almost three years of construction and a £90m (\$74m) investment. With an internal area of 7,500 sq. m., making it larger than a Premiership football pitch, Testbed 80 was designed with technologies and systems which are more capable and complex than any of Rolls-Royce's other testbeds. The testbed conducted its first run on a Rolls-Royce Trent XWB engine at the test facility in Derby, UK earlier this year.

"Testbed 80 is the largest facility of its type in the world. However, it is not only big, it is also smart and features the most advanced testing technology we have ever used," Warren East, chief executive, Rolls-Royce, said. "As the new global hub of our testing capability, it will support the next stage of our UltraFan program as we begin

ground testing the first demonstrator in 2022. This incredible piece of infrastructure is a very visible sign of our commitment to this site and secures the future of Derby as the home of large engine development, continuing a history that began in the late 1960s with the RB211."

Business Secretary Kwasi Kwarteng, said: "This testbed here in Derby shows that the UK remains a global leader in aeroengine technology. I'm proud that we're supporting Rolls-Royce's development of the highly-efficient UltraFan engine, as well as investment in green and cutting-edge aerospace technology here in the UK that will create high-skilled, well-paid jobs for decades to come. As the civil aviation market recovers, the innovation of great British companies such as Rolls-Royce and the entire aerospace sector are central to our plans to build back better from the pandemic and end our contribution to climate change by 2050."

Testbed 80 will support the company's sustainability strategy. Rolls-Royce says they will be continuing to improve the efficiency of the gas turbine. The facility has been designed to test a range of engines, including the Trent XWB and the Trent 1000, but will also have the capability to test the UltraFan demonstrator, the blueprint for our next generation of engines. UltraFan will be 25% more efficient than the first Trent engine, and ground testing of the demonstrator at the testbed will begin in 2022.

Rolls-Royce also says they are committed to promoting the use of Sustainable Aviation Fuels (SAFs), which can already be used as "drop-in" fuels in existing engines. Testbed 80 has been designed to support this commitment – it is equipped with a 140,000-litre fuel tank (you could fill a car up almost 3,000 times with this amount of fuel) SAFs. Rolls-Royce partnered with MDS Aero Support Corporation of Ottawa, Canada, for the design and construction of the facility.



Jet Aviation Redelivers World's First VVIP-Outfitted BBJ 737 MAX

Jet Aviation has redelivered the first-ever VVIP cabin interior completed on a BBJ 737-8 to an undisclosed customer. The completion was designed, crafted and engineered at Jet Aviation's completions center in Basel. It is the company's third redelivery this year.

The redelivery of the first BBJ MAX aircraft draws on the full extent of Jet Aviation's completions capabilities. The interior design was created by Jet Aviation's design studio, in

collaboration with the customer, to seamlessly integrate a bespoke cabin with state-of-the-art systems and technology.

"The brief was for a cozy, residential space in which one could relax and enjoy the ride," says Grischa Schmidt, senior director design at Jet Aviation's design studio. "The living area features a deep, inviting sofa, a seven-seat dining table for socializing and a well-equipped, functional kitchen to accommodate fine dining. Wooden detail, soft fabrics and indirect lighting all complement this residential and relaxing atmosphere."

The interior includes details such as woven wooden paneling, full flat cocoon seats finished in 3D wood veneer and an integrated wine fridge in the living area.

"We are delighted to redeliver this exceptionally beautiful and detailed aircraft," says Matthew Woollaston, Jet Aviation's vice president completion sales. "As we strive towards creating the ultimate customer experience, we are committed to pushing the boundaries of what is considered possible in VVIP completions. This interior is a fine example of the intricacy and attention to detail of our teams here in Basel. As our first BBJ 737 MAX, this was an exciting opportunity to familiarize ourselves with the next generation of this aircraft, and we look forward to applying that knowledge to future MAX projects."

"We want to congratulate Jet Aviation on this great milestone," said James Detwiler, president of Boeing Business Jets. "The BBJ 737-8, with its ultra-long-range and ample cabin space, and Jet Aviation's top-quality design and craftsmanship create a perfect combination. This new BBJ is built to meet expectations of VIP customers to travel non-stop and in ultimate comfort to their destinations worldwide."



Ramco Adds Two New Customers

Global Aviation software specialist Ramco Systems announced that it will implement its aviation software, Ramco Aviation M&E MRO Software V5.8 at Iraq's national carrier, Iraqi Airways Company as well as Houston-based Bristow Group Inc. Bristow is among the world's largest helicopter operators providing offshore transportation, search and rescue (SAR) and aircraft support services to government and civil organizations worldwide.

At Iraqi Airways, Ramco will implement its complete Aviation Software including modules for Maintenance & Engineering (M&E), CAMO, Materials Management and Quality & Safety. The cloud-based software will automate the operations of the Iraqi national carrier, manage complete records of its aircraft, and enable the airway's staff to manage their operations and receive alerts on the go through its Mobility module, providing greater flexibility, optimized aircraft availability and reduced friction. Ramco Aviation Software will also be integrated with enhanced inventory tracking and stock visibility capabilities enabling better resource management, unified employee records, and control operations end to end, on a single platform.

"We were seeking a best-in-class Aviation ERP software that would deliver quality results and help us embark on a digital transformation journey. We are happy to partner with Ramco as

our technology partner in this journey," said Captain Kifah Hasan Jabbar, CEO, Iraqi Airways. "As the world slowly recovers from the pandemic and air travel returns, it is vital for airlines to adapt and prepare to serve customers with a robust digital infrastructure. We are excited to be working with Ramco in building such a platform at Iraqi Airways."

Ramco has had a decade-long relationship with Era Group (Era). Bristow's merger with Era makes them the largest civilian offshore, SAR solution provider and the largest operator of helicopter models S92, AW189, and AW139. Ramco will deploy its aviation software to track inventory and manage maintenance, engineering and operations on a single integrated platform.

Compliant with global regulatory standards, the multi-country roll-out of Ramco Aviation says their software will help Bristow comply with multiple regulatory bodies, will provide cost savings while increasing efficiency and reducing potential for human error, as well as helping them achieve their goal of paperless engineering and operations.

Bristow's staff will also be able to interact with the solution on Ramco's mobile application, Ramco AnywhereApps and operational Electronic Flight Bag features, which will enable them to manage their operations and receive alerts on the go

Flair Airlines signs APU maintenance agreement with EPCOR

EPCOR added a new Canadian customer to its global customer base. The AFI KLM E&M subsidiary based in Amsterdam, which specializes in APU and pneumatic components, won an exclusive maintenance contract for the maintenance of Flair's expanding Boeing 737 fleet.

Flair Airlines, Canada's only independent ultra-low-cost carrier (ULCC), is expanding with the addition of 13 new Boeing 737MAX 8 aircraft in 2021. Currently the Canadian operator uses three 737-800s, and the new aircraft will grow the fleet to 16.

The contract covers the repair and maintenance of the Honeywell GTCP131-9B APU. Key for winning this contract is the expertise that EPCOR has as Honeywell licensed Airline MRO, their ever-evolving predictive maintenance system 'Prognos for APU' with latest APU Fleet management functionality.

"EPCOR's airline mindset with competitive pricing and its continuous workshop process improvements," says Guy Borowski, VP Maintenance of Flair Airlines.

Bernard Kuiken, commercial director of EPCOR, added: "We are very proud to be able to support Flair Airlines through AFI KLM E&M's global MRO network. In a challenging time for our industry, only a few operators have explicit short growth ambitions like Flair does. With over 450 Honeywell GTCP 131-9B APUs repaired since we were licensed, you may call us real -9B experts."



Cobham Mission Systems Secures Fuel Tank Inerting for a Fifth U.S. Major Airline

Cobham Mission Systems announced a long-term agreement to provide air separation modules (ASM) for another major U.S. airline operating Boeing 737s (B737).

An aircraft's ASM prevents the build-up of explosive conditions in fuel tanks by generating nitrogen enriched air to help lower the amount of oxygen in the fuel tank. Since its introduction in 2015, Cobham has delivered 885 B737 ASM model NC1211 units which have achieved over 5,000,000 flight hours with no failures, providing our airline partners with substantial savings in ownership and maintenance costs.

"Cobham Mission Systems is delighted to partner with another major US airline," said Jason Apelquist, SVP business development and strategy. "Our air separation modules are the most reliable in the world, with 2,100 delivered and more than 17,600,000 flight hours on commercial aircraft worldwide. We are proud to contribute to our airline customers' aircraft operation and maintenance cost reduction efforts through the outstanding performance, reliability and life on-wing Cobham ASMs provide."

Cobham has been developing and delivering fuel tank inerting systems and subsystems for 30 years. With 6,700 systems on commercial (including B737, A320, A321, and B787) and military aircraft, and a total over 52,000,000 flight hours, Cobham holds the unique technical ability to design an optimally sized and configured fuel tank inerting system using Hollow Fiber Membrane technology. Cobham fuel tank inerting systems are designed for both military and commercial applications.



Spirit Airlines Donates \$50,000 for Embry-Riddle Scholarships

The Spirit Airlines Charitable Foundation pledged \$50,000 to Embry-Riddle Aeronautical University for upcoming student scholarships. The donation continues the foundation's ongoing relationship with the university and supports its mission in granting educational accessibility to students within the aeronautical industry.

"Embry-Riddle and The Spirit Airlines Charitable Foundation share the same mission to advance education in the in the aeronautical industry," said Lanie Morgenstern, director of The Spirit Airlines Charitable Foundation. "As champions of education, we are pleased to continue our work by supporting the students of Embry-Riddle throughout their studies. We are a proud partner of this university and have a meaningful impact in collegiate careers."

The Spirit Airlines Charitable Foundation established the "Spirit Airlines Denise Masella Aviation Scholarship," an endowed aviation scholarship for women in financial need at the university. This scholarship was created from the money raised at the 2020 Spirit

Open fundraiser, where proceeds were donated to numerous organizations across the country and provided educational scholarships to students pursuing a career in aviation.

"We are deeply grateful to The Spirit Airlines Charitable Foundation for their generosity and commitment to students as well as educational excellence," said Embry-Riddle Senior Vice President for Academic Affairs and Provost Lon D. Moeller. "Through the foundation's generosity, Embry-Riddle will be able to advance educational opportunities for a broader talent pool, and enrich the aviation workforce as well as the lives of our students."

The Spirit Airlines Charitable Foundation is committed to inspiring positive change in the communities where we live and work. Investments are made in organizations that have a meaningful impact on the lives of children and families, education and military veterans through team member volunteerism, monetary and in-kind donations.

Iberia Maintenance and DHL Deepen Relationship

DHL Supply Chain Iberia and Iberia Maintenance signed a contract through which DHL will manage the internal logistics of spare parts and components for Iberia Maintenance at its La Muñoza hub in Madrid and also at the Madrid-Barajas Adolfo Suarez and Josep Tarradellas Barcelona-El Prat airports.

In addition to this contract, DHL provides Iberia Maintenance with global distribution of these spare parts when the need arises at any of the customer airline's destinations around the world.

This contract also includes the logistics of Iberia's IT and aircraft supply warehouses, where a large part of the elements necessary for the in-flight service are managed.

The new agreement continues the relationship that Iberia and DHL have maintained for years, with Iberia Maintenance providing maintenance, repair and overhaul services for DHL's fleet of engines since 2008. Specifically, Iberia Maintenance has serviced more than 113 RB-211 engines used in the Boeing B757s of DHL's subsidiaries DHL Air UK and Blue Dart at its engine workshop in Madrid.

In the new contract signed by Iberia Maintenance and DHL, DHL Supply Chain's mission will be to ensure the supply of material on demand for Iberia Maintenance technicians, and to reinforce the logistical design to ensure the reliability and visibility that this supply chain requires to optimize planning and improve the availability of the aircraft.

The agreement calls for a redefinition of the pre-existing logistics processes with a strong focus on continuous and exhaustive stock control and inventory and material movement management, carried out by DHL with advanced digitalization tools. That will allow operations to adapt to the demand of Iberia Maintenance's different business units in a timely manner.

"This strengthened partnership will guarantee real-time traceability of parts moving through our system, complete inventory accuracy and the integration of the freight forwarding activity that DHL has been developing for the last 3 years for Iberia Maintenance," says Iván González Vallejo, director of Maintenance Strategy and Supply Chain.

"It is an honor and a source of pride that a company like Iberia Maintenance, a benchmark in quality and customer commitment, has placed its trust in DHL to guarantee its spare parts logistics, a critical area in which DHL Supply Chain can provide enormous experience," says Matilde Torquemada, director of Business Development, DHL Supply Chain in Spain. "This is a long-term agreement in which DHL provides rapid implementation with seamless transition and business continuity in these value-added services for the airline's MRO operations, providing agile execution and centralized logistics decision making."

The new agreement allows Iberia Maintenance to integrate the interface of the logistics operation with its transport control tower, reinforcing the precision in the inventory of key parts for Iberia Maintenance's maintenance and repair operations and guarantees real-time knowledge of the complete traceability of the components.



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Rolls-Royce Starts Testing Most Powerful Hybrid-Electric Propulsion System in Aerospace

Rolls-Royce has started testing the first elements of the most powerful hybrid-electric aero power and propulsion system in aerospace at a newly-renovated testbed. The tests are part of the 2.5 megawatt (MW) Power Generation System 1 (PGS1) demonstrator program, for future regional aircraft.

Rolls-Royce has begun testing the AE2100 engine element, specialist



controls and thermal management system, supported by a system integration generator, at their Testbed 108 in Bristol, UK.

Later this year a fully operational generator and a 3,000-volt power electronics system, currently completing testing at our facility in

Trondheim, Norway, will be brought together to start full PGS1 system testing. The generator can be used either for hybrid-electric propulsion systems or as part of a “more-electric” system for larger aircraft.

Rolls-Royce says the PGS1 forms an important element of their sustainability strategy, which includes developing innovative electrical power and propulsion systems, as well as further improving gas turbine performance and promoting the use of Sustainable Aviation Fuels.

“This is an important milestone for us all at Rolls-Royce. We are bringing together a system that promises to be truly ground-breaking in the world of aviation,” says Alan Newby, director Aerospace Technology and Future Programs, Rolls-Royce. “We know that in a post COVID-19 world people will want to connect but do so more sustainably. Electrification offers a new way to power short-haul aircraft and we want to be at the forefront of pioneering this technology.”

Newby continues, “Our PGS1 tests will lead the way in finding out what this new generation of hybrid-electric propulsion system is capable of delivering. For example, our generator is about the size of a beer keg but it needs to produce enough electricity to power around 2,500 homes and do so continuously. By doing these tests we will be able to validate our digital modelling and find out precisely what is physically and technically possible.”

Once ground tested, PGS1 will then provide a technology basis for any future hybrid aircraft program requiring MW power.

Both Testbed 108 and PGS1 have been supported by the UK Aerospace Technology Institute’s MegaFlight project, while the 2.5MW electrical generator, motor and power electronics design, make and testing in Trondheim has been supported by the EU Clean Sky 2 program.

Lufthansa Technik Shenzhen Resumes Investments and Capability Build-up

With the recovery of the Chinese aviation market, Lufthansa Technik Shenzhen (LTS) has resumed its investments into new capabilities. The company is currently converting its bonded warehouse to a 2100 sq. m. maintenance workshop as well as climate controlled material storage.

The corresponding conversion measures are scheduled to be completed in June 2021 and will enable LTS to further build up its capabilities. These will include providing component repair services for more than 70 Honeywell shipped components onboard the Airbus A350, for which the company will be the only licensed facility in Asia-Pacific.

The increase of capabilities will also include a cooperation of LTS with its partner TAT Technologies.

LTS will soon provide the Asia-Pacific market with the largest capability of heat transfer component repairs, overhaul and core replacement services, supporting most major platforms and components on the environmental control, bleed air and fuel inerting systems.

Additionally, LTS also plans to build up service capabilities for components of Meggitt fire & safety Systems, valves, sensors and fuel systems, with LTS serving as Meggitt OEM center of excellence in China



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Dallas Airmotive Brazil Regional Turbine Center Now Provides PW500 Hot Section Inspections

Dallas Airmotive's Brazil Regional Turbine Center will now provide hot section inspections for all PW500 family engines that power the Embraer Phenom 300, Cessna Citation Bravo, Excel, Encore and XLS Series aircraft.

"All related tooling and training, along with full ANAC approval, is now in place and we have our first hot sections scheduled for early Q2 2021," commented Wellington Amorim, general manager of the Dallas Airmotive RTC. "Significant effort has been in place for a number of months as our team prepared to offer this enhanced layer of regionally based support." The facility will also be able to service operators who participate in the Pratt & Whitney Canada Eagle Service Plan.

"Since 2009 the Brazil RTC has continued to expand its portfolio of engine and APU support," said Jeff Turner, Dallas Airmotive, vice president of Sales and Service. "With the growth of PW500 powered aircraft in the region, adding PW500 Hot Section Inspection capability was a natural extension of the multiple engine services our Brazil RTC provides customers each and every day."

The Brazil RTC is ANAC-approved to provide maintenance for Pratt & Whitney's PT6A, PW500 and JT15D engines and Honeywell's TFE731 MSP and non-MSP engines. The RTC also provides line maintenance for Honeywell's HTF7000 engines and 36 series APU.



Boeing and Alaska Airlines Partner to Make Flying Safer and More Sustainable



Boeing and Alaska Airlines announced they are partnering on the latest Boeing ecoDemonstrator program and will flight test about 20 technologies on a new 737-9 to enhance the safety and sustainability of air travel.

In flights beginning this summer, Boeing and Alaska will test a new halon-free fire-extinguishing agent that significantly reduces effects on the ozone layer, evaluate an engine nacelle designed to reduce noise and assess cabin sidewalls made from recycled material, among other projects.

"We have a long history of working with Boeing to advance aviation technology, safety and fuel efficiency," said Diana Birkett Rakow, Alaska Airlines' vice president, public affairs and sustainability. "Alaska Airlines flies to some of the most beautiful and geographically diverse regions in the world and we are committed to finding ways to reduce climate impacts across our

network. This work with Boeing to accelerate innovation on the ecoDemonstrator program enables us to contribute to a more sustainable future for our global community."

Since 2012, the ecoDemonstrator program has accelerated innovation by taking nearly 200 promising technologies out of the lab and testing them in the air to address challenges for the aviation industry and improve the passenger experience.

"Boeing is committed to continually improve air safety and the environmental performance of our products," said Stan Deal, Boeing Commercial Airplanes president and CEO. "We're proud to collaborate with our hometown customer and other partners around the world this year to make flying more sustainable."

In five months of ecoDemonstrator flight tests, Boeing and Alaska will work with nine other partners to test new technologies. After

tests are complete, the airplane will be configured for passenger service and delivered to Alaska. The program's technologies include:

- Testing a new fire extinguishing agent for aircraft that significantly reduces effects on the ozone layer. This material is intended to replace Halon 1301, which is no longer being produced.
- Collaborating with the U.S. National Oceanic and Atmospheric Administration to measure greenhouse-gas levels in the atmosphere to support the agency's climate modeling and long-term forecasting.
- Evaluating acoustic lining concepts within the engine nacelle that may reduce noise on current engines and will inform designs for next-generation models.
- Recycling carbon composite material from Boeing 777X wing production into a cabin sidewall panel. This durable, light

material would reduce fuel use and carbon emissions, and supports Boeing's goals for sustainable manufacturing.

ecoDemonstrator test flights are flown on a blend of petroleum-based and sustainable aviation fuel. SAF is in regular use today, reduces life-cycle CO2 emissions by up to 80%, and offers the most immediate and greatest potential to reduce emissions over the next 20 to 30 years in all commercial aviation markets.

SR Technics' BD Team Adds Christoph

In March, SR Technics added Olaf Christoph to its business development team. Christoph comes to SR Technics after nearly twenty years as sales director for new engines and engine services at GE Aviation,



where he handled the accounts of several major airline customers in the European region. Prior to that, he spent a decade in various manufacturing roles, including quality management, production and industrial engineering. Christoph received his Mechanical Engineering MA degree in 1985 from the German University of the Federal Armed Forces, where he had served as an officer for twelve years before joining the private sector.

With the addition of Christoph, the Business Development team headed by Senior Vice President Caroline Vandedrinck will continue to accelerate growth in the company's core areas such as engine services and line maintenance thus consolidating our strong position on the MRO market, leveraging opportunities based on the current industry outlook and emphasizing its longstanding commitment to an outstanding customer experience.

"The Business Development Team under Caroline Vandedrinck has brought together a talented group of individuals to spread the word on our flexible, fully customized MRO services," commented Jean-Marc Lenz, CEO. "Despite the current economic challenges, we are confident that this team will help us expand our reach and ensure we prosper when the market rebounds."

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A large white aircraft engine nacelle is the central focus, with a technician in a blue uniform working on the fan section. The background shows a hangar with blue railings and two monitors on a stand.

WIDEBODY ENGINE MROS

**TALK ABOUT CHALLENGES,
SUPPORT PROGRAMS AND
ADVICE TO CUSTOMERS**

James Careless



W

idebody aircraft engines are the heavyweights of aerospace propulsion. As such, they

require special care and attention to ensure their reliability and peak performance, making widebody engines expensive items to maintain and replace.

To get an inside look at the world of widebody engines and how owners can optimize their shop visits, Aviation Maintenance spoke with top MROs around the world. In this article, they talk about the challenges associated with maintaining these power plants and the ways in which owners can mitigate their servicing and replacement costs. Some of these MROs even provide advice on how to get the most out of widebody engine shop visits.

AAR

AAR maintains and services widebody jet engines in its MRO network

performing engine inspections, LRU and line maintenance, repair and overhaul activities. The company is not in the core engine overhaul business as this is the market occupied by many of its customers.

Instead, AAR contracts with its network of engine overhaul customer shops to provide complete solutions to this MRO's



Carl Glover, VP Sales & Marketing Americas, AAR



Most MROs including AFI KLM E&M found themselves confronted with challenges such as supply chain shortages/delays and unpredictable customer demand during the pandemic. They took advantage of the situation by streamlining their production and accelerating improvement projects. AFI KLM E&M image.

commercial and defense clients.

“For widebody aircraft we have tailored repair and management solutions on the PW4000 /CF6 -80 (MD11/ B747/ B767) & RB211-535 (B757) engine variants,” said Carl Glover, AAR’s VP Sales & Marketing Americas.” Under these solutions AAR repairs and overhauls the engine accessories in our component MRO network or those of our OEM channel partners. Our partner engine shops perform the engine maintenance with AAR as the USM (Used Serviceable Material) provider.”

AAR has recently diversified into the support and provision of engine modules for customers which are tailored to their specific build specs, reducing TAT (turn-around times) and EHM (engine heavy maintenance) costs. “When it comes to serving the owners of widebody aircraft, “there are some unique challenges in maintaining some of the widebody engines that are currently being operated,” Glover observed.

“Recently there have been some key material shortages in the supply chain affecting component availability. This has impacted shop TAT and driven up demand for certain spare engine types for short term leasing support.”

To mitigate this situation that has been exacerbated by the global pandemic, AAR has been consulting its customers to forecast their future needs for specific widebody engine materials and parts. Doing so is helping the company anticipate and remedy possible shortages, using tactics such as pre-provisioning high repair TAT components in a ‘closed pool’ reserve.

Even with these preemptive measures, “issues remain in the component repair space on some key gas path components due to scrap rates and shop capacity considerations as the vendor community balances capacity to cover the ‘post covid recovery curve,” said Glover. “An additional challenge has been the freight charges for whole

engine shipments, which have increased globally due to the demand for main deck freight in response to COVID-19 medical support activities and increased demands from e-commerce.”

To help manage the costs of widebody engine maintenance, AAR provides extensive material management and (SLB) sale leaseback solutions to their engine customers. They also offer large scale engine management programs directly to operators and lessors alike, in which AAR’s technical teams manage engine worksopes, material management and repair activities on their behalf.

As well, “we provide our customers whole engine and module exchanges to increase engine availability,” Glover said. “This has seen particular interest from our widebody freight clients who need operational capacity to support fleet demands. In these instances, AAR supplies them with a serviceable engine/modules while purchasing the

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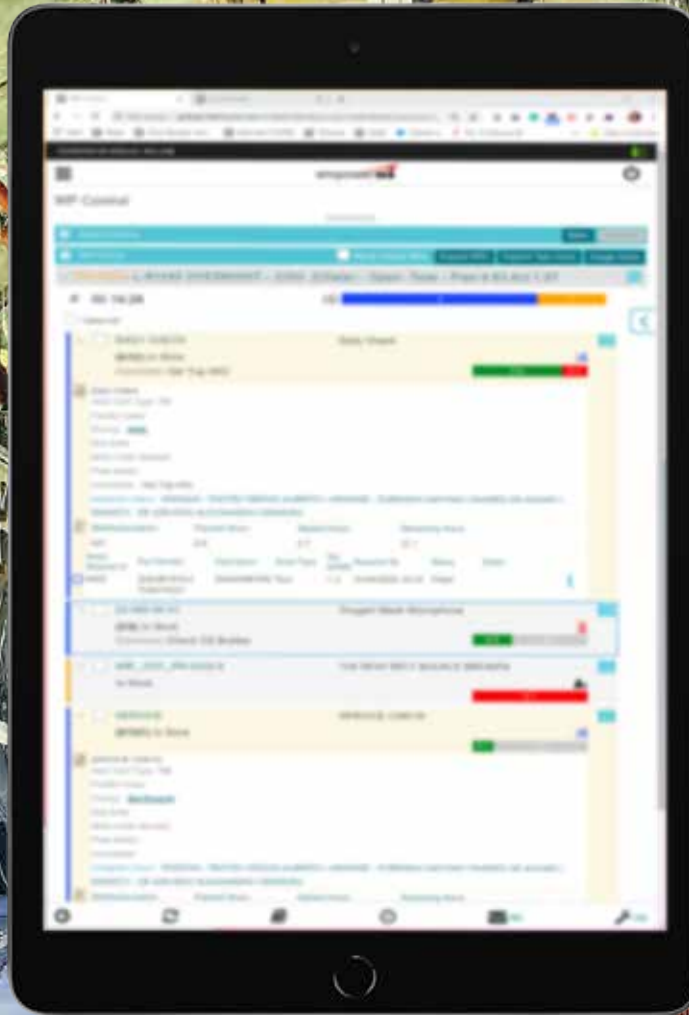
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unserviceable engine asset from the customer and having them repaired.”

“AAR has been focused on the recovery of the industry in support of our customers in our MRO facilities, component shops and engine business,” he concluded. “We work very close with our customers to ensure we have the capacity, inventory or a workable solution that they may need for engine maintenance and overhauls.”

AFI KLM E&M

AFI KLM E&M's MRO facilities in Amsterdam-Schiphol, Paris-Charles de Gaulle and Paris-Orly overhaul a wide range of engines fitted on Air France's and KLM's aircraft, plus Airbus and Boeing aircraft owned by other carriers. “As an Airline-MRO, we believe our intimate knowledge of not only maintaining but also flying these aircraft and engines is the real difference maker in terms of our ability to closely match the maintenance program with the operational needs of the operator,” said Michael Grootenboer, AFI KLM E&M Senior Vice President of Group Engines Products.

Given this varied client base, AFI KLM E&M works on a range widebody engines. They include the GE90-94 and GE90-115 (Boeing 777) in Paris, with the Trent-XWB (Airbus A350) soon to be supported there as well. In Amsterdam, the company services the GEnx-1B (Boeing 787), the CF6-80E (Airbus A330) and the CF6-80C2 (various aircraft such as the 747.)

In addition, AFI KLM E&M's global network allows the company to offer other services such as widebody engine parts repairs, teardowns and others. “As an example, with our joint venture in Miami with Bonus Tech, we provide teardown solutions for a wide range of engine types, including the PW4000, Grootenboer said. “Through Airfoils Advanced Solutions, our joint venture in Rosult, France we perform High Pressure Combuster airfoil repairs on engines such as the GE90. And both in our engine shop in Amsterdam and at our subsidiary CRMA in Elancourt (just outside Paris), we offer a wide range of parts repairs for our full engine range, including CF6, GEnx, GE90 and GP7200 on parts such

as the combustor and the fan mid shaft.”

As with other widebody engine MROs, the pandemic confronted AFI KLM E&M with challenges such as supply chain shortages/delays and unpredictable customer demand. In particular, “the COVID-19 crisis required us to adapt our maintenance operations to the lower operating pace of our parent airlines and customers' fleets,” said Grootenboer. “So we streamlined our production and accelerated improvement projects we had already launched on the shop floor, as well as customer solutions such as Smart Work Scoping and Remote Table Inspection. We were aided in this by the inherent flexibility of our organization and our highly skilled workforce.”

Now that COVID-19 is waning, AFI KLM E&M is managing the usual issues associated with widebody engine maintenance. “The more EGT-driven nature of widebody engine maintenance programs, when compared to the generally cycle-limit driven programs on narrow body engines, requires a different strategy in monitoring the operational engine and planning its maintenance,” Grootenboer noted. “Here we are greatly aided by our own Prognos for Engines predictive maintenance solution.”

“Furthermore, widebody engines are of course significantly more costly than narrow body engines, while its numbers operating worldwide are generally smaller,” he continued. “This results in a different trade-off when it comes to developing and/or industrializing repairs for the engine's parts. Our in-house capability for the repair of, for example, combustors and fan mid shafts for GE90 and GEnx gives us a significant cost advantage, while making us less reliant on the (occasionally disrupted) supply chain. Equally importantly, repair and reuse of engine parts lowers not only the cost of ownership, but reduces the consumption of resources and energy for the manufacture of new parts and thereby contributes to the sustainability of the maintenance and operation of aircraft engines.”

The current economic climate has made it more difficult for widebody aircraft operators to pay for repairs and overhauls. In response to this reality, AFI

KLM E&M offers a range of payment plans and of comprehensive maintenance solutions to fit the needs and budget of the operators. These apply to items such as providing or sourcing spares, leveraging the range of AFI KLM E&M's material solutions (new, repaired and used serviceable parts) to optimize shop visit cost, offering smart workscooping to create a custom visit that fits the needs and budget of customers, and working with this MRO's network of shops, subsidiaries, joint ventures and partners to find a solution that meets customer requirements. This may also include engine teardown services, engine parts trading, greentime solutions and other services.

Now that airlines are more bringing widebodies back into service, Michael Grootenboer has some words of wisdom when it comes to getting their engines ready for service. “With the end of the crisis progressively coming in sight, it is important to launch the dialogue between operator and maintenance provider, to make sure that the planning of upcoming shop visits is aligned and matches the need of the operator for the pick-up in traffic we are all so eagerly looking forward to,” he said. “As an Airline-MRO, we have a strong understanding of the operator's constraints. Adaptiveness is in our DNA and we can adapt our workscoopes and shop visit plans effectively and efficiently in order to save money for the operators and maximize the revenue generating potential of the customer's fleet.”

GE Aviation Services

GE Aviation's commercial engines portfolio includes the CF6, GEnx and GE90 widebody engines. Going forward, it will also include the GE9X engine, which was certified by the U.S. FAA in September 2020. The GE9X is currently part of Boeing's flight test program for its 777X passenger aircraft.

To keep these engines humming, GE Aviation operates overhaul and component repair facilities globally. Widebody engine overhaul facilities are located in Kansas in the U.S., Brazil, Wales, Scotland and Malaysia. Component repair facilities are located in Ohio and Texas (U.S.), Hungary and



Aileen Barton, marketing director for GE Aviation Services, recommends scheduling needed engine maintenance now while demand for air travel remains slower to help prevent constraints across the aviation industry in coming years as flight departures grow back to 2019 traffic levels. GE Aviation image.

Singapore. Additionally, GE Aviation has joint ventures and service agreements with partners around the world to overhaul and repair GE engines.

Issues caused by COVID-19 are front-of-mind for this company when asked about maintaining and overhauling widebody engines. "One of the biggest challenges during the pandemic was adapting to meet our customers' needs virtually when traveling in-person wasn't possible for engine maintenance training or to provide guidance to airline maintenance technicians on engine inspections," said Aileen Barton, marketing director for GE Aviation Services. "Before COVID-19, aircraft and jet engine mechanics would travel to one

of GE's or its partners' training centers for hands-on learning. Due to global travel and social distancing restrictions during the outbreak, more training is being delivered online to where customers are, namely on their laptops and mobile phones."

This online maintenance training is being provided by GE Aviation's Customer Technical Education Center (CTEC). As well, GE Aviation's YouTube channel includes Maintenance Minute video demonstrations. According to Barton, maintenance customers interested in remote and online courses should contact their GE field service engineer or customer support manager.

"A further challenge is keeping

global shop capacity and supply chain schedules aligned to meet customer demand throughout the pandemic, during what's been an unprecedented downturn in the aviation industry," said Barton. "GE Aviation is taking advantage of this downturn with a renewed focus on Lean principles to help us improve our processes for better customer delivery times, to improve first-time part yield for new and repaired material and to manage more work as the recovery comes."

Depleted customer cash flow is yet another pandemic problem that is keeping GE Aviation busy. "Widebody engine operators are looking for solutions to preserve cash and maximize



For operators of newer widebody engines, the goal is generating more flight hours between maintenance cycles to keep costs down. MTU Maintenance achieves this using 'intelligent fleet management' to optimize removals across a defined period, rather than rigid hours-based schedules. MTU image.

flexibility," Barton noted. "GE Aviation is working with each customer individually to meet their needs."

These consultations are being done under the umbrella of GE Aviation's TrueChoice Services, which gives customers options for maintaining aircraft engines based on their specific (and sometimes unique) operating situations. "These options include TrueChoice Overhaul, as well as alternatives to overhauls," she said. "Additionally, our open and competitive MRO philosophy provides customers more flexibility while still having access to OEM material, whether GE is servicing the engine or another MRO provider is."

In the same vein, GE Aviation's 'TrueChoice Material' solutions include new, used and repaired material for widebody engine owners. To provide a selection of lower-priced possibilities, GE Aviation buys in-service GE engines and aircraft with GE engines installed. "These acquisitions provide GE Aviation

with an inventory of used serviceable engines and engine parts that are sold to customers and third-party MRO providers," said Barton. "Meanwhile, Used Serviceable Material (USM) and repaired material can offer GE Aviation customers a way to lower their heavy overhaul costs compared to all-new engine parts, while still maintaining OEM quality standards."

That's not all. Widebody aircraft owners can also obtain replacement engines from GE Aviation on short-term operating leases that run up to two years. And because GE Aviation builds the engines it services, the company has the capability to custom assemble engines with a specific amount of remaining flight cycles on rotating life-limited parts and thrust levels. "Custom engine builds are reliable, cost-effective and support each customer's unique operational needs," Barton said.

Given the apparent 'Return to Flight' crunch that is facing many widebody

operators as COVID-19 eases, Aileen Barton recommends contacting your widebody maintenance provider now to book appointments, rather than waiting until later and risking delays in receiving service. "Planning is key," she advised. "Scheduling needed engine maintenance now while demand for air travel remains slower will prevent constraints across the aviation industry in coming years as flight departures grow back to 2019 traffic levels. Customers are encouraged to provide material orders and schedule shop visits earlier to be more prepared for the recovery."

MTU Maintenance

Independent MRO MTU Maintenance services General Electric's CF6-80C2 and GE90-110/115B widebody engines (with full disassembly, assembly and test capabilities) at its facilities in Hannover, Germany and Vancouver, Canada. The Hannover site handles both CF6-80C2 and GE90-110/115B engines, while the

Vancouver facility focuses on CF6-80C2s exclusively. As well, as part of GE's OEM network, MTU Maintenance maintains the turbine center frames (TCF) for the GENx and the low-pressure turbine (LPT) of the GP7000. The company will be introducing TCF MRO capabilities for the GE9X engine in the near future.

According to Fabien Schoen, director of Programs for MTU Maintenance, there are a number of challenges associated with servicing widebody engines economically. "Generally speaking, these are cost-intensive engines for operators," he said. "As such, MTU Maintenance offers a wide range of services designed to reduce MRO spend by the absolute maximum across the lifecycle."

A case in point: For operators of newer widebody engines, the goal is generating more flight hours between maintenance cycles to keep costs down. MTU Maintenance achieves this using 'intelligent fleet management' to optimize removals across a defined period, rather than

rigid hours-based schedules. "This approach is complemented by predictive maintenance, based on engine trend monitoring, on-site services and spare engine support," said Schoen. "Once an engine comes into the shop, our customized workscoping, high-tech EASA-FAA approved repairs and our engineering expertise help lower overall costs. We call this program 'PERFORMPlus'."

Over time, engines age and the costs associated with servicing them increase. To mitigate this financial sting, MTU Maintenance provides 'smart strategies for mature engines'. In this vein, "our fully independent solutions include 'smart repairs' and tailored workscopes to suit operators' remaining flight periods as well as material salvation and intelligent teardowns," Schoen said. "Furthermore, these services can be combined with alternatives to MRO such as leasing in of green-time engines or exchanging engines for

the remaining period until phase-out. This service solution goes by the name 'SAVEPlus'." As well, MTU Maintenance supports a full range of maintenance contract types including Time and Material and Fly-by-Hour. Customers can also lease replacement engines through the company's leasing arm MTU Maintenance Lease Services B.V. in Amsterdam, as needed."

The pandemic affected this MRO as it did everyone else in the aviation industry. "Our CF6 MRO business remained strong throughout the pandemic, due in large part to the continued operations of cargo airlines," said Schoen. "Generally speaking though for passenger aircraft, narrowbodies have been reactivated first in areas seeing some recovery in air travel. Widebodies have been slow to recover so far and we expect this trend to continue."

In the context of the COVID-19 cash crunch, MTU Maintenance is predicting a continued trend away from traditional planning with fixed maintenance intervals



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Material management is one critical factor in delivering responsive turn-around times (TATs) according to Max Allen, vice president of Commercial Programs RB211 for StandardAero. Shown above is an RB211-535 compressor. StandardAero image.

to more individually-tailored solutions. "Some airlines are concentrating on short-term savings with cash preservation as the main objective, while others are focussing on long-term planning," Schoen told **Aviation Maintenance**. "MRO providers must flexibly meet both these goals to provide the best solution for customers in today's market."

As for Fabian Schoen's advice to widebody engine operators wanting to optimize shop visits in the current travel slowdown? He suggests that they discuss their fleet's requirements with MTU Maintenance to get a maintenance and payment package that works best for them.

"With the tools and measures I have already described, we are able to generate individual and optimized solutions for the specific needs and challenges of our customers," said Schoen. "We believe it may take a while for the widebody fleet to come back to the pre-covid utilization levels and we can offer tailor-made cost-efficient engine fleet management solutions (e.g.,

'eat-the-fleet') to minimize cost during such unfortunate periods."

StandardAero

StandardAero provides maintenance, repair and overhaul (MRO) services for a range of aircraft engines. In the widebody category, they service the Rolls-Royce RB211-535 engine (used in Boeing 757s) at StandardAero's facility in San Antonio, TX, USA.

When it comes to getting engines in and out of the shop quickly, "material management is one of the critical factors in delivering responsive turn-around times (TATs) for major repair events," said Max Allen, Vice President of Commercial Programs RB211 for StandardAero Airlines & Fleets division. "This includes timely new production parts delivery, comprehensive in-house component repair capabilities, and – where appropriate – the utilization of used serviceable material."

If the parts aren't available, it doesn't matter how well trained the company's technicians are or how advanced a

facility's MRO management software is. Delays will occur.

Achieving an efficient production line for engine repairs is also key to providing timely engine service. "If the line is not appropriately laid out, or not correctly sized, it can delay the overall MRO process, raising TAT times and costs," Allen said. "Likewise, if an MRO is forced to ship engines to a distant test cell for testing, unnecessary delays can be introduced into the overall process."

To ensure timely service, StandardAero's RB211 production line in San Antonio – which is located in the former U.S. Air Force San Antonio Air Logistics Center – was purpose-built from scratch to meet the specific requirements of the RB211 powerplant. This includes having access to an on-site engine test complex with multiple high-thrust test cells to verify performance after repairs

Beyond disrupting the parts supply chain, COVID-19 has added its own twist to RB211-535 maintenance for

StandardAero. "On the one hand, the trend of 757s being retired from passenger service has continued and, in the case of a number of operators, accelerated as part of cost reduction efforts in the wake of the pandemic," said Allen. "On the other hand, the 757's popularity in the cargo market has continued to grow, as confirmed by the large number of freighter conversions undertaken in 2020 (and the large number scheduled for 2021)."

The 757's growing role as a freighter is offsetting its retirement from passenger service, and motivating StandardAero to ramp-up its RB211-535 throughput. (The company is in its fourth year as Rolls-Royce's maintenance service partner on the product.) In fact, given the 757's strength in the cargo market, StandardAero expects the RB211-535 to provide a steady stream of work for its San Antonio facility for decades to come.

When it comes to paying for RB211-535 repairs, StandardAero offers plans to support both 'program' and 'time and material' (T&M) customers.

"Program customers are those operators who are enrolled on Rolls-Royce's TotalCare long-term service agreement," said Allen. "StandardAero supports these customers as Rolls-Royce's end-of-life engine maintenance service partner under a partnership signed in 2018."

While program customers account for the majority of StandardAero's RB211 throughput, the company does support T&M customers with the same full scope of MRO services. "The majority of our customers already have their own financing solutions in place, but StandardAero is able to assist with lining up third-party financing providers where necessary," he said.

So, what steps should widebody aircraft operators be taking to get the most from their shop visits? "Probably the best advice that we always give is for operators to plan ahead as far as possible," Allen replied. "Shop visit slots are booked up months (and,

occasionally, years) ahead of schedule, and it is therefore not always possible to accommodate the demands of a customer with critical short-turnaround requirements, regardless of the workscope."

"As the industry continues to recover after the pandemic, the demand for shop visits has only increased," he added. "Over the

past year a number of maintenance events were deferred for the sake of cost avoidance. Now these engines are starting to be sent for induction as activity resumes and airlines' cash position improves. As such, engine slots are now in even greater demand, and it will therefore require operators to plan as far ahead as possible when reserving induction slots." **AVM**

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SCHEDULE OF EVENTS

Registration Hours

Tuesday 2nd November 2021 - 2:00pm - 5:00pm

Wednesday 3rd November 2021 - 8:00am - 7:00pm

Thursday 4th November 2021 - 8:00am - 5:00pm

Exhibition Opening Hours

Wednesday 3rd November 2021 - 10:30am - 7:30pm

Thursday 4th November 2021 - 9:30am - 5:30pm

CONFERENCE AGENDA

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Maximising IT for Minimising Costs

Five years ago, the concept of 'paperless' and mobile maintenance formed the buzzwords of our industry. It took time for aviation and its cohort of operators, lessors, regulators, financiers, manufacturers and MRO providers to become more at ease with the disruptive technologies that enabled a new age of maintenance to gain traction.

Today, we see drones, artificial intelligence (AI), machine learning, blockchain and predictive maintenance being discussed more and more. While aviation is still undeniably cautious with new innovations, it is more open to learning how to adapt to them. The MRO IT conference track sessions will encourage forward, proactive thinking in addition to a focus on establishing tangible and robust business cases. End the experience at a joint-panel session with the Flight Ops IT conference speakers, where we will explore the most constructive methods to maximise communications and data-sharing between two of the most important departments in an airline.

Conference Programme Wednesday 3rd November

9am Joint Opening Keynote

11am-12.30pm Session 1

Creating a value case - the business proposition - ROI

Significant investment in IT/technology is required to ensure successful digitalisation of systems, often with ROI not immediately visible. How do we create a value case for new mobile application of new systems and to help transform maintenance, increase productivity and efficiencies?

Chair: Adrian Ionascu

Title TBC - Senior Representative, EMPowerMX

Why Now is A Compelling Time to Invest in Digital MRO - John Simmons, iBASEt Delivering a Mission-critical MRO IT Solution in the Cloud - Considerations and a Case Study - Matthew Tobin, Vice President, IFS Aerospace & Defense Cathay Pacific - Digital transformation, making IT work. From innovation to stable production - Amir Bennegadi, IT application manager, Cathay Pacific Elevating Your MRO Business Using Blockchain Technology - Karthik SR, Envecon*

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

Industry Standards and Regulatory Framework Update

What are the latest regulations for IT in MRO, how does this affect the airline and industry in the future and what do we need to do to comply with the latest standards? What are the problems with legacy systems moving to modern platforms and what are the best approvals processes?

Chair: Nick Godwin

aTechlog and Cabin Log to Make the Work of Operators More Efficient Than Ever Before - Thierry Kuppens, AVIOBOOK Techlog regulatory approval - Paul Boyd, Managing Director, Conduce Considerations for the ETL & Digital Maintenance - Robert Saunders, Ultramain MRO Safety Management System & Interface - Sotirakis Stamou, Aviation Safety Inspector, Hellenic CAA

3.30pm-4pm Coffee Break

4pm-5.30pm Session 3 Business modelling and Risk modelling

Technology and data being used for predictive maintenance provides many challenges. Why is predictive maintenance important, but what are the risks involved and how can this affect the business model and supply chain?

Chair: Hugh Revie

What are model-driven predictive simulations and how can they benefit your maintenance planning? - Phil Cole, Business Manager Civil Aviation, Aerogil-

ity The Business Case of Fully Integrated, Scenario Based Planning in Aircraft Maintenance - Joost van der Maarel, Novulo Maintenance Task Packaging and Scheduling - Dino Spirtovic, Royal Netherlands Aerospace Centre (NLR) Prognos Predictive Maintenance Solutions - James Kornberg, Innovation Director AFI KLM E&M*

5.30pm Networking Reception

Thursday 4th November

9:00am Session 4

Technology

As technologies advance at rapid pace, how do airlines best take advantage and ensure technology gets into the production environment? How can we successfully and safely implement newer generations of mobile technology, software in legacy systems and paperless systems? What should the long term digital strategy look like?

Chair: Julien Methot, Senior Manager Business Consulting, Swiss Aviation Software

Putting Failure in Context - Importance of Digital Twin and Digital Thread for Predictive Maintenance in Aerospace - Suresh Iyer, Aras Corporation Benefits of a Digital Twin for MRO Facilities and Processes - Hugh Revie, Ubisense Mobile Maintenance App - Upendra Singh, Go Airlines* Applications of AI/ML use cases in MRO IT systems - Saravanan Rajarajan, Associate Director Aviation Practice, Ramco Systems

10.30am-11am Coffee Break

11am-12.30pm Session 5

Data, Analytics & Cyber Security

Big data provides the potential to facilitate maintenance planning and predictive maintenance, and the opportunity to optimise decisions, but how do we best achieve this? What role can machine learning and digital twins play? What is our ability to maximise the use of data and how do we ensure data transfer/delivery is secure?

Chair: Matt Tobin, Vice President, IFS Aerospace & Defense

Digital Tech-Ops: Providing data & mobility to Mechanics - Experiencing & Benchmarking - Julien Methot, Senior Manager Business Consulting, Swiss Aviation Software Aircraft Technical Services & Availability Challenges - Francois Gandon, A320 Technical Support Manager, THALES* Digital Threads, Integrating Core and Innovative Technologies to Optimise Technical Operations - Bruno Bouf, VP Head of Aerospace & Defense, Capgemini Invent, CapGemini* Fast Track to Mature Operational Reliability - Senior Representative, Ascentia Team, Collins Aerospace

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

Joint Panel Discussion: Flight Ops IT & MRO IT Conflict between Flight Ops and Maintenance - able bedfellows!

How can MRO IT and Flight Ops IT best work together for maximum efficiency and minimise turnaround times? With the advent of paperless aviation, where do TechLogs, EFBs and CabinLogs converge and how can the supply chain best support the airlines to ensure complex decisions are made easier?

Moderator: Nick Godwin, Commssoft

Paul Boyd, Managing Director, Conduce

Robert Saunders, Ultramain

Martin Mitev, AViation Advisers

Rene de Vogel, Boeing

Matt Tobin, Vice President, IFS Aerospace & Defense

James Ray Hunt, Snr Product Manager Predictive Maintenance, GE Aviation's Digital Group



MRO IT

PROVISIONAL CONFERENCE AGENDA

	Avionics	CONNECTED aircraft	Flight Ops IT
Wednesday 3rd November			
9am	JOINT OPENING KEYNOTE		
10.30am	Networking Coffee Break		
11am	<p>Mandates and Regulatory Framework Updates Despite the 2020 Coronavirus Pandemic's massive impact on the aerospace industry, enhanced safety and communications between the aircraft in the sky and the ground control continue to dominate the industry as technology becomes and increasing driver. Airlines need to move from capacity to efficiency, so what's the latest regulations and how are regulators and mandates impacting on the industry? What needs to be installed in the aircraft to meet these mandates and what is the impact on avionics for operators? Following the Coronavirus pandemic and its economic impact on the industry, who is going to pay for updates?</p>	<p>The Connected Aircraft Evolution: Increasing the Benefits of Connectivity Technology has been developing at a rapid rate, but what do we now mean by the 'Connected Aircraft', especially in a post-Covid-19 age? A truly Connected Aircraft becomes a great business enabler and offers airlines and the broader industry great benefits and opportunities. With many airlines focusing on cost savings and efficiencies, how can investment in the connected aircraft contribute towards these? What are these benefits and opportunities and how can we deliver enhanced services and solutions for a more integrated aerospace world?</p>	<p>The Business Case and Use Case for Flight Ops IT A well-established use case motivates airlines to investigate new Flight Ops technologies, while the business case quantifies these benefits and encourages investment. Following the Covid-19 pandemic and additional challenges and pressures on airlines, this session addresses the 'combined business case'; that is, the importance of partnerships between airline departments in addition to third party providers. An IT support team's role in realising potentials is also addressed.</p>
12.30pm	Delegate Networking Lunch		
2pm	<p>CNS Updates What are the latest developments and trends in Communication, Navigation and Surveillance and flight tracking to mitigate these possibilities. How can we optimise infrastructure and how can enhanced surveillance contribute towards safety and security? What is safety services approved? How do we make positioning more robust with hybridisation? How do we transition from SES to the next systems using the EASA framework?</p>	<p>Connectivity, Communications and E-Enablement For the Connected Aircraft, communications systems are key, but each offer different benefits and solutions. The drive for cost savings and efficiencies means airlines are streamlining or optimising systems. What you can do with satcom, LEO, L and Ku Bands? What type of system is best for different communications such as traffic, ACARS messages, safety services and non-safety services?</p>	<p>EFB Operational Use & Regulations The Electronic Flight Bag (EFB) has been in operational use for some time, however implementation and use is closely regulated. The regulatory framework is summarised, and benefits analysed via real use cases. Maximising the use of the EFB requires integration of various data sources, and subsequent training for Flight Crews on effective use of these technologies. As EFBs continue to evolve, we explore key considerations here.</p>
3.30pm	Networking Coffee Break		
4.00pm	<p>Challenges for Avionics in the Environment The aviation industry has been in the spotlight for its adverse impact on the environment, yet huge strides have been made to reduce the environmental impact of aircraft. The Coronavirus Pandemic has shown a bigger spotlight on the sector to be more 'green', with much government financial support linked to environmental change. What are technical capabilities for environmental challenges, how do we decrease emissions and what is the CO₂ limitation challenge? What is impact of given technology of environment (at different stages of flight) and what realistic role can electrical power play?</p>	<p>Application and Benefits of Connectivity and E-Enablement Savings come from applications that bring value and efficiencies. The synergy and compatibility of applications are of prime importance to enhance efficiencies. What are the applications of connectivity and how do these most benefit airlines/operators and the supporting supply chain? How do we get the most value from connectivity? Here we explore case studies of connectivity applications.</p>	<p>Additional Operational Drivers When one considers Flight Ops IT, the EFB is a leading factor. Yet there is a wealth of additional benefits on offer other than fuel savings and efficient route planning; process efficiencies and greater operational reliability are recognised here. To define these wider operational drivers, real-time data, weather 'nowcasts', and ground handling / line maintenance efficiencies are explored, combined with an appreciation of Flight Ops IT in the overall enhancement of Flight Safety.</p>
5.30pm	Networking Reception		
Thursday 4th November			
9am	<p>Connectivity, Architecture and Cybersecurity As the aircraft becomes more integrated and connected, security and safety concerns are becoming heightened. What are the challenges with connected FMS and what are cyber security implications of IMA? How do we ensure safety and security with</p>	<p>The Increasing Value of the Connectivity Through ATM What services can be expected from ATM and what is the value chain of connectivity from the ground to the air? Where can the connected aircraft contribute to the wider chain and how can it impact on other operations within the 4 As?</p>	<p>Data - standardisation, management and analysis As airline's ability to ingest and analyse flight data efficiently, then filter effectively to pilots via a suite of EFB applications is complex but of key importance. Interfacing different applications to communicate and process data is one aspect, while assimilating various data standards, codes and formats from a mixed fleet of aircraft is another. Learn from the experiences of airlines, OEMs and software providers.</p>
10.30am	Networking Coffee Break		
11am	<p>Data, usage of data, trends and monitoring Following the recent pandemic crisis, airlines need to move from capacity to efficiency. An important role for the need of Avionics to analyse more and more different types of data rates - data which is difficult to treat with single protocol/architecture, causing major under or over use of bandwidth. How can new services and applications be better supported? What is the Data Value Chain and benefits of data-sourcing (collected by airlines)?</p>	<p>Aircraft Data Management Solutions and Cyber security As data becomes more prolific and more 'valuable' to an organisation, how do we control this flow of information and who 'owns' the data? As processing data offline becomes more economical, what are data limitations; how do we value data and share just required data and ensure its security?</p>	<p>Innovations Development and progression are vital aspects of technology. Join this session to see what is evolving to benefit flight operations, and what innovations can / will extract additional value for airlines. The capabilities offered by new and emerging aircraft types are discussed, in addition to an exploration of what other industries are doing and how this might inspire</p>
12.30pm	Delegate Networking Lunch		
2pm	<p>Innovations in the Industry How will the industry change after the impact of the Coronavirus pandemic and how will technology assist in efficiencies for airlines and aircraft? With more research and investment being applied in urban mobility, single pilot operations and autonomous systems, what does the future hold and what part will avionics have to play? How do we develop standards for use of AI and machine learning and what impact will autonomy have on the pilot and passenger?</p>	<p>Future of Connectivity, E-Enablement and Satcom (Funky Future Stuff!) What could be done in the future with connectivity and how can new tech assist airlines in reducing costs and enhancing efficiencies? With giant leaps in technological development, what is possible, how can AI and machine learning benefit safety and security? What are other industries doing with connectivity that could be applicable to the aerospace industry?</p>	<p>Conflict between Flight Ops and Maintenance - able bedfellows! How can MRO IT and Flight Ops IT best work together for maximum efficiency and minimise turnaround times? With the advent of paperless aviation, where do TechLogs, EFBs and CabinLogs converge and how can the supply chain best support the airlines to ensure complex decisions are made easier?</p>
4.00pm	Conference Close		

MRO IT	AEROSPACE testing	CERTIFIED TRAINING
<p>Creating a value case – the business proposition – ROI Significant investment in IT/technology is required to ensure successful digitalisation of systems, often with ROI not immediately visible. Following the Covid-19 pandemic, airlines are needing to look at cost savings and efficiencies, however, also needing to invest in different areas. How do we create a value case for new mobile application of new systems and to help transform maintenance, increase productivity and efficiencies?</p>	<p>Urban Air Mobility, EVTOLS and UAVs The concept of Urban Air Mobility is rapidly developing, but with little in terms of regulations and understanding the impact on the airspace – what do we have to test for if we have hundreds in the sky? What are the requirements, how do we appropriately test a crash, what about acoustic emissions tests, how to test without autorotation, what about detect and avoid? In this session we discuss some of the requirements and implications.</p>	
<p>The ETL and other Regulatory Considerations for MRO IT The electronic techlog (ETL) is an important tool in digital maintenance. But what regulatory considerations are there, and what are the implications for safety management? Key compliance and approval requirements are explored.</p>	<p>High Level Integration and Testing, Complex and Embedded Systems With systems becoming more complex and the integration of systems of systems, greater use of multicore processors, how can we ensure testing and certification integrity, including COTS components? What are the issues with GPUs and GPGPUs with no current regulatory guidance? How can we test blockchain authentication to identify corruption? In this session we investigate the challenges in integration and testing of high level, complex and embedded systems.</p>	<p>Introduction to the Emerging & Required DO-326/ED-202-Set: Aviation-Cyber-Security Regulation for Safety</p> <p>Optimizing DO-178C/DO-254 Avionics Software & Hardware Development Guidelines</p>
<p>Business modelling and Risk modelling Technology and data being used for predictive maintenance provides many challenges. Why is predictive maintenance important, but what are the risks involved and how can this affect the business model and supply chain? How can you develop predictive modelling and provide levels of protectiveness through business continuity?</p>	<p>Ensuring Successful Testing in the New Environment The Coronavirus pandemic has had a massive impact on the working environment, including how testing is undertaken. Remote and virtual testing has moved rapidly forward, whilst developments in digital twinning has revolutionised the way the testing and verification is undertaken. What's the impact of the new working environment on multicore, digital twins and digital manufacturing, and what role can predictive maintenance play? How do we employ measures to ensure the reliability and integrity of testing in this new age?</p>	
<p>Enhancing MRO Efficiencies Through use of Emerging Technologies As technologies advance at rapid pace, how do airlines best take advantage and ensure technology gets into the production environment? How can we successfully and safely implement newer generations of mobile technology, software in legacy systems and paperless systems? What role can AI and augmented reality play in creating efficiencies? What should the long term digital strategy look like?</p>	<p>Cybersecurity Within The Testing Environment Cyber attacks are a major threat to any organisation and is increasing in activity. As more testing moves to server or cloud based environments, securing test processes and data is becoming increasingly important. Cybersecurity also needs to be designed into avionics to maintain continuous airworthiness & testing requirements. What do regulators want the industry to do to meet cybersecurity standards, what does airline need to do to enhance netwo</p>	<p>Model Based Development (MBD) Techniques & DO-331 application for Aviation Software Development: moving from Documents to Models</p>
<p>Data, Analytics & Cyber Security Big data provides the potential to facilitate maintenance planning and predictive maintenance, and the opportunity to optimise decisions, but how do we best achieve this? What role can machine learning and digital twins play? What is our ability to maximise the use of data? What role can the Cloud play and how do we ensure data transfer/delivery is secure?</p>	<p>Electrification, Aerostructures, Materials Testing With more new materials in aerosturctures, new processes are required to successfully test from birth to death. How do we standardise testing for 3D printing, conductive inks, graphene, ALM for temperature, pressure, loads, corrosion, reliability, obsolescence or robustness? Electrification brings new power supply issues, providing potential problems for avionics. How can electrification develop reliable tests of electrical systems?</p>	<p>Applying the New Mandatory Aviation Systems/Safety Regulations: ARP4754A (with ARP4761/A)</p>
<p>The Future of Testing With Machine Learning and AI the current buzz for the future of the aerospace industry, how do we approach designing and testing for automation? How do we identify what to test and to what standards, how do we ensure safety of systems and how to test new processes such as transition from automation to pilot and vice versa? In this session we take a look at what the future of testing holds.</p>		<p>The Emerging & Required DO-326/ED-202-Set Essentials: The Airworthiness Security Process, Methods & Considerations</p>

REGISTRATION HOURS

Tuesday 2nd Nov
2:00pm – 5:00pm

Wednesday 3rd Nov
8:00am – 7:00pm

Thursday 4th Nov
8:00am – 5:00pm

(Registration closes 30 minutes prior to exhibition hall closing)

EXHIBITION OPENING HOURS

Wednesday 3rd Nov
10:30am – 7:30pm

Thursday 4th Nov
9.30am – 5.30pm



RESTORING STORED AIRCRAFT TO SERVICE

James Careless

Rising like a phoenix out of the ashes — or out of the dust of the desert — parked aircraft are being returned to service as vaccinations begin working, the pandemic recedes, and the pace of travel steps up. Returning stored aircraft to service is a complex and painstaking process.

The apparent waning of COVID-19 is encouraging airlines to resume normal passenger schedules after a year of storing unused aircraft. Unfortunately, bringing these airliners back online isn't as easy as starting up a parked car. There are many steps that have to be taken to achieve this safely and in line with Original Equipment Manufacturers' (OEMs) guidelines.

In fact, returning stored aircraft to service is just the last phase in a process that began last year. That is when



American Airlines image.

these airliners were grounded due to COVID-driven route suspensions, border closures, and overall declines in passenger traffic. They then had to be maintained while in storage, during which time issues related to long-term inactivity cropped up. Now that these aircraft are needed once again, further work has to be done ensure that they can resume flying safely and reliably.

To put all of this in context, **Aviation Maintenance** magazine spoke with OEMs, airlines, and MROs. Here's what they told us.

Preparing for Storage

Even in normal times, preparing an aircraft for long-term storage requires a fair degree of time and effort. According to the MRO Avia Solutions Group, storing a single widebody aircraft like an Airbus A380 or Boeing 777 takes 4-6 employees working together for a 12-hour shift. The reason aircraft storage is so labor-intensive is due to how much

the tasks that need to be performed during the grounding period and to safely return the aircraft in service are already well known and well documented."

"What makes the Covid 19 groundings different is their scale, their unexpectedness and



Juozas Lapeika, deputy CEO and head of Base Maintenance at FL Technics. Avia Solutions/FL Technics image.

has to done to anticipate and forestall damage from all kinds of hazards. According to Ed Sangricco, American Airlines' managing director of Tech Ops – Tulsa, "some of the regular tasks for putting aircraft into storage include covering any openings to keeping wildlife and debris out, preserving engines, lubricating flight controls and landing gear, putting up window shades, and implementing ways to minimize moisture in the cabin and on the flight deck." As well, in-flight entertainment screens and systems have to be covered, and potable water tanks and fuel tanks must be dosed with anti-growth agents for indefinite non-use.

Storing aircraft in regular circumstances can be challenging, but at least such storage can be methodically scheduled and resource-planned beforehand. "Long-term groundings, be it in flight-ready conditions or storage, are not unusual in our industry," noted Claire Kauffmann, Airbus' head of Scheduled Maintenance Services. "So

the suddenness – often within a few days," Kauffmann explains. "This was the reason that Airbus offered more flexibility in maintenance recommendations without compromising on safety. We aimed to prevent all potential issues linked to parking and storage taking into account the parking conditions and locations."

Boeing took the same proactive attitude to supporting airline clients during the unexpected COVID-19 rush to ground aircraft. "We partnered closely with operators to ensure safe and proper



The aircraft OEMs partnered closely with operators to ensure safe and proper storage. Shown here are some of the British Airways fleet parked due to the pandemic.

but more help was required during the ‘Pandemic Mass Grounding’. To make it happen, “United Technical Operations personnel worked with departments across the airline such as engineering, fleet planning, network operations, supply chain and more to help ensure our aircraft were stored in accordance with the manufacturers’ (Boeing, Airbus) specific storage instructions,” said a United spokesperson. “Our teams also evaluated the best storage locations with the majority of our aircraft stored where United has in-house maintenance facilities and appropriate staffing such as our Hubs.”

All of this activity occurred while MROs such as Avia Solutions Group subsidiary FL Technics were trying to maintain their regularly scheduled services to customers, albeit on a reduced scale due to COVID-19. “It was quite a challenge to find a balance between heavy maintenance checks that had been contracted throughout the season and the number of short notice storage or parking (available for immediate return to service) requests coming from our customers,” said Juozas Lapeika, the company’s deputy CEO and head of Base Maintenance. “Good preparation was of the utmost importance for smoothly supporting all of these requests at the same time. This is why Avia Solutions Group management dedicated one team of our staff to handle storage and parking requests for aircraft, the performance of periodic checks and eventually Return to Service tasks, which gave us required flexibility and swift reaction time.”

During the push to ground aircraft, Avia Solutions Group worked closely with airport authorities in Vilnius, Lithuania (where the company is headquartered) to expand the number of storage spaces available to its airline clients. “Even a drone was engaged to give us all a good aerial overview to check if the current stored/parked aircraft arrangement was efficient enough,” Lapeika said.

Maintaining Aircraft During Storage

Grounded aircraft are like farm animals:




Putting aircraft into storage and bringing them out of storage is labor-intensive. American Airlines image.

storage,” said Boeing spokesperson Rafael Gonzalez. “During this period, Boeing captured Best Practices and performed cross-model collaborations

to ensure that the right procedures were applied across the Boeing fleet.”

This kind of support was appreciated by customers such as United Airlines,



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American Airlines credits upline work with their Network Planning group that ensured they had aircraft that were ready to fly at the right time. American Airlines image.

They need to be cared for on a regular basis to keep them in peak condition. This was particularly true during the Pandemic Mass Grounding, when the uncertainty as to how long these airliners would be stored plus the need to return them to service whenever possible was on top of everybody's mind.

Again, it was only the vast scale of the Pandemic Mass Parking that was new to the aviation industry, not the

storing of aircraft in itself. As such, "as per OEM requirements and accordingly provided Work Orders by responsible CAMO organizations, there is a number of periodic tasks that are mandatory to be performed whenever an aircraft is being parked/stored, based on 7 day, 14 day, 30 day, 60 day, 90 day, 180 day, and one year cycle checks," said Avia's Lapeika. "These tasks basically cover visual inspection of certain zones, as

well as different components or systems functional tests. Despite the aircraft is parked/stored, it is not being left out and needs continuous maintenance support."

To be precise, "American's stored aircraft were kept in ready status, carefully worked on and inspected regularly, to ensure they were prepared to fly safely and reliably when they were once again needed for revenue service," said American Airlines' Sangricco. "Storage maintenance tasks include everything from running engines and rotating tires to inspecting baggage holds and coffee makers. Maintaining fuel system integrity and ensuring lubrication requirements are also important items maintained throughout the storage process."

Under United Airlines' maintenance plan for its stored aircraft, technicians performed scheduled checks and inspections regularly, with the goal of allowing these aircraft to return to service quickly when the opportunity arose. "This work required combination of United's Tech Ops professionals as well as FAA-approved essential maintenance providers for assistance where necessary," said the United Airlines spokesperson. "Technology also played an instrumental role in keeping maintenance on schedule to avoid any delays in getting an aircraft back in the air. So our teams used tools like iPads to electronically access critical information about the processes and procedures required to maintain a stored aircraft. In addition, we developed web-based solutions that illustrated the condition and status of every aircraft scheduled for, or currently in, an approved storage program."

Issues That Arose During Storage

Even with the most conscientious ongoing maintenance, stored aircraft can experience issues when they sit on the ground for extended periods. This was certainly the case for the Pandemic Mass Parking.

According to Boeing spokesperson Rafael Gonzalez, the OEM saw a number of issues arise during this



“We communicate frequently to our customers and MROs via Multi-Operator Messages (MOMs), Fleet Team Digest (FTD) Articles and monthly presentations,” Gonzalez said. “Communicating with the fleet prior to making major changes in our maintenance requirements gives our operators ample time to prepare for additional maintenance, if required.”

time, each of which it developed fixes for. For example, extended parking could result in corrosion occurring on vulnerable external areas of the aircraft. To address this, “Boeing provided guidance on increasing inspection and cleaning intervals, and has also approved the use of additional corrosion inhibiting compounds (CICs) for relief and mitigation,” he said.

Meanwhile, high humidity and extreme weather events damaged some Line Replaceable Units (LRUs) on the airlines’ stored aircraft. To keep this from happening again, Boeing provided aircraft maintainers with various humidity reduction methods to preserve LRUs such as APUs, batteries, and soft interiors. “We have also worked closely with our customers and MROs to ensure LRUs are maintained properly in extreme weather conditions – below freezing and over 110F -- for each Boeing model,” said

Gonzalez.

This concern about climate conditions was also cited by the United Airlines spokesperson. “One of the challenges our teams had to plan for was weather, especially in areas where humidity or inclement weather were more of a threat,” they said. “To overcome this challenge, our teams stayed in constant communication with departments across the world to identify alternative storage locations where aircraft could be quickly moved in the event of an impending major weather event.”

Sitting unused for extended periods of time can also cause Component Degradation in APUs, batteries, and Integrated Drive Generators (IDGs). Boeing addressed this by working closely with its suppliers to publish the latest preservation information provided with respect to these components in this OEM’s Maintenance Manuals.



Avia Solutions' subsidiary FL Technics is assisting clients with numerous scenarios of returning aircraft to service: putting aircraft back online at the airline, getting them ready to fly after they have been sold or sending them for cargo conversions are the most common. Avia Solutions/FL Technics image.

Finally, there is another source of bugs that can damage aircraft during extended storage, and that source is, well, bugs.

"One of the most frequently heard-of problems during extended time on the ground is a possibility of various bugs finding their way through the pitot-static system covers and settling down inside them," explained Lapeika. "As you may know the pitot-static system determines aircraft airspeed and altitude. To do this, air enters the pitot tube or static port through calibrated holes during flight, and blocking them would result

in erroneous data. Fortunately, there are special procedures meant to overcome such risks, such as the Flushing of the Air Data System task, which are part of our aircraft Return to Service procedure."

In the same vein, "typical prevention measures during include protection against birds nesting in the engines and keeping insects out of the cabin," said the Airbus spokesperson. The takeaway: When aircraft sit on the ground for extended periods of time, they have to cope with everything that Nature and Physics can throw at them.

Preparing Aircraft to Return to Service

Returning stored aircraft to service is a complex and painstaking process. The fact that an aircraft has been conscientiously monitored and maintained during storage doesn't mean that it is 'good to go'. Any protective measures that were employed have to be reversed (right down to uncovering the in-flight entertainment system screens), and all systems must be checked and 'run up' on the ground to verify that the airliner is safe to fly.



“To return an aircraft to service all the necessary maintenance actions must be performed,” said Kauffmann. “To this end, Airbus has been advising its operators via webinars, All-Operator-Telex (AOTs) and other channels that this includes all scheduled maintenance, daily and weekly servicing when needed, and the restoration of any defects which may have arisen during the period of storage or parking.”

“Everything required to bring the aircraft back to operational standards and ensure safe use is essential,” emphasises Kauffmann.

This includes calendar and mandatory items, Airworthiness Directives, AOT-specified tasks, shelf-life equipment, and any inspections that were/are due to be done. “Upon release into service, the aircraft must be fully airworthy in every respect,” they told **Aviation Maintenance** magazine. “In 2020 alone, Airbus held more than 100 technical webinars to support worldwide customers with detailed recommendations on this topic.”

One complicating factor is that ‘return to service’ has different meanings to different clients. “We can now identify three scenarios for passenger aircraft that are getting out of long-term storage,” explained Lapeika. “One scenario is regular return to service to the same operator’s fleet. The second is aircraft returning to service after delivery to new operators. And the third is aircraft returning to service and being sent for cargo conversion. Each of these scenarios comes with different volumes of works and requirements. However, Avia is happy to provide all the required support.”

To add to the challenge, “the request to return an aircraft to service might come on quite short notice, which is a challenge for our production team to combine it with ongoing heavy maintenance projects,” he said.

“However, Avia Solutions Group does understand the importance of quick reaction, which is directly connected with our customer’s business success. Therefore, we are always ready to take an ‘extra mile’ proactive approach and come up with out of the box solutions.”

Going the extra mile to restore aircraft to service expeditiously – which is happening now — has been an American Airlines’ priority since the Pandemic Mass Grounding began.

“The upline work we’ve done with our Network Planning and other key Operations teams to orchestrate the aircraft returning to full service, ensured our aircraft were ready to fly at a moment’s notice and that we have the right number of aircraft to fly based on demand,” said Sangricco. “A lot of work went into storing aircraft, but the same goes for getting them back in the air and carrying customers.”

“It takes about 1,000 hours of reactivation work to prepare an aircraft ready for commercial service,” he added. “Any aircraft in long-term storage must also complete a satisfactory Maintenance Verification Flight to confirm the aircraft is ready to return to service.”

Over at United Airlines, “our teams are following the aircraft manufacturer’s prescribed guidance on returning an aircraft to service which includes operational and engine checks, deep cleaning, fluids check, and a full inspection,” the United Airlines spokesperson said. “Returning aircraft to service has been an enormous achievement that represents the incredible professionalism, attention to detail and commitment to safety of not just Tech Ops, but rather the entire operations teams at United.”

One can only hope that the return to service efforts now underway represent the final phase of the Pandemic Mass Grounding, and that passenger travel is on its way to full volume recovery in the days to come.

Unfortunately, some of the stored aircraft may never return to the skies, specifically older airliners that are less fuel-efficient than their younger counterparts and in need of extensive overhauls. In such cases, “the more cost-effective solution for the owner or an operator is to part out these aircraft for valuable components and scrap the remaining items along with the airframe,” said Lapeika.

This being said, the rest of these stored aircraft should return to service soon. They have remained flyable thanks to diligent monitoring and maintenance during the Pandemic Mass Grounding – plus keeping birds and bugs outside of the aircraft where they belong. **AVM**

CONNECTED TO YOUR PURPOSE

The three most important things on the aircraft for the people who sit in the back of a business jet are said to be the crew, the catering ... and the connectivity.

Aimée Turner

In the COVID-19 era, one thing has become clear: the need for inflight connectivity is more important than ever before. Many business executives today are using their 'office in the sky' as a critical asset to manage the demands on their professional and personal lives while adhering to safety and social distancing

requirements.

They are using the technology on board the aircraft to conduct virtual meetings during flights, manage their inbox, lead remote workforces, conduct video conference calls, and stay on top of breaking news. Many are also holding in-person meetings on board the aircraft while on the tarmac instead of driving to an office to help ensure personal health and safety.

All that combined highlights the increased importance connectivity plays for today's business traveller who requires their connectivity provider to deliver ever greater bandwidth with faster speeds and more personal services.

Fewer Flights but Usage is Up

Dave Mellin is the director of communications for Gogo Business Aviation which has been at the forefront of the internet-on-aircraft phenomenon offering both Air to Ground (ATG) and satellite connectivity on the back of its cell tower backbone notes an important aspect: although business aviation traffic is still not at pre-pandemic levels, his business is seeing a double-digit increase in data consumption since the COVID pandemic hit.

"So even though flights are down, data usage is up — it's a statement about how important connectivity has become," says Mellin. "It's one of the big reasons we just announced a new unlimited data and streaming plan



The production of a motherboard for a Gogo inflight connectivity system. Gogo image.



A Gogo field engineer assists with the installation of an AVANCE LS system in the nose of a business jet. Gogo image.

— unique in business aviation because it comes with no caveats. For Gogo, data is data.”

Insatiable Demand

Chris Moore is president at Satcom Direct Business Aviation which provides onboard connectivity in addition to a complete flight system via its partnership with satellite partners including Inmarsat supporting JetConnex and SwiftBroadband services and IntelSat which operates the FlexExec Ku-band satellite network for which SD holds Master Distributorship status. He agrees with the near insatiable demand for high-speed connectivity.

“Connectivity and high-speed data have become leading priorities for owners and operators and the connectivity stakeholders are responding by significantly investing in more powerful, more accessible high-speed data for business jets,” he says. “Every year we are moving closer towards emulating on the ground functionality in the air, and that is what customers want and expect. All stakeholders in

the supply chain are investing heavily to improve infrastructure, hardware, software, and flexibility of service.”

Moore notes that existing satellite constellations are being updated with the number of LEO, MEO and GEO services growing.

This all combines to help deliver more bandwidth for more aircraft. Indeed, the costs associated with outfitting aircraft for high-speed data are gradually reducing as more



Chris Moore, President, Satcom Direct Business Aviation

competition enters the market, with the size of the equipment also reducing.

Meanwhile, Honeywell’s JetWave system connects to the Inmarsat Jet ConneX Ka-band satellite system through either a tail-mounted antenna on mid-size jets or with a fuselage-mounted antenna for large-size jets. John Peterson, vice president and general manager of Honeywell’s software

and services business, reports that the business has witnessed a slowdown in the cabin connectivity and wifi installation in the business aviation market. Even so, there has remained a steady demand in the aftermarket as owners now judge connectivity capability an essential feature of the business aviation proposition. He says the fun social media channels of old have now developed dramatically to become important real-time business networking tools, constantly keeping executive teams informed and effectively managed. “When you consider a HNWI corporate executive is costing the business \$10,000 an hour and the aircraft \$100,000 an hour,” Peterson says, “the pressure on these executives to keep turning the data in order to keep people and businesses profitable is immense.”

He says the goal of businesses like Honeywell is to help operators keep the balance between cost, speed and the region so an aircraft owner/operator needs to decide to opt for satellite-only or have an additional air to ground ATG component. “These are



Connectivity and high-speed data have become leading priorities for business jet owners and operators, says Chris Moore, president, Satcom Direct.

all things that need to be sorted out, to balance all these scenarios and the algorithm becomes even more complex when you start to trade off within those technologies. It becomes a sophisticated choice for operators to get that balance right. Many are taking advantage of the aircraft being on the ground to book in their installation slots as they understand that the aircraft will only depreciate in value if their second-hand aircraft fails to upgrade," says Peterson.

Taking Advantage of the Pandemic

Owners have indeed been taking advantage of the pandemic slowdown. As an aircraft repair station, Flying Colours is deemed an essential service by the authorities in the USA and Canada. This has enabled the business to continue operations throughout the pandemic and to support its customers around the world. Kevin Kliethermes, director of sales at Flying Colours, reports that although some customers have delayed work as those owning aircraft in Europe have been restricted

on flying due to the changing travel restrictions, other customers have moved their maintenance schedules forward as regular flying was restricted so they used downtime to undertake maintenance work. "This work regularly includes satcom/connectivity upgrades as we always advise our customers to install systems that will remain current for years to come," he says.

Connectivity providers have certainly not stopped innovating during the pandemic and are all planning to meet significant anticipated demand. James Person, Viasat's head of sales and business development in its business and VVIP aviation division reports that just as the demand on the ground continues to increase for higher speeds, usually driven by higher resolution video formats such as 4K and 8K, his business expects that trend for internet data speed requirements to prevail for the foreseeable future.

What is Viasat doing from a technology perspective to prepare for the growing demand for higher speeds? One major area of focus is its advanced satellite technology. With each generation of Viasat satellites, it adds typically an order of magnitude - that is, at least 10x - the amount of capacity per satellite.

"As an example," Person says, "our first-generation Ka-band satellites that Viasat operates, such as WildBlue-1, have in the order of 10 Gbps (gigabit per second) of total throughput capacity. Our European Ka-band satellite, KA-SAT, has nearly 100 Gbps. ViaSat-2, which launched in 2017 has over 250 Gbps, and each ViaSat-3 satellite, which start launching in 2022, have over 1000 Gbps or a terabit per second each of capacity. And because it's a Viasat designed shipset, it makes its hardware forward-compatible, so a Viasat Ka-band shipset installed today will be able to take advantage of advances in its ViaSat-3 constellation when it begins launching next year.

This incredible increase in satellite capacity - and in the smarts of the

satellite to adjust that capacity to when and where it is needed – will be critical to keep up with that never-ending demand for higher speeds.

Satcom Direct's Chris Moore believes that as the digitization of business aviation continues, his business will focus on designing and delivering satellite connectivity services built specifically for the needs of the business aviation sector.

"Our SD Plane Simple antenna systems are leading the charge in terms of providing more high-speed data to more aircraft around the world at more affordable rates," he says. The Plane Simple antenna system series is the first network-integrated terminal designed exclusively for business aviation and aims to bring reliable connectivity to a much broader range of aircraft than ever before. Moore says the simple 2LRU system (the antenna and a single modem) simplifies retrofit installation and so reduces costs, reduces footprint, and provides a seamless transition path to future technology through its agnostic design to keep up with future technology.

He adds that this simplified system results in more reliable faster connectivity, in smaller formats, at competitive price points, all of which is attractive to existing and new customers. Low-cost installation reduces the burden of adding high-speed connectivity and the modular design enables minimally invasive upgrades. The system can also be located in the unpressurised area of the fuselage so freeing up valuable baggage compartment space.

The first Plane Simple Ku-band tail mounted antenna will support Intelsat's Ku-band FlexExec satellite service and is anticipated to enter into service this year and will launch with flexible service plans aimed to align with how flight departments manage budgets.

As part of the SD eco-system of hardware, software, ground infrastructure and customer support, Moore says the addition of the Plane Simple antennas positions SD as a single source for all business aviation connectivity needs which streamlines the ownership and

aircraft maintenance/management experience. "We are excited about the possibilities this brings for owners and operators seeking reliable, cost effective and easy to install high speed data systems," he says, adding that a second Ka-band tail mounted antenna variant will come to market towards the end of 2022.

On Track for 5G

Gogo's Dave Mellin meanwhile says his business believes the future of hi speed data is 5G — at least for the foreseeable future. "That's why we're building Gogo 5G. Data consumption has increased by 38% year over year on the ground, and the same applies to inflight connectivity, so the need for faster speeds and vastly increased capacity will be necessary, and Gogo 5G will be able to accommodate that increased demand long term."

He says the business will launch Gogo 5G in 2022 and that the business remains on track for that. "We've crossed some significant milestones with testing the 5G belly mounted antennas and we've completed our first end-to-end call using the Gogo 5G SIM card so we are feeling optimistic about the progress we're making. There is a worldwide semiconductor chip shortage, and that has impacted our 5G plans, but that is out of our control and everything else that is in our control, we are executing according to plan."

When launched Gogo's ATG system only became operational once the aircraft went above 10,000 ft due to an original design decision based on the Federal Aviation Administration ban on using personal electronic devices below that level. Since that regulation was relaxed, Gogo can now connect at 3,000 ft thanks to its AVANCE software. "What is significant about that," Mellin says, "is that we were able to make that happen with a software push done over the air. No one had to board the aircraft or have any physical interaction on the aircraft. No down time to implement that change — that's a massive increase in efficiency and saves operators thousands every time we push new software."

That lower service altitude is significant for business travellers because it can provide up to 20 minutes additional connectivity time during normal flights and it makes connectivity more feasible for smaller aircraft such as turboprops that fly short hops or at low altitudes for most of the flight.

Mellin reports that one of the biggest benefits with the lower service level has been with the turboprops and some of the aircraft that fly in congested airspace. "One of our customers told us that when he flies into Teterboro — the airport just outside New York City — every time they have him drop below 10,000 feet way early, often for periods of 30 minutes or longer before landing, to avoid all the commercial aircraft flying into Newark, JFK or LaGuardia. Whenever that happened, he'd lose connectivity, but now he has that much more time to continue working."

Future Trends

Viasat's James Person sees an acceleration of interest and requirements for high-speed connectivity in smaller business and private aircraft. "In the past, perhaps due to limitations on SWaP (size, weight and power) as well as cost of equipment or service, satellite-based high-speed connectivity was an option for large cabin and long-range aircraft only," he says. "Now with smaller shipsets, such as Viasat's Ka-band or Ku-band 3-LRU shipsets, super-mid cabin aircraft can now have the same connectivity experience."

ViaSat is seeing great demand in this category, including among the Embraer Praetor, Bombardier Challenger 300 series, and Gulfstream G280 for the same 20+ Mbps that it had already been delivering to large cabin aircraft. He says COVID flying restrictions served to accelerate this trend as travellers couldn't fly to other countries/continents and with the increased usage of domestic fractional or charter aircraft usage, demand for internet service aboard increased.

Video Usage Soars

A second trend that continues is the increase in the amount of video that is consumed aboard business and private aircraft. As cellular plans and networks on the ground moved to enable streaming film, sports, and other content, those same mobile users kept their expectations high when going airborne. Again, a COVID trend of video conference calling accelerated this trend of the expectation for video calls while in flight. As a consequence, Viasat lifted the lid on its Ka-band speeds that enabled more users to stream simultaneously on business aircraft and added a new 200 GB monthly plan as well as including its Unlimited Streaming option in its top plans to support this trend of greater video consumption.

Satcom Direct's Chris Moore commenting on the likely direction that satcoms are headed says the role of connectivity is evolving as it has become more than just a means of staying connected, it has developed into a data management system and he anticipates this will continue to evolve. "Communications is now a given," he says, "but the optimisation of the data adds value to all parts of the flight operations." In addition, he notes, the data generated supports capturing a digital history of the aircraft performance from the day the systems are installed. This helps retain asset value through the collection of accurate, validated, real-time data for existing and future owners and helps protect owner investment.

Open Architecture

The SD connectivity eco-system has been developed using open architecture approach which means that customers can plug-in third-party tools that support maintenance tracking, fueling, or flight planning. Data generated by the aircraft platform is shared by the SD eco-system with for example maintenance tracking software or engine manufacturers to support development and pro-actively engage in predictive maintenance management. This all helps reduce the

downtime of an aircraft/fleet.

Advancing satcom technology is increasingly being seen as improving the passenger experience, supporting more efficient fleet management, and improving safety which enhances the overall ownership experience. Connectivity is no longer just about communications and transmitting data, it is about collecting aggregating, validating, and delivering data to an extended network of stakeholders via a secure and safe network to improve the aircraft management experience.

Honeywell's Peterson is in complete agreement: "We at Honeywell constantly feel that pressure to perform and keep everything improving and once the people sitting in the back of the aircraft are satisfied, it then becomes more of a matter of getting the whole aircraft connected. And when we talk about connecting the whole of the aircraft, operators are searching for economies of scale, the exact same sort that scheduled commercial aviation enjoys.

"Honeywell has gone through a whole digitization of the air transport industry and has built a huge ground network with TBs of information being processed every month. We are now bringing that to the business aviation community but to make it work, you have to have a connected aircraft which can communicate key pieces of operational data so that everyone responsible for delivering that aircraft mission is sharing the same information and working in collaboration to provide a seamless service similar to that which supports the commercial air transport."

"The fact is that in business aviation often, no one is expecting you and there is little infrastructure so Honeywell has created the Forge Community data platform bringing together a whole raft of expert airport related services so support the business aviation owner and operator — it is in this way that business aviation community can start enjoying those economies of scale."


Peterson adds that Honeywell plans to take this to the next level and will for

example be able to support the early arrival from feeding Top of Descent messages with Honeywell acting as the ISP to guarantee high levels of reliability through leveraging its scalable software. "We can stitch together the whole business jet user/operator community," says Peterson.

The Forge Community will bring supplier services together in one place, allowing the operator to pick and choose. "It is very traditional in its thinking but very advanced in the technology behind it and Honeywell is bringing it all together so operations look seamless, flawless. We also want to bring a lot more scale into it in the future. Our mission is getting the whole aircraft connecting, something that is invisible to the passenger."

High-Speed for All

Flying Colours' Kevin Kliethermes also discerns more choice emerging in providers. "For many owners high-speed connectivity is now one of the most important elements of the passenger experience and that demand for more data, more quickly around the globe is something we are finding small to mid-size aircraft owners are also requesting. High speed data was once just a feature available to the large cabin aircraft, not anymore.

"The demand is stimulated by a consistent introduction of more robust systems that are beginning to come to market. Until recently customers could choose from just one or two providers and the size of the aircraft and where it was operating would potentially limit the possibilities, as well as budget costs. Now the situation is changing as high-speed data is being made viable for super and mid-size aircraft. Just recently we installed the Honeywell JetWave Ka-band system onto a Bombardier Challenger 604 which is the first time we have had to fulfill this request. It has always been the preferred choice of the large jets, but we expect to see more requests for high-speed services on these types of aircraft." 

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PRE-COVID LESSONS FOR POST-COVID RETURNS TO SERVICE



Jeff Guzzetti

P

arking an airplane for an extended period of time – like most airlines have

done during the COVID-19 Pandemic — introduces uncertainty and risk, especially if the maintenance performed prior to storage and later during return to service (RTS) is not properly executed. The actions taken by each person involved in these maintenance actions are critical to ensuring the airworthiness of the airplane. A recent example of this could be evident in an FAA emergency airworthiness directive issued last July for inspections of older Boeing 737 aircraft

after four engine failures occurred due to a stuck bleed air check valve from corrosion. These airplanes were all parked due to the recent pandemic prior to RTS.

However, these same issues have been well-documented in other accidents and incidents long before COVID-19. Case-in-point: Dynamic Airways flight 405 on October 28, 2015.

The weather in Washington DC was unseasonably warm that day. As I ate lunch outside with some of my colleagues in the FAA Accident Investigation Division, a call came in

from the Communication Center. The left wing of an airliner was engulfed in flames on the taxiway at the Fort Lauderdale-Hollywood International Airport (Graphic 1). One person ran behind the still-operating right engine and was blown to the ground, receiving serious injuries. Even though many passengers insanely held onto their carry-on bags as they slowly evacuated a burning airplane, no one was killed. Passengers were streaming down emergency exit slides and spilling onto the tarmac. A relaxing lunch with my co-workers would have to wait for another day.

Immediate Indications of a Problem

It was known early on from media and airport sources that flight 405 — a Boeing 767-200ER powered by two Pratt & Whitney JT7D-7 engines — had experienced a massive fuel leak near its left engine about four minutes after it pushed back from Gate E9. The crew was in contact with an FAA air traffic controller (ATC) ground controller at the time of the event, thus triggering an internal FAA “services rendered telecon” — or “SRT” — about an hour after the notification of the accident. Hosting an SRT was standard FAA procedure for high-visibility events so that key ATC managers — and investigators in our division — could get briefed on the event and have the opportunity to listen to the raw ATC voice recordings.

The ATC playback in this case revealed that the wide-body jet was taxiing for takeoff for a scheduled charter flight to Caracas, Venezuela when another airplane — taxiing behind flight 405 — radioed that something was wrong: “Hey...out of the left engine. Looks like its leaking...I don't know if its fuel or what.” The FAA ground controller responded with: “Okay. Dynamic four zero five heavy, did you copy?” The 767 crew replied: “Yes sir, we copy,” and then requested to return to the ramp. Shortly after the controller cleared the leaking jet to return, another voice from an undetermined origin shrieked over the frequency. “Engine’s on fire! Engine’s on fire!”

After the SRT concluded, I learned that the NTSB was launching a small “go-team” of five investigators from its headquarters offices located just across the street from my office. The team consisted of the investigator-in-charge and four NTSB “Group Chairmen” — specialists in systems, powerplants, maintenance records, and survival factors. The NTSB also invited investigators and experts from Pratt & Whitney, Boeing, and Dynamic Airways to assist.



Graphic 1. The left wing of an airliner was engulfed in flames on the taxiway.



Graphic 2. Left wing and flaps that were severely burned from the fuel fire (NTSB Photo).

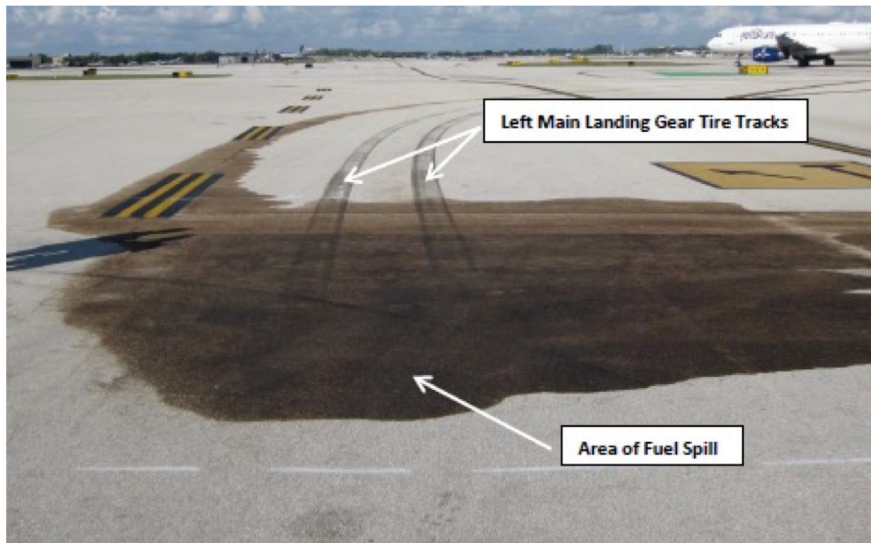
By statute, the FAA did not need an invitation. In its wisdom, Congress granted the FAA the right to participate in all NTSB aviation investigations because FAA regulates the industry, while the NTSB leads independent investigations and only makes recommendations. I launched Eric West — our most senior air safety investigator — to be the FAA coordinator for all agency support to the NTSB. Eric was a former charter pilot from Boston who was also a certified mechanic with inspection authorization. He had been an FAA inspector and accident investigator

for two decades. Eric was assisted by FAA specialists for each of the NTSB’s four specialty groups who arrived at Ft. Lauderdale from various FAA offices across the country.

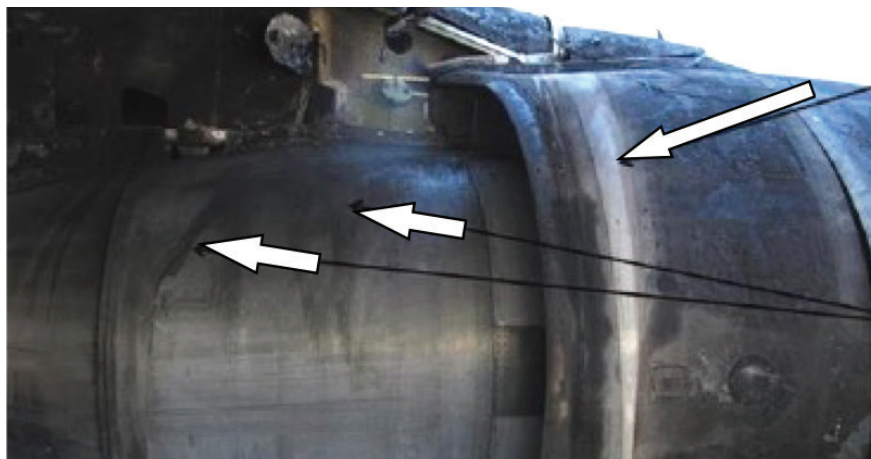
Examining the Wreckage for Clues

When Eric and the other investigators arrived at the scene later that day, their cursory look inside the left engine revealed no evidence of an uncontained engine failure or internal damage. Instead, it was clear that a significant fuel leak and subsequent fire occurred in the left engine strut and nacelle during

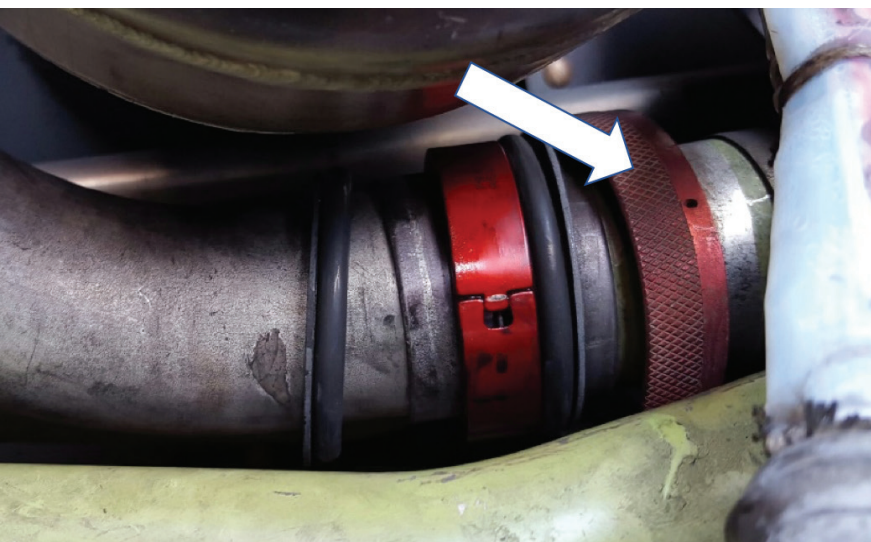
ON GUARD



Graphic 3. A puddle of fuel with tire tracks from the airplane provided more clues for investigators. NTSB Photo.



Graphic 4. Inboard side of left engine. Note the streaking marks from fuel spillage, denoted by the white arrows. NTSB Photo.



Graphic 5. Close-up view of Wiggins coupling on the left side of the accident airplane. Note that the white arrow depicts the lack of safety wire.

taxi. The lower inboard portions of the left wing, left engine cowling, and left fuselage center section were badly burned (see Graphic 2 on previous page). A puddle of fuel with tire tracks from the airplane provided more clues (Graphic 3 at left). Fortunately, the captain cut-off the fuel when the fire began to rage, and it was quickly extinguished by airport firefighters before the flames and smoke were able to penetrate the cabin. Given the passengers' propensity to remain on the burning airplane as they grasped for their backpacks, purses, and other items, Eric was convinced the local authorities would have required a lot of body bags if the cabin would have been compromised with smoke and flames.

During a closer examination of the left engine and strut the following day, investigators noted that a fuel coupling assembly — known as a “Wiggins coupling” — was found separated. Indications of fuel leakage were observed at the flange interface of the fuel supply lines where the coupling had separated, including discoloration from fluid pooling in the strut compartments and streaking down the left engine cowling (see Graphic 4).

What investigators found next was disturbing. No safety lockwire was present on either the body or the nut side of the fuel coupling as required in the Boeing aircraft maintenance manual (AMM), and no broken lockwire was recovered in the surrounding strut compartments. (See Graphics 5 & 6).

The affected coupling was downstream of the front spar Wiggins fitting which was located in the upper flammable fluid leak zone of the aft upper strut area (graphic 7). The outer couplings (parts 117 & 113 denoted by arrows in graphic 7) are designed to be threaded together, and then lock-wired to prevent the coupling from loosening under vibration.

Eric called back to the office to inform me that Dynamic Airways

issued a Fleet Campaign Directive after the Wiggins coupling discovery to inspect the remainder of their aircraft to ensure proper installation of the fuel line coupling assemblies. No other instances of improper installation were found.

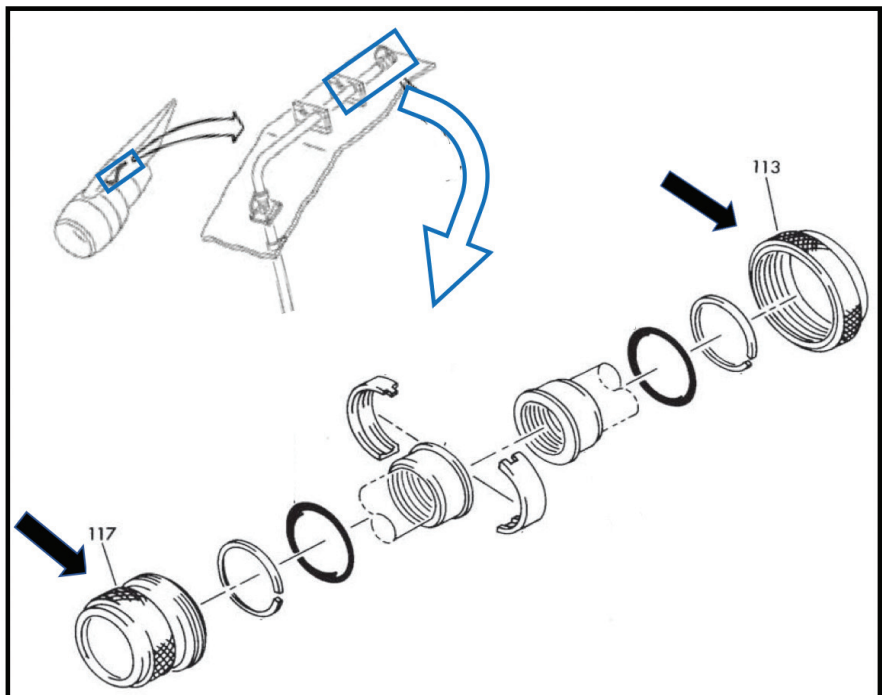
Determining How the Airplane “Lived”

Like performing an autopsy of a deceased person, investigators must determine how an airplane “lived” before it “died” in an accident. In this case, the NTSB maintenance records group pored over thousands of aircraft records. The accident airplane was “born” at Boeing in 1986 — nearly 20 years before the accident. The original owner of the 767 was Kuwait Airlines, but it was then purchased and operated by several more airlines, domestically and internationally, until 2006. At that point, a leasing company purchased the airplane and leased it out. Six years later, the leasing company sent the airplane to a maintenance facility in Michigan in August 2012 to have a “4C” Check accomplished. Each C-check must be accomplished at intervals of 18 months, 6,000 hours or 3,000 cycles. It was during this 4C check when the Wiggins coupling would have been addressed. Following the 4C check, the airplane was flown to Goodyear, Arizona on November 12, 2012 to be stored.

Three long years later, on April 15, 2015, the leasing company ferried the airplane back to the same Michigan maintenance shop for a “6C” check and other work in preparation for lease to Dynamic Airways. One of the required maintenance tasks during this time involved a visual inspection of the fuel feed line components, including the Wiggins coupling. The Boeing AMM called for a “Zonal Inspection (General Visual)” of the area at each C-check maintenance interval. Following this maintenance, the airline took possession of the 767 on June 25, 2015, the FAA accomplished a conformity inspection



Graphic 6. Exemplar fuel of the coupling and bonding jumper from the RIGHT engine. Note that the lockwire and bonding jumper are properly installed.



Graphic 7. Isometric and exploded drawings of the Wiggins coupling from the 767 maintenance manual. The affected coupling was downstream of the front spar Wiggins fitting which was located in the upper flammable fluid leak zone of the aft upper strut area. The outer couplings (parts 117 & 113 denoted by the black arrows) are designed to be threaded together, and then lock-wired to prevent the coupling from loosening under vibration.

on August 29, 2015, and the airplane was returned to service on September 15, 2015 – six weeks prior to the accident in Ft. Lauderdale.

The NTSB interviewed the mechanics who worked on the airplane during the 2012 and 2015 maintenance

periods. All of them seemed qualified and experienced, and none of them recalled specifically working on the accident airplane. Regardless, both personnel who were involved in these two maintenance checks should have caught the missing lockwire.

ON GUARD

The Probable Cause and Lessons Learned

The NTSB final report on the accident was released last summer in the midst of the current COVID pandemic was beginning. The report concluded that the probable cause was the separation of the fuel line Wiggins coupling and subsequent fuel leak "... due to the failure of maintenance personnel to install the required safety lockwire." In

the analysis section of the report, the NTSB said that the missing safety wire "... was the result of an error by the third-party maintenance provider". The agency also criticized the flight crew for initiating the emergency evacuation while the right engine was still running, and the passengers who decided to evacuate from a flaming airplane only after grabbing their carry-on bags.

The lessons learned from the flight 405 fire are obvious. Operator experience shows that dispatch reliability is higher and maintenance problems are fewer for airplanes flying in regular service as compared to airplanes used sporadically. When the airplane is in service, flight crews monitor airplane systems from the cockpit, and maintenance personnel perform preventative maintenance, regular inspections and repair procedures. When an airplane is parked, maintenance tasks can be missed, the environment can cause problems, and complacency can set it.

Last June, the International Air Transport Association (IATA) published "Guidance for Managing Aircraft

Airworthiness for Operations During and Post Pandemic" that provides helpful information for airlines and maintenance facilities with regard to properly returning a stored airplane to service. A few months later, in November 2020, the European Union Aviation Safety Agency (EASA) published "Return to service of aircraft after storage: Guidelines in relation to the COVID-19 pandemic" in November 2020.

An unprecedented number of aircraft have been parked due to the COVID-19 pandemic. Gradually, as travel restrictions are lifted and as operators prepare to resume passenger flights, these aircraft will need to be returned to service. Due to the high number of aircraft affected by the pandemic, and with limited maintenance resources available to perform the work because of it, organizations should expect to experience difficulties and increased risks. The actions taken by each person involved in returning the airplanes to service are critical to ensuring the airworthiness of the airplane. **AM**

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REQUEST FOR QUALIFICATIONS (RFQ)
TRI CITIES AIRPORT
INDUSTRIAL DEVELOPMENT CONSULTANT

I. INTRODUCTION
Tri Cities Airport Authority (TCAA) Aerospace Park is a 160-acre development at Tri-Cities Airport (TRI) with direct taxiway access adjacent to an 8000-foot design group C-III runway. TCAA and NETWORKS Sullivan Partnership (NETWORKS) are soliciting Statements of Qualifications from Industrial Development Consultants (IDC) to more effectively promote Aerospace Park to the aerospace business sector. The IDC will be responsible for developing industry contacts, generating qualified leads, and securing meetings between qualified leads and TCAA. The initial award of agreement will be for one (1) year with two (2) possible one (1) year extensions. TCAA and selected IDC will develop a scope of work for this project and may assign additional tasks as directed by TCAA Staff or Airport Authority Board of Commissioners. TCAA will reserve the right to possibly engage other IDC firms for professional services.

II. EVALUATION CRITERIA
TCAA will select up to three (3) IDC consulting firms from the RFQ submittals for additional review and evaluation. TCAA staff may request interviews of selected firms to determine a final candidate. TCAA executive staff shall review and rank the Statement of Qualifications.
TCAA will evaluate and selected consulting firms based on 1) demonstrated knowledge of the aerospace industry, 2) demonstrated history of successful representation or negotiations for or with aerospace industries, and 3) demonstrated success with aerospace economic development projects including the relocation and/or expansion of aerospace-related companies.

III. STATEMENT OF QUALIFICATIONS CONTENT
IDCs will submit the Statement of Qualification on no more than fifty (50) single-sided 8.5" x 11.0" paper. IDC should include resumes in Appendix A. The Qualification Statement should contain only information relative to the Evaluation Criteria outlined in Item II and must be kept in the same order given in Item II. Additional information related to, but not specifically requested, may be included in Appendix B. The maximum allowable fifty (50) page limit does not include Appendices A and B.


IV. APPROVALS
The final Agreement for IDC Services will be subject to review by the TCAA Board of Commissioners.

V. LICENSES
All submitting firms or individuals must hold proper business and professional licenses as necessary to operate in the State of Tennessee and must comply with applicable laws in the State of Tennessee. TCAA does not require the IDC to be based in Tennessee; however, TCAA requires the IDC to submit evidence of all professional licenses, if necessary, as part of the RFQ submittal in the State of Tennessee. Failure to comply with the licenses request may be grounds for rejecting the company/firm submittal as non-responsive.

VII. SCHEDULE FOR SELECTION AND AWARD
April 1 RFQ advertised
May 8 Final date for questions or clarifications submitted
May 15 A/E Statement of Qualifications due to airport
May 22 TCAA staff meeting to review process
May 29 TCAA staff IDC firm recommendation
June 5 Begin selected firm's agreement discussions
June 12 Complete firm's agreement discussions
June 24 Firm's agreement submitted to TCAA Board for review and approval
Schedule subject to change

VIII. SUBMITTAL
The IDC shall submit five (5) hard copies and one (1) electronic copy of the RFQ Qualification Statements to: Mr. Mark Canty, Director of Business Development, 2525 Highway 75, Suite 303, 3rd Floor Administration Offices, Tri-Cities Airport, Blountville, TN 37617, by May 15, 2021 prior to 4:00 PM. All submittals received after this time will be returned unopened and will not be considered. Any questions pertaining to this RFQ must be submitted in writing to Mr. Mark Canty, Director of Business Development, 2525 Highway 75, Suite 303, 3rd Floor Administration Offices, Tri-Cities Airport, Blountville, TN 37617, or e-mail mcanty@triflight.com. Questions by phone will not be accepted. Fees or other cost proposal information is expressly excluded from this RFQ.

IX. NO-CONTACT POLICY
TCAA has imposed a no-contact policy on the selection process. The no-contact policy is intended to prohibit any potential proposer from engaging in any direct or indirect lobbying of any Board Member, Airport Authority staff member, other persons or organization that may be involved in this RFQ process. The no-contact policy is effective between the date this RFQ is issued and the date of the approval of the Agreement for IDC Services agreement by the Airport Authority Board of Commissioners. Questions submitted in writing to the Airport Authority for clarifications of the information contained in this RFQ are not prohibited by this policy.



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Dinakara Nagalla

Q&A with Dinakara Nagalla, Founder and CEO of EmpowerMX

What has EmpowerMX learned during the pandemic?

Our customers are facing some daunting challenges. First, it's no secret that even prior to the pandemic it was getting increasingly challenging to find enough qualified aircraft maintenance technicians. The staffing reductions that ensued during the downturn gave MROs and airlines a bit of a breather, but the combination of early retirements and layoffs drove a good number of these people to find work in other verticals, or even leave aviation entirely. It is clear now once again that the increasing demand for services are highlighting the dearth of experienced labor necessary to support it. In response, there is an unprecedented level of focus on improving processes and driving efficiencies, and technologies and solutions such as ours can play a critical role in driving those efficiencies.

Next, as carriers began to park the older and less efficient aircraft, they are now being stripped for usable parts, leading to a glut in the market, and MROs have to deal with an entirely new dimension in parts procurement and the supply chain.

And finally, the pandemic has highlighted to many aviation centric companies not only the need for efficiency, but the need for agility, and I think that as they rebuild themselves, this need for increased agility is being kept top of mind.

What challenged your company the most during this unusual time and how did you meet that challenge?

Initially, like many aviation businesses, our initial efforts were focused on supporting our customers and their unique responses to the pandemic, and figuring out how we can exit the crisis better and stronger, and more importantly making sure we have the solutions our customers will inevitably need. By far, the 2nd and 3rd quarters of 2020 was the most challenging period – but as many businesses did, we took advantage in the necessary shift in priorities, and focused all of our energy into product development and enhancement. This investment paid off, and by the end of 2020, we were well positioned to address the resurgence. We began actively reengaging with prospects around the world, and found a receptive audience for our existing solutions, as well as new offerings that are aligned with the market's increasing focus on digital MRO and initiatives like Electronic Task Cards.

Have you been able to add customers during the pandemic?

We're humbled by the fact that our customers are the world's leading airlines and MROs, and we consider each of these organizations as a partner, not just a customer. Accordingly, when the pandemic brought the airline industry nearly to its knees, we focused the majority of our efforts towards helping our customers navigate through the crisis by understanding what they'll need from us when the recovery begins. As the business environment has started to improve, these customers have

not only started to ramp back to pre-pandemic levels (and in some cases above), but they've embraced our new solutions and continued to serve as excellent and loyal references for other prospects that are starting to emerge. As a result, we've had a very busy first half of 2021 supporting our existing customers increasing usage and newly developed solutions, along with new customers who are adopting our Digital MRO solutions. Today, I know of no other cloud native, mobility first, fully integrated yet modular suite that can help transform any traditional MRO business into a fully digital operation.

How is EmpowerMX responding to its customers' changing needs?

We have always embraced the concept of "adaptive transformation" in our product design and development, where we build our solutions using a modular concept but with highly integrated components. Customers today find this approach incredibly useful, as they want to test new technologies rapidly and incrementally, without having to rip out and replace legacy systems. We don't expect customers to transform overnight, and as they adapt to new regulations, consumer expectations, and market conditions, they require new tools that evolve with their needs and are flexible enough to meet their demands and the demands of their business.

What are your goals for the company? Our primary goals are customer focused - to dramatically improve their ROI and bottom line by reducing maintenance costs by 15% to 25% and improving safety, operational, and compliance KPIs. Our vision is to create a next gen "Digital MRO" which doesn't merely take paper off the shop floor – rather, we want to bring the MRO, their customers and vendors together into a fully integrated, digitally connected service operation with an open data network to create transparency and visibility for all using blockchain and our unique predictive maintenance and forecasting technologies.

What sets EmpowerMX's offerings apart from others in the market?

We have been in this industry for over two decades now. And were one of, if not the first-to-market with a cloud-based MRO software-as-a-service (SaaS) solution in 2013, while other providers were thinking about the how and why of doing so. EmpowerMX is truly the only cloud-based software platform on the market that can enable a digital MRO today. Our machine learning algorithms, built into the core of our product, powers and administers our digital task card generation, electronic signatures, task applicability and labor hour tracking. Our upcoming new predictive maintenance module integrated into all aspects of product usage is best of breed. We can bring an operator online within 60 days after commencing implementation, and our solution pays for itself within six months. EmpowerMX is truly an ROI driven offering, not just a nice to have.

Give an example of a problem your product solved for a customer.

This is a great question, and when we pause to think about one single problem we solved, we think it is impacting MRO throughput and the resulting financial performance. And that isn't an isolated problem—it is a series of small successes that waterfall into this massive outcome called throughput, and that too, where quality and safety are non-negotiable. It is about creating a clean process flow from within the aircraft maintenance environment—starting with pre-induction and permeating through final delivery and data analytics support. Heavy maintenance visits typically create thousands of task cards, each with their own independent process needs—from material to labor and tooling just to name a few; Where EmpowerMX becomes the go-to solution is how easily our modules can support all these functions, and clients can choose modules on-the-go, without long upgrade projects.

Please give examples of how EmpowerMX's products have helped save airlines, MROs or the military money.

We help save money even while one of our modules are being implemented. By way of the many small wins within the process, EmpowerMX has a history of achieving large gains, resulting in airlines and MROs saving time and money. One example is a large regional MRO based in the US. Before implementing EmpowerMX at this facility, the MRO was not profitable. By the time implementation was complete and the processes were standardized throughout the facility, the MRO had a consistent, realized profit margin increase of 10% a year. This was the result, primarily, of On-Time or Early deliveries. Prior to implementation, On-Time delivery based on contracts was consistently below 50%, and sometimes as low as 30%. By the end of the implementation, On-Time delivery was consistently above 95%. In 2017, the facility delivered 367 maintenance events. Only 2 of those maintenance events were late. Not only that, but they were also delivering early. Over 100 days a year were captured that year for additional throughput by early delivery days alone. When you can do more with what you already have, the results become apparent. In this example, there was over a 10% EBIT improvement as well as a substantial increase in revenue. The combination of increased revenue generation as well the major margin improvements lead to a dramatic increase in the bottom line.

How does EmpowerMX help with data analytics/predictive maintenance?

EmpowerMX provides data analytics and predictive maintenance support through a couple of key methods.

Our product promotes standardization without hindering the end users, through task standards and templates. These tools ensure that data is standardized as users are incentivized to provide the right data, or conversely unable to provide incorrect data. This results in standardized inputs and outputs that makes the task of data analytics and predictive patterning much easier for an organization.

The second is data support. EmpowerMX helps with this process by making simple and customizable reports available to product users. By

providing access to almost any data point that an organization would need that is standardized through process incentives allows users to estimate maintenance visits more accurately to any relevant need such as: labor by skill, by task type, by billing code, materials demand probability, high risk tasks, task constraints, and more. When you know you have the labor, tooling, and materials required, you are already one step ahead of the competition.

What insights can you share about protecting data and information with regards to cybersecurity/hacking, which is a growing concern in any business sector?

Cyber security and data protection is the number one issue for all of us and our customers using the EmpowerMX cloud. Any cloud organization should first adopt ISO 27001 on information security management along with ISO 27032 offering guidance on cyber security management. It's important to follow these standards at a minimum and or eventually certify to these standards to mitigate the risk. EmpowerMX not only stays compliant with these standards but also encrypt all our data, secure all our servers behind firewalls, separate our network infrastructure components under different VPN networks, enable dual factor authentication to access our cloud infrastructure, and deploy in-built AI tools for cloud security analysis and auto patching. This is where we are years ahead of other MRO software providers in the cloud.

The supply chain is desperately outdated across the board in both the civilian and military sectors of aviation. Does EmpowerMX have products that can help improve the supply chain?

The pandemic exposed just how vulnerable airline and defense (A&D) supply chains are. Inefficiencies in the Supply Chain causes return to service delays, schedule disruptions, fines, and dissatisfaction with the aircraft operators. This is further exasperated by legacy systems that can't adapt and scale, bogging down the A&D Supply chain. While the aviation asset repair complexity is on a much different scale, the majority of the systems supporting the MRO industry are built for a traditional desktop model repurposed to work on tablets but are incapable of automating the process across a wide range of participants. EmpowerMX has several solutions exclusively available in the cloud to help solve this problem. For example, EMX Connect is an advanced system that is capable of wiring any legacy system to provide a seamless flow of data to automate the supply chain. This also fulfills the need for predictive analysis and always-aware systems that can minimize delays during the repair process. The EmpowerMX MRO suite—Connect, Shops, and Materials modules will bring airline MRO operators and suppliers closer than they have ever been before, digitizing the entire network of participants, and thus enabling the seamless exchange of data. [AVI](#)

Dinakara Nagalla is the founder and CEO of EmpowerMX, the Frisco, Texas based Digital MRO Platform, offering a modular, cloud-based, mobile-first suite of applications for touch-free, data-enabled heavy maintenance, shop floor, and supply chain.



SMS Part 5: The Relationship Between Risk Controls and Your Safety Risk Management System

In this article we will begin to look at how to use mitigations — or risk controls — to reduce the risk associated with aviation safety hazards.

Last year, Aviation Maintenance Magazine published a series of four articles explaining how to establish and use a safety risk management (SRM) system to identify aviation safety hazards and assess them for risk. The SRM is one of the key elements of a complete Safety Management System (SMS). This article assumes that you have some familiarity with the basic concepts of SMS that were covered in those articles. If you do not, then we recommend that you go back and read those four articles (you can find all four on Aviation Maintenance Magazine's website).

This year, we will guide you through the next steps of implementing an SMS system; and in this month's article we will focus on basic concepts related to risk controls and how they relate to the work you did in recording your hazards and safety risk analyses.

Part of the SRM process for analyzing hazards — the process that we addressed in the past articles - involved assigning likelihood levels and consequence levels to each identified hazard. These help you to place risks on a likelihood-consequence matrix which in turn helps you to identify which hazards need to have their risk levels reduced. Based on this matrix, there are two ways to reduce the risk associated with a hazard. You can reduce the likelihood that the hazard will occur; or you can reduce the consequence of the hazard in the event it occurs.

These two concepts are not new to aviation. We've been using these concepts for years. For example, an air carrier's required inspection items are items for which a second inspection is necessary for the work is complete. The second inspection provides a second opportunity for an independent inspector to look for flaws. This improves the likelihood that any existing flaws will be caught, which in turn decreases the likelihood that flaws exist in the work performed. This effort reduces the likelihood that the underlying hazard will occur (the hazard(s) for which the inspection was designed). Total risk, in this case, is reduced by reducing likelihood.

Another example can be found in the common practice of having duplicate or back-up systems where the systems are critical. Where there is an effective back-up system, the failure of the primary system will not lead to catastrophic results. This the consequence of a failure is mitigated through the design functions that permit a duplicate or back-up system to operate in the event of a primary system failure.

Note that where a system is critical and it is impractical to have a duplicate or back-up of the system, it is normal to impose life limits that are designed to remove parts that are subject to wear or degradation before they could reasonably fail. This effort to decrease likelihood of failure shows us that elements like practicality can be weighed to allow us to choose from more than one risk control, and we can sometimes choose from controls that improve our management of likelihood, consequence, or both in our efforts

to reduce total risk.

Let's apply these concepts to an example. Imagine a scenario where a repair station performs plating. One of the hazards associated with plating is hydrogen embrittlement. This should be recorded in the repair station's database of hazards. Naturally, without any risk process controls, the likelihood of hydrogen embrittlement might be high. Hydrogen embrittlement can cause a component to fracture at stresses less than those typically associated with the expected strength of the metal. In other words, the metal is more brittle than expected which can lead to damage in the component. The potential safety consequence of such a hazard might be significant.

There are normal processes associated with common plating operations that are intended to reduce the likelihood of hydrogen embrittlement (such as heat treatment for thermal stress relief). The heat treatment adequately reduces the likelihood of the hydrogen embrittlement hazard, and this reduces the total risk associated with the hazard (typically reducing it to an acceptable level). Thus, heat treatment would be recorded as the risk control associated with the identified hazard of hydrogen embrittlement in your plating process.

Obviously, the risk control is valuable to prevent hydrogen embrittlement, but recording it in your hazard-risk-mitigation database has independent management value. If data shows later hydrogen embrittlement in plated components, this database allows you to focus on the risk controls that were intended to reduce that risk, and to analyze them for flaws.

It also allows you to use your hazard-risk-mitigation database to perform change management. For example, if the repair station decides to replace the ovens used for heat treatment with new ovens, then the hazard-risk-mitigation database should show where those ovens are being used as hazard mitigations, and to permit the change management reviewers to ensure that the new ovens will be adequate to mitigate each risk for which the old ovens had been identified.

By changing the likelihood level, consequence level, or both, the system can effectively reduce risk posed by hazards. As we will see in future articles, this helps to drive an effective audit schedule as well as becoming an effective and objective change management tool. How do we select process controls that will effectively reduce likelihood, consequence, or both? Read our next article where we will discuss strategies for identifying and selecting risk controls.

Want to learn more? We have been teaching classes in SMS elements, and we have advised aviation companies in multiple sectors on the development of SMS processes and systems. Give us a call or send us an email if we can help you with your SMS questions.

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