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Caring for aircraft fleets in 2020 during the corona crisis has led to a vast disposal of older-generation jets, a fleet planning shift and the acceleration of the digital transformation.

Cover image courtesy of American Airlines.

CATEGORIES: GENERAL AVIATION | COMMERCIAL | BUSINESS JET | MILITARY | ENGINES | TECHNOLOGY | PRODUCTS/ TOOLS | SPECIAL REPORT | AFTERMARKET

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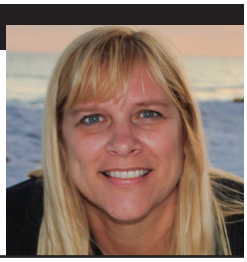
A Very Important Attribute



BY JOY FINNEGAN
EDITOR-IN-CHIEF

FAA Administrator Steve Dixon announced on November 18, 2020, as we were going to press, that he was rescinding the order that grounded the Boeing 737 MAX aircraft 616 days after it was taken from the skies. What a long, strange trip it has been.

Before saying anything else, let us take a moment and acknowledge the 346 lives that were lost aboard both Lion Air Flight 610 and Ethiopian Airlines Flight 302. We wish those families peace. Boeing also reflected on those losses. "We will never forget the lives lost in the two tragic accidents that led to the decision to suspend operations," said David Calhoun, Boeing CEO. "These events and the lessons we have learned as a result have reshaped our company and further focused our attention on our core values of safety, quality and integrity." Please see Jeff Guzzetti's article about the Lion Air accident and related maintenance concerns in our last issue, Autumn 2020, starting on page 36.

The Airworthiness Directive published by FAA specifies design changes that must be made before the aircraft returns to service including installing software enhancements, completing wire separation modifications, conducting pilot training and accomplishing thorough de-preservation activities that will ensure the airplanes are ready for service.

FAA also issued a Continued Airworthiness Notification to the International Community (CANIC) and published the MAX training requirements. Accomplishing all of these things will slow the MAX from returning immediately to the skies. The pilot training program revisions must be incorporated by each airline operating the MAX. Airlines must also take required maintenance steps to prepare them to fly again.

In a press conference on November 18, 2020, Administrator Dixon said the MAX journey had been a "painful and arduous process" that ultimately strengthened the cooperation between other regulators. "We serve as the certifying authority; they serve as the validating authority. In this particular case, one of the things I'm really proud of is the transparency that we've had with them throughout this process," Dixon said. "We worked side by side with the foreign authorities. This is the most heavily scrutinized transport aircraft in history," Dixon said.

When asked if anyone was held accountable for the MAX situation Dixon replied, "I think we all hold ourselves accountable every day and I never want to take the easy way out. It's easy to point the finger, blame individuals for things. I'm interested in improving processes and continuing to raise the bar on safety. If I see a need to make a change in certain areas, I will do that…We are doing that. We stood up an ODA office. We have measures in place to make sure it does not happen again and to make sure that we've got a solid human factors and an operational perspective throughout the entire certification process."

Dixon was asked if he felt what happened with the MAX would result in longer certification times for future aircraft. He said one of the things they needed to do was exercise oversight from a "systematic perspective." He said putting in place safety management systems (SMS) would help them do that. He stressed the need for manufacturers to push data and information to FAA on a more regular basis, rather than on a transactional basis. "I don't know that it necessarily increases the amount of time, but I think it does improve the systematic rigor of the process. And that's what we're shooting for in terms of improving and moving to really the next level of safety with aircraft certification. I wouldn't say longer, but I would say better," Dixon stressed.

He repeated numerous times the FAA's desire to improve the certification process, make it more systematic and to be more data driven. However, he also added, "The design of the aircraft was not the only causal factor. We had maintenance issues. We had also had issues with how the airplane was operated. So we've got to take a look at all of those and how they all interact." Administrator Dickson personally took the recommended pilot training and piloted the Boeing 737 MAX, so he could experience the handling of the aircraft firsthand. He was already a type-certified 737 captain for Delta Air Lines for many years.

Rescinding the previous order to ground the MAX will allow airlines that are under the FAA's jurisdiction, including those in the U.S., to take the steps necessary to resume service and for Boeing to begin making deliveries.

Boeing says they have worked closely with airlines, providing them with detailed recommendations regarding long-term storage. The beleaguered company also says in a statement that it has focused on improving their company by taking concrete steps to ensure a similar problem does not occur again. These steps include an organizational alignment, bringing 50,000 engineers together in a single organization that includes a new "Product & Services Safety" unit and unifying safety responsibilities across the company. Boeing also says a shift in cultural focus has taken place where engineers have been further empowered to improve safety and quality. The company says they are identifying, diagnosing and resolving issues with a higher level of transparency and immediacy.

Although the company, the FAA and other regulators seem to be on board with this important move towards getting the MAX airborne again, Dixon admitted that some may still feel trepidation, even though it is the most heavily scrutinized transport aircraft history. He said he would put his own family on it. Still, he admitted that being skeptical was understandable. "Skepticism in aviation is a very important attribute," Dixon said.

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FL Technics Tout Quick Turn Engine Services

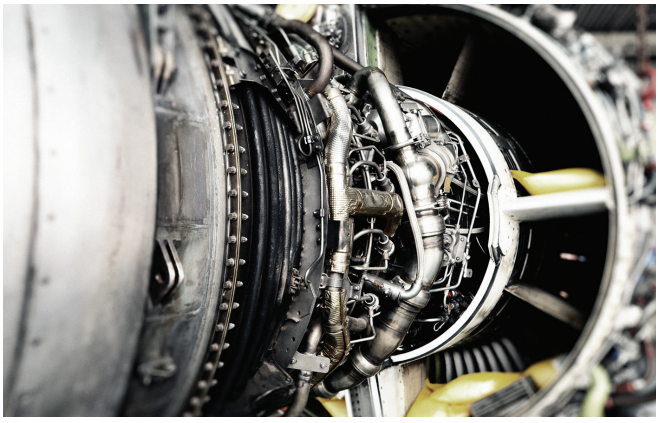
FL Technics Engine Services received Part-145 approval from the Transport Competency Agency of Republic of Lithuania (TCA) approved by the European Union Aviation Safety Agency (EASA) for its engine MRO quick turn activities and they says they are already welcoming their first clients.

FL Technics Engine Services quick turn activities' shop offers airlines, lessors and asset management organizations high quality tailor-made solutions for aircraft engine life cycle's optimization. FL Technics Engine Services already signed the first contracts for annual re-preservation and further long-term storage within it is brand new and fully equipped Part 145 facilities for two CFM56-3C1 Engines.

"We're extremely pleased that in such short time FL Technics Engine Services have already acquired clientele for its new services. Since CFM56-3C1 remain a valuable asset and a popular engine type in its niche, especially in Europe, preservation and long-term storage procedures are in high demand. It is great that now FL Technics Engine Services are able to provide even more high quality services as such," said Julius Bogusevicius, head of Engine, Airframe and Materials Services at FL Technics. "The first of the engines we are starting to service at the moment is being re-preserved for a lessor. This will maintain engines value until a decision for further actions – repair or teardowns – is made. The second engine is considered as spare engine and the airline, our client, definitely would like to keep it ready for immediate operation in case potential AOG (Aircraft on ground) situation."

The quick turn engine shop allows customers to optimize their engines' Time on Wing (ToW), simultaneously optimizing and minimizing costs using the full scope of FL Technics Engine Services and FL Technics one-stop MRO services.

"The cases of our first clients show, that this new quick turn engine shop allows us to provide high quality services in a timely manner,'" states Valerij Deveikis, the CEO of FL



Technics Engine Services. "Being located in Kaunas, with strong integration to FL Technics base maintenance hangars, warehouses and the logistic infrastructure, FL Technics Engine Services will be able to fix engine problems significantly faster."

Additionally, the company says the current situation in the European air cargo market shows that quick turn activities are in high demand. While Covid-19 invoked travel restrictions within the EU have drastically affected the operations of passenger narrow-body aircraft and the number of grounded planes increased from 20% to 75%, the cargo market has generally remained stable, with an almost constant grounding rate of 10-11% with an increased aircraft utilization, mainly driven by major express logistic carries and local Covid-19-related charter programs. During the peak of first Covid-19 waves, most land borders within the EU were closed and air cargo became even more efficient and convenient than before.

FL Technics Engine Services is the first approved Part-145 Engine Maintenance Organization for Turbofan Commercial Engine Repair in Lithuanian History.

H+S Aviation to Grow Relationships with CT7, T700 Engine Operators/Adds Russo

H+S Aviation, a Signature Aviation Global Engine serve as a global strategic account executive for the company's T700 and CT7 engine product lines. Russo's business development efforts include tailored maintenance solutions for T700 and CT7 engine operators and managing strategic partnerships and accounts for H+S Aviation.

Russo brings 30 years of aviation industry experience from multiple customer-facing roles and most recently with focused efforts on the GE T700 and CT7 engine lines.

"With many of the CT7 and T700 engines now utilized in multiple roles in the civil market, operators require customised, safe and affordable maintenance solutions," Mark Stubbs, GES chief commercial officer said. "We're proud to have Len join the team, as his vast knowledge of these engines and experience will help provide our customers with the expertise essential to fine-tuning our services to their needs."

"H+S has been serving T700 customers for over 34 years and I'm excited to help re-introduce customers to H+S Aviation's value story of quality and performance – as one of the most capable, OEM-authorised T700/CT7 commercial repair facilities in the world," Russo said.

Sabena technics Acquires AeroTech Pro

French group Sabena technics, an independent provider of aircraft maintenance and modification (MRO) solutions, announces the acquisition of AeroTech Pro, thereby strengthening its presence on military markets.

Based in Aix-en-Provence and Istres (France), AeroTech Pro offers high added value services, including technical assistance, for military markets in France and abroad. It also has access to a 10,000 m2 hangar, next to the Istres air base, to carry out airframe maintenance operations on its own.

“We were looking to associate AeroTech Pro with a leader of the MRO sector. With Sabena technics we found the best possible solution as we share the same values of quality, responsiveness and loyalty, all for the satisfaction of our customers. We are convinced that together we will be able to provide them, in France and internationally, with complete and competitive solutions guaranteeing the best fleet availability", says Jean Bernard Garcia and Philippe Galland, shareholders and managers of AeroTech Pro.

“Through this acquisition, we are valuing the know-how of an agile and responsive French SME with real knowledge of military operators’ needs. This operation not only marks a new step in our external growth strategy, but also ensures the sustainability of AeroTech Pro's activities ", indicates Philippe Rochet, Chief Executive Officer of Sabena technics. “We look forward to working together and benefiting from synergies to better meet our customers' expectations”.

This announcement also echoes the visit of French Minister of the Armed Forces, Florence Parly, a few weeks ago at Sabena technics’ site in Dinard. A visit during which she notably confirmed the role of the MRO provider alongside Airbus as part of the pre-order of three A330 MRTT, thus confirming the position of Sabena technics as a major global player in the support for this program.

"Thanks to the recognized technical expertise of AeroTech Pro on A400M and A330 MRTT, Sabena technics will develop its service offering and strengthen its position on these two Airbus military aircraft. This makes us the only private industrial company with infrastructures and human resources in France able to ensure their industrial support. Moreover, we can accompany the manufacturer in its development by projecting technical teams on the operation and maintenance sites as close as possible to the operators, both in France and abroad” adds Philippe Rochet.

As a long-standing partner of several states and military organizations, Sabena technics, in France in particular, has been providing global support packages (MCO), modification and modernization as well as logistics services on various aircraft operated by the Navy, the Air Force, the Army and Civilian Security for 50 years.

EME Aero Completes First Pratt & Whitney GTF Shop Visits

EME Aero, the engine services joint venture between Lufthansa Technik AG and MTU Aero Engines AG, recently completed the first regular maintenance visits of Pratt & Whitney PW1100G-JM Geared Turbo Fan (GTF) engines. Since January, when the first engine arrived in line with Pratt & Whitney's low pressure turbine (LPT) retrofit program, a total of 21 engines were successfully delivered back to different customers. Moreover, EME Aero has now become an official member in the Pratt & Whitney GTF MRO network.

After completing the LPT retrofit program, whose 15 engines were used to smoothly start up operations in the facility, EME Aero has now already completed another six regular customer engine shop visits. "Despite all the obstacles and additional challenges due to the Covid 19 situation, we are still right on track with our ramp up," said Derrick Siebert, CEO and managing director of Business at EME Aero. "The entire team is proud of reaching another important milestone by completing the first series of shop visits of GTF engines. This proves that EME Aero has now achieved full operational readiness."

EME Aero is one of the world's most advanced and largest shops for the latest generation of commercial aircraft engines. With only 18 months from construction to Entry into Service, it was questionable if the very challenging ramp up program could be met. Yet, in December 2019 the state-of-the-art engine shop, including a fully operational test cell, was ready to start operations as an MRO facility.

"The roughly 400 employees, who have been trained at the company's own training center and at the locations of the two joint venture partners in Germany, finally are now ready to carry out full repairs on the PW1100G-JM," said Robert Ma lach, COO and managing director of Operations at EME Aero. "We are optimistic about our future. The strong team spirit from the project and ramp-up has shaped us and is carrying us through these challenging times to be ready for upcoming steep ramp up."

The next step for EME Aero is the implementation of a high tech flow line planned for the end of this year and readiness for the induction of PW1500G engines in the middle of 2021.

Textron Parts and Distribution Now Repairs Cessna Citation CJ3 MLG

Textron Aviation Parts and Distribution can perform its' new standard repair process on Cessna Citation CJ3 aircraft main landing gear (MLG). This solution provides customers with a cost-effective solution for repairing their MLG instead of replacing it when the gear experiences damage.

"The development of this repair solution was a collaborative effort across Textron Aviation. The ability to repair instead of replace, while providing a rental asset, allows customers to benefit from reduced downtime and operating cost," said Kriya Shortt, senior vice president, Parts and Programs. "We are committed to providing our customers with a continuous evolution of product and service offerings to better their total ownership experience."

To achieve this milestone repair capability the Textron Aviation team successfully completed static and cyclic testing of the Citation CJ3 MLG with up to five lifetimes (75,000 landings) of the gear's life limit, to substantiate the repair safe-life.

This repair solution will subsequently be applied across all CJ series aircraft starting in 2021. Textron Aviation is also taking this opportunity to address future repairability for its new Cessna SkyCourier and Denali turboprops in development.

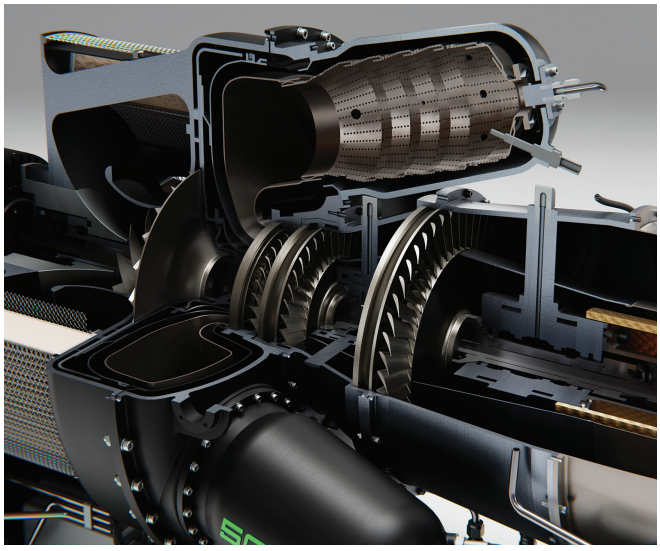
Hill Helicopters Reveals New Engine Design for the HX50

Hill Helicopters unveiled its Hill GT50 light turbine engine, designed specifically for the new Hill HX50 personal helicopter. The company says their GT50 is a compact, light, reliable and innovative solution that "defines the future of the light turbine helicopter."

Designing its own advanced engine allowed Hill Helicopters to move outside the constraints of existing engines designed in the 1950s and meet the unique demands of their HX50 helicopter.

"The GT50 was designed and developed by a team of industry veterans, using methods, tools, and techniques pioneered over decades," says Jason Hill, Hill Helicopters president and CEO. "It is an intelligent ensemble of proven ideas and architecture, embodied into a new engine that fully exploits modern advancements, manufacturing methods, and supply chain opportunities to fulfill a specific market need.

The company says the Hill GT50 employs state-of-art component and gas-path design delivering unmatched efficiencies for an entry-level turbine. The outstanding performance and operating range for the compressor and turbines is coupled with an efficient and robust three-can combustor system, offering a low-risk development route, flameout redundancy and fuel flexibility.



The historically expensive and heavy compressor turbine gearbox of current helicopter engines has been eliminated and replaced by a direct-drive starter-generator to dramatically reduce the cost and mechanical complexity of the engine. Extensive use of redundant electrical engine ancillaries further simplifies the engine package and a modular design makes for easy maintenance of the unit's core components. The engine is also fully electronically controlled and features the Hill FADEC System, providing rapid startup and shutdown, tight RPM management, and optimal engine monitoring and control, the company says.

"The availability of reliable, powerful and affordable engines is what limits light helicopter design today," Hill adds. "When considering the overall mix of requirements necessary to power a truly ground-breaking aircraft, we saw the opportunity to design a simple turbine engine with unmatched efficiency, power, and cost. "

Grid Raster Now Supports Hololens 2 for Enterprise Customers

Grid Raster, a provider of cloud-based XR platforms that powers high-performance and scalable AR/VR/MR experiences on mobile devices for enterprises, says they now support Microsoft Hololens 2 on its XR cloud platform, allowing enterprise customers the ability to leverage the headset for a fully virtual experience in training, design, production and customer service applications.

Powered by cloud technology, the company says Microsoft's Hololens 2 is a revolutionizing tool for business applications especially during the COVID-19 pandemic, where it is even more important for organizations to practice human social distancing while maintaining design and production cycles. Mixed-reality devices display 3D imagery over what a person typically visualizes in their surroundings. The Hololens 2 offers technology that allows the user to remain fully engaged with their surroundings.

The use case opportunities for enterprises are endless in many industries, such as engineers using the HoloLens 2 to overlay blueprints over aerospace designs, surgeons consulting a patient's medical records in real time, and automotive employees working on different continents can seamlessly collaborate to build cars while remaining socially distant without sacrificing productivity.

"Even in a pandemic-free commercial world, enterprises are now moving toward an environment where they leverage 3D technology in order to create and execute more precise designs and on the manufacturing floor," said Rishi Ranjan, CEO of Grid Raster. "The key to powering technology like the Hololens 2 is the cloud, where enterprises can truly leverage this technology and appropriately scale projects while maintaining project efficiencies and across many different devices."

Rolls-Royce to Accelerate Aerospace Tech with ATI Program

A new project led by Rolls-Royce with support from the ATI Program will make future aerospace servicing technologies a reality.

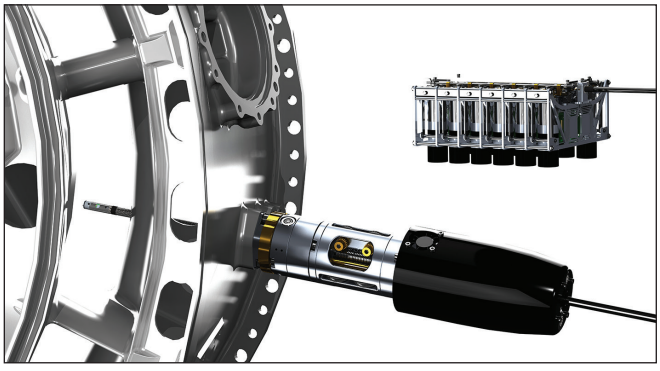
Engineers will work on 20 technologies that will reduce disruption for airlines and lessen our environmental impact by repairing components rather than scrapping them. Other industries such as nuclear and off-shore renewables will also benefit from the project.

Technologies include:

• Snake robots which travel inside jet engines to access complex parts, enabling repairs which are not possible with today's tools;

• Engine sensors which send us data from the sky and allow us to better predict when engines need maintenance;

• Inspection and analysis tools to inspect parts buried deep within engines while they are being repaired;



• Advanced automated repair technologies targeting parts which cannot currently be repaired, meaning they do not need to be scrapped.

Miniature maintenance and inspection tools as well as new repair technologies will be used on our existing engines such as the Trent XWB, while engineers will explore how to repair and maintain aerospace materials and components for future low-carbon engines, including electric technology.

They will work on inspection and repair solutions for composite fan technology, which reduces the weight of a jet engine and will be used in our next-generation engine design, UltraFan.

The new technologies have the potential to avoid substantial amounts of CO2 every year by:

• increasing the time engines are available to fly, avoiding unnecessary maintenance;
• reducing scrappage by repairing more components, rather than replacing them;

• reducing the movement of people and parts by using more digital inspection techniques and key-hole surgery for engines.

Some of the technologies will have multiple uses and will benefit several other industries. For example, miniature chemical analysis tools can be used in nuclear power generation where human access is restricted. High-tech cameras and algorithms will help to identify damage on components in sectors as diverse as security and off-shore wind turbines.

Dr Ian Mitchell, Chief of Technology – Repair and Services, Rolls-Royce, said: "Our latest engines are quieter and cleaner than ever before, substantially reducing CO2 emissions. This programme will take that one step further by improving how we service our engines, creating technologies which will reduce waste, avoid emissions and minimise disruption, while laying the foundations to service the gas turbine and hybrid-electric engines of the future."

Mark Scully, Head of Technology for Advanced Systems & Propulsion, ATI, said: "Through-life services are a critical aspect of ensuring propulsion systems continue to perform efficiently and with minimum impact on the environment. The ATI welcomes this project to the ATI Programme portfolio and are pleased to see a wealth of expertise from the supply chain and academia supporting this important development."

Ian Campbell, Executive Chair of Innovate UK, which is the funding agency for the ATI Programme, said: "This project represents the coalescing of aerospace innovation excellence in the UK supply chain and academia, and is the culmination of research and development to deliver technologies that place the UK at the forefront of in-service engine performance."

Work has begun on the project – known as REINSTATE – in Derby, UK and will continue for more than three years, in conjunction with universities and SMEs including Roke Manor Research, BJR Systems, Clifton Photonics, the Manufacturing Technology Centre, the University of Nottingham, the University of Sheffield, and the University of the West of England.

The REINSTATE project is supported by the ATI Programme, a joint Government and industry investment to maintain and grow the UK's competitive position in civil aerospace design and manufacture. The programme, delivered through a partnership between the Aerospace Technology Institute (ATI), Department for Business, Energy & Industrial Strategy (BEIS) and Innovate UK, addresses technology, capability and supply chain challenges.

Business and Industry Minister Nadhim Zahawi said: "Our aerospace industry is leading the way in developing new technology to make air travel greener, backed by Government investment to spearhead new innovations.

"I am excited to see one of these projects go live today, which will see Rolls-Royce developing technologies to potentially slash thousands of tonnes of CO2 per year - a fantastic example of the how the industry can help us make strides towards our wider net zero ambitions."

Elliott Aviation Promotes Roger Woolums to Engineering Manager

Elliott Aviation has promoted Roger Woolums to engineering manager at their Moline Ill. headquarters (KMLI). He will lead and oversee the company's in-house engineering department, as well as product development for the company's manufacturing division, Elliott Technologies.

Woolums joined Elliott Aviation in 1998 after working in the U. S. Navy as an avionics technician on F/A-18 aircraft. He has worked as an avionics wiring technician, an avionics modifications team lead, and an avionics supervisor before he transitioned to the Engineering department in 2006. He was the lead certification engineer on all of Elliott Aviation's ADS-B STC's, which have been installed in nearly 750 turbine-powered aircraft worldwide. He was also the lead certification engineer on Elliott Aviation's STC for the Mid-Continent MD302 installation in the Citation 560XL as part of the Garmin G5000 retrofit program, and in the King Air 200/300 series as part of the Garmin G1000 NXi retrofit program. He has also added 10 models of aircraft to Elliott Aviation's Part 23 and Part 25 cabin WiFi STC. Woolums has also helped in the STC and production of Prizm aircraft lighting, which is manufactured through the Elliott Technologies division.

IFS Helps Marshall Scale its Defense Business

To ensure visibility and control over mission-critical business processes such as manu-facturing and MRO, defense manufacturer and service provider Marshall Aerospace en-listed IFS for a comprehensive enterprise applications platform.

UK-headquartered Marshall is a leading provider of managed services, integrations, and technologies for the global aerospace and defense (A&D) sector. Having embarked on a group-wide initiative to increase agility, competitiveness, and profitability, the company needed an enterprise applications suite that could scale with its manufacturing line of busi-ness and at the same time eliminate information silos and process inconsistencies across its divisions and sites.

Following a competitive bid process, Marshall selected IFS Applications 10. It offered the needed support for its complex project and composite manufacturing business, together with an MRO solution for heavy maintenance for

its Hercules C-130 and other aerospace and defense customers.

By standardizing processes with IFS, Marshall is able to monitor and analyze all business data from a centralized location while benefitting from a modern platform for support activi-ties. The IFS solution is used throughout the value chain, from first contact with customers to estimating, planning, project management, production, shipping, MRO and in-service support activities. The company also leverages the IFS platform to manage all suppliers and contractors and to address complex trade control requirements of the international defense industry.

StandardAero and Netherlands Air Force Sign F135 Engine Lease Service Agreements

StandardAero together with the Royal Netherlands Air Force (RNLAF) announced today the next milestone in a long-term Maintenance, Repair, Overhaul and Upgrade (MRO&U) partnership in The Netherlands with the signing of F135 engine lease and services agreements.

The lease agreement with the Netherlands Central Government Real Estate Agency (RVB) provides all necessary facilities for F135 module MRO&U, including a dedicated engine test stand. The services agreement with the RNLAF provides all necessary equipment for F135 module MRO including highly skilled technician personnel from the RNLAF as well as other key functions such as engineering to perform MRO operations under the operational management of StandardAero.

This capability, at the Logistics Center Woensdrecht (LCW), is an example of the successful alignment of public and industry interests.

SEAMAX Delivers First Aircraft Under Brazilian Cert Rules

In a ceremony with Brazilian aviation specialists and authorities, SEAMAX Aircraft delivered its first aircraft certified under ANAC's ALE (Aeronave Leve Esportiva) rules in Brazil, an equivalent to the FAA's Light-Sport category in the U. S.

SEAMAX has been already certified in a dozen countries, and last year, after Brazilian Aviation Authority, ANAC, regulated the ALE category following international ASTM standards, the SEAMAX M-22 became the third approved model under this category in Brazil.

The Seamax M-22 was the first amphibious aircraft to obtain the Type Certificate in Europe in 2005, even before the effectiveness of the Special - Light-Sport Aircraft (S-LSA) category, in addition to approval in several countries around the world. It is the earliest amphibious aircraft currently in production to hold an approval in the S-LSA category back in 2008, by the USA Federal Aviation Administration (FAA). After the ruling of the equivalent category in Brazil, the Aeronave Leve ESportiva Especial (ALE-E), which became effective in 2017, Seamax M-22 obtained the final approval of ANAC in April 2019.

For an aircraft to obtain the ALE certification, it must be approved in all the ASTM standards requirements, ranging from the project's design through its manufacture to customer support. The certification transfers the responsibility of the product to specialized professionals, who in turn are liable to the screening of the requirements required in the standards, removing the responsibility of the operator as it is done in the case of experimental aviation where the operator "flies on its own sole risk."

The aircraft certification as ALE-E (Sport Light Aircraft - Special) allows the aircraft operation in densely populated areas, allowing operations in large urban centers such as Campo de Marte airport in São Paulo capital, or Pampulha airport in Belo Horizonte. These operating rules will enable the operator to fly shorter routes without deviating from large centers.

The certification also allows the Seamax M-22 to be used for flight instruction, validating the hours required to obtain a private pilot's license and allowing the operator to obtain "amphibious clearance." It can be used as a glider tug and to provide small services.

The company's CEO, Dr. Gilberto Trivelato, says this achievement "will allow the company to integrate and leverage the Seamax M-22 aircraft as an effective instrument for leisure, services and as well as personal transport in Brazil.

The company adds that after 20 years of continuous engineering improvement, the SEAMAX M-22 is mature enough to allow the company to transfer technology to the United States. "This has been a very bold but conservative, gradual, and very well planned move for our company," says Shalom Confessor, SEAMAX executive director for the U. S. "SEAMAX is continuously listening to the voice of the customer and the most prominent aviation experts and connected with the most reputable aviation institutions in the globe before we decided to bring the assembly operations to the United States," adds Confessor. SEAMAX assembly in the USA is located in Daytona Beach, Fla.

People of Determination Group Designs and Develops Wheel Chocks for Etihad

Elliott Aviation has promoted Roger Woolums to engineering manager at their Moline Ill. headquarters (KMLI). He will lead and oversee the company's in-house engineering department, as well as product development for the company's manufacturing division, Elliott Technologies.

Woolums joined Elliott Aviation in 1998 after working in the U. S. Navy as an avionics technician on F/A-18 aircraft. He has worked as an avionics wiring technician, an avionics modifications team lead, and an avionics supervisor before he transitioned to the Engineering department in 2006. He was the lead certification engineer on all of Elliott Aviation's ADS-B STC's, which have been installed in nearly 750 turbine-powered aircraft worldwide. He was also the lead certification engineer on Elliott Aviation's STC for the Mid-Continent MD302 installation in the Citation 560XL as part of the Garmin G5000 retrofit program, and in the King Air 200/300 series as part of the Garmin G1000 NXi retrofit program. He has also added 10 models of aircraft to Elliott Aviation's Part 23 and Part 25 cabin WiFi STC. Woolums has also helped in the STC and production of Prizm aircraft lighting, which is manufactured through the Elliott Technologies division.

"Roger has successfully led our company to create several major STC's," said Mark Wilken, vice president of Avionics Programs and Operational Logistics for Elliott Aviation. "He has many leadership qualities that will position the Elliott Aviation and Elliott Technologies for growth."

Determination, a group that works to promote inclusion of individuals with special needs and orphans.

The wheel chocks bear the Bee Logo, a distinctive trademark which designates the wheel chocks as products by people of determination.

Wheel chocks keep the aircraft and ground staff safe while they work on the ramp. Each aircraft needs approximately six wheel chocks placed close to the aircraft wheels to secure its parking position and prevent movement that could lead to accidents.

Initially, Etihad received two wheel chocks to evaluate and assess if they adhered to safety regulations and were the correct measurements. The evaluation process concluded with great success by the airline's technical team.

By the end of this year, Zayed Higher Organization for People of Determination will provide Etihad Airways with 50 wheel chocks to be used in day-to-day operations.

Etihad says they are "proud to partner with Zayed Higher Organization in supporting people of determination and encouraging them to develop their skills."

Etihad Engineering Launches In-House Production for Face Masks

Etihad Engineering, the Maintenance, Repair and Overhaul (MRO) arm of Etihad Aviation Group, has accepted an order for 1.3 million facemasks to be manufactured at its newly established in-house face mask production facility.

During the next three months, the medical face masks will be distributed to staff across the entire Etihad Aviation Group from cabin and ground crew, to catering, cargo, engineering employees, and medical professionals.

The new facility operates fully automated machines that produce up to 20,000 masks daily. The masks are three layered and provide up to 98% filtration which ensures the highest levels of protection and safety.

Before initiating mass production,

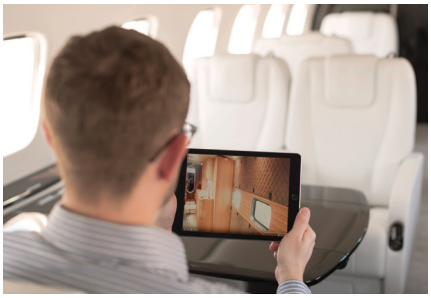
prototypes of the mask underwent a series of stringent tests where microbial cleanliness and bacterial filtration efficiency levels were thoroughly examined. After the successful completion of the testing phase, the face masks were medically certified by two certifying bodies, Laboratorio Analisi Tecnal (Italy) and CNTAC (China).

"Since the start of the pandemic, we witnessed consistent demand for face masks at the workplace. With the safety, health and wellbeing of our customers and employees our paramount concern and top priority, we saw an opportunity to be self-sufficient," Haytham Nasir, VP Airframe Services, Etihad Engineering says.

Duncan Aviation Collaborates With Gulfstream for Gogo AVANCE L5 STC

Duncan Aviation's collaboration with Gulfstream Aeropsace resulted in the development of a full-equipment Supplemental Type Certificate (STC) for the Gogo Business Aviation AVANCE L5 Wi-Fi system for the Gulfstream G200 and Galaxy airplanes. The STC is the ninth that Duncan's Engineering and Certification Services Department has developed for the AVANCE L5 system, and it covers the Wi-Fi certification and the full equipment and antenna installation for G200 aircraft. The AVANCE L5, developed by Gogo Business Aviation, is a complete Wi-Fi system that operates on the Gogo Biz 4G network.

The Engineering and Certification Services team developed the STC for the Gulfstream G200 in partnership with Gulfstream Aerospace in Savannah, Georgia. The STC for the G200 will be available through March 7, 2022, only for customers who install the system at any of Duncan Aviation's full-service facilities (Battle Creek, Michigan, Lincoln, Nebraska



and Provo, Utah) or any of its 27 Satellite Avionics Shops or Workaway stations or at Gulfstream Aerospace.

Duncan Aviation is extending the free-of-charge period for Gogo Text & Talk and Gogo Vision subscription services to one full year. Gogo Text & Talk lets an aircraft's crew and passengers use their personal smartphones and devices to call and text in the air just as they do on the ground. Gogo Vision lets passengers enjoy blockbuster movies, hit TV shows, popular magazines, flight maps and more on their own devices during flight.

Currently, the Gogo AVANCE L5 system connects to the Gogo Biz 4G network and delivers faster speeds and enhanced network capabilities. Passengers can stream live video and audio, watch video conferences, use their personal smartphones, access data for cockpit apps in real-time, and perform remote diagnostics in-flight.

HAECO Employees Establish N.C. Chapter of AWAM

HAECO Americas says several female team members from HAECO Americas in Greensboro, North Carolina (N.C.) have established the first N.C. chapter of the non-profit organization, the Association for Women in Aviation Maintenance (AWAM).

Taking its cue from the state's historical distinction of being "First in Flight," the chapter (www.awam31.org) based in the Piedmont Triad was formed to champion women's professional growth and enrichment in aviation maintenance. It provides opportunities to share information, network, educate, foster a sense of community, and increase public awareness of women in the industry. AWAM also sponsors a scholarship program that provides training and financial support to women pursuing a career in aviation maintenance.

Members of AWAM include maintenance technicians, engineers, teachers, scientists, vendors, pilots and other individuals and groups who support aviation maintenance. Membership is open to both women and men as individuals, students, educational institutions and corporations. For more information about AWAM membership, visit https://www.awam.org.

"HAECO Americas has been looking to find ways to reach out to girls and women in order to introduce them to the aviation industry," says Tammy Biddix, president of AWAM Chapter 31, and HR Systems Analyst at HAECO. "We felt that starting a chapter would give us resources and provide more benefits. We have a vested interest in encouraging people to consider a career in aviation maintenance."

Global AVX Launches Dedicated Aviation Online Auction Platform

Global AVX, a digital auction platform for transparent aircraft transactions, has begun preparations for its first online aircraft auction on 10 December 2020. Dedicated to supporting international aircraft sales and two years in the making, it is the brainchild of corporate lawyer Robert Bourke.

The concept was conceived to enable bankruptcy professionals to adequately address their disposal obligations and duties by ensuring the distressed aviation assets were receiving a fair market price. The platform addresses this critical need by acting as a market driver stimulating aircraft sales internationally.

The technology aims to complement and enhance traditional broker activity and is already attracting professionals seeking new and innovative ways to promote, market and sell aircraft assets to a market which has seen a spike in business and corporate aircraft ownership interest as a result of the pandemic.

Calgary, Alberta and Scottsdale, Ariz.-based Hopkinson Aircraft Sales is the debut broker looking to maximize the opportunity presented by Global AVX, listing a 1997 Cessna Citation Ultra aircraft for auction.

establishing an independent market-based price through a global auction process. Combined with Global AVX's industry-first full transparency report, bankruptcy professionals can now deliver complete accountability to all of their transaction stakeholders

Global AVX says the online mechanism supports aircraft transactions between motivated aircraft brokers, as well as direct sellers, and international purchasers in a transparent, accountable and trustworthy online environment. With travel restrictions limiting physical sales negotiations Global AVX notes an increased interest in high-value deals being conducted online and is now

To eliminate time wasters, Global AVX says they vet all potential bidders, while looking to also deal with qualified acquisition consultants on behalf of proposed purchasers. This pre-qualification is further enhanced by anti-money laundering interrogation, and a validation of adequate funding. Each potential purchaser is also required to place a certain percentage of the minimum reserve price in an escrow account prior to becoming a qualified bidder.

Bidders and/or their acquisition consultants, are then given access to the Global AVX secure data rooms where they are encouraged to examine the aircraft specifications and relevant documentation including airframe logbooks, flight manuals, interior manuals, maintenance tags, and technical information about the engines which are supplied by the broker. Buyers remain anonymous, the auction is automated to ensure fair bidding, and lasts for a period of two days to ensure all genuine global bidders have the opportunity to participate. The sale must complete within two months of the auction taking place.

"We want brokers, owners or operators to see this as a viable medium which extends their global capabilities for aircraft transaction activity. We are focused on helping them achieve the deal no matter where the aircraft is parked. Our aim is to seamlessly integrate into the business aviation community with our innovative new technology platform," explains global sales director, Stephen Kelly. "Our process also eliminates the tire-kickers and ensures the aircraft for sale are qualified by professional data reports. In essence we are a Software as a Service platform enabling aviation transactions between willing buyers and sellers at prices determined by peer to peer interaction."

CORROSION PREVENTION

AIRCRAFT PARKED DURING COVID-19 NEED MAINTENANCE AS MUCH AS THOSE STILL IN SERVICE

James Careless

To say that COVID-19 has been bad for the global airline business would be a serious understatement. According to an October 2020 ICAO presentation, the pandemic's full year (January-December 2020) impact will slash gross passenger operating revenues by up to $96 billion worldwide, and reduce the overall number of seats offered by airlines up to 47 percent.

"The pandemic has put a huge financial strain on owners and operators, and they are doing what they can to reduce spending," says Emily Romblad, customer marketing manager with Celeste Industries Corporation. This includes parking aircraft wherever they can. "Literally every carrier in the world has taken the majority of their fleet out of service for an undetermined period of time," says Chuck Pottier, president of Zip-Chem Products.

Above, Zip-Chem has multiple products to prevent or slow corrosion. Below, Mankiewicz's experts say that in the right environment, parking aircraft short term isn't detrimental to their exterior paint. Zip-Chem and Mankiewicz images.

Corrosion Doesn't Spare Parked Aircraft

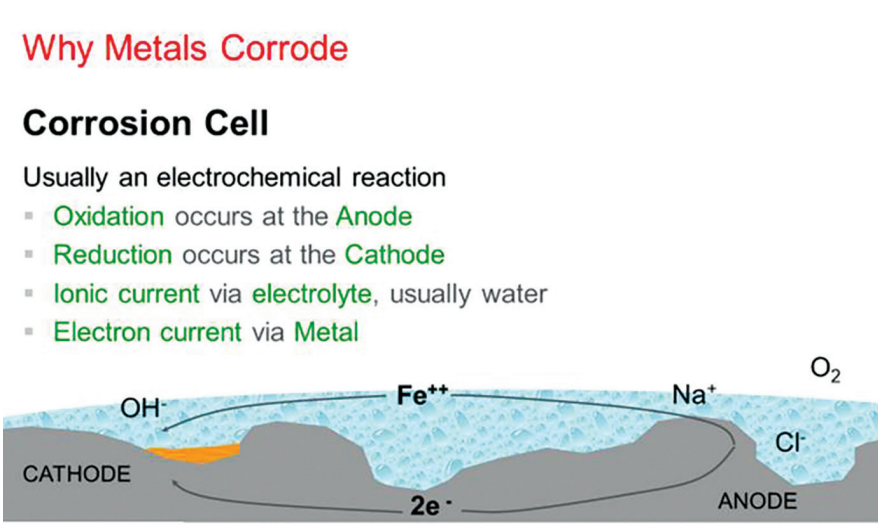
Parking aircraft to save money is a risky proposition. This because that airframes and their engines are highly complex pieces of technology that need to be regularly maintained, whether they are in daily service or indefinitely parked. In other words, aircraft are not cars. An airliner cannot be left unattended for weeks on the ground and then reentered into service as if no time has elapsed.

This is an inconvenient truth that some airlines are doing their best to ignore. They are so understandably

desperate to staunch the financial bleeding that they are grounding aircraft first and leaving any subsequent maintenance issues for a later date, hopefully when COVID-19 has eased and air traffic is on the rise.

Unfortunately, this 'park them where you can' approach increases the likelihood of corrosion in airframes and engines alike. This is because "aircraft were being parked wherever they could find room in what might be less than ideal environments which could be hot and humid," says Jon Jacobson, Av-DEC's commercial technical sales team manager. 'Hot and humid' translates into environmental conditions that speed up corrosion on metal and other aircraft materials.

Fortunately, "since the beginning



The natural environmental process of heating and cooling causes condensation which can result in corrosion. Daubert Cromwell image.

of the pandemic many operators have repositioned planes to more favorable dry environments," says a Boeing spokesperson. "This has also improved resource and material availability for cleaning procedures and application of protective coatings."

This says, aircraft still deteriorate over time in dry storage conditions. They just do so at a slower rate, especially if the cash-strapped airlines that parked them fail to do required maintenance. For instance, "some operators are opting to go longer between cleaning tasks or eliminating the task altogether," says Romblad. "However, soils that build up on the exterior can actually accelerate

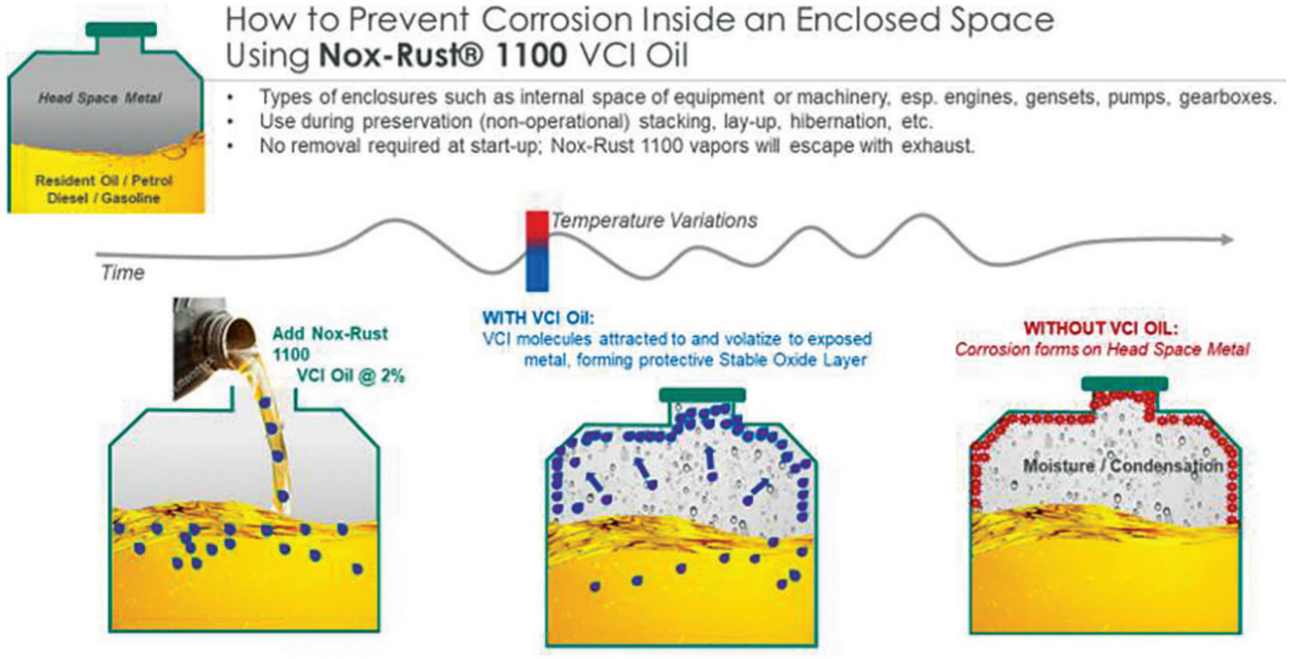
Mankiewicz has been offering corrosion protection for 17 years in cooperation with the Airbus Group. Mankiewicz image.

corrosion, so it's important to routinely clean to prevent the buildup of corrosion causing contaminants."

In fact, the long-term parking of aircraft has no negative influence on their exterior paint, says aviation coatings firm Mankiewicz. "UV radiation, humidity and temperature differences are much lower on the ground and therefore cannot harm the protective outer layer," according to information that the company provided to Aviation Maintenance magazine. "Resulting dirt can simply be washed off and in the worst case the outermost layer, the clear coat, can even be polished."

Engines At Risk During Parking

Aircraft engines are particularly vulnerable to corrosion when parked for extended periods of time, as is the case for many aircraft during COVID-19. "This new form of 'medium-term' parking presents risks," says Ed Barnes, ExxonMobil's global chief engineer for Aviation Lubricants. The reason: "Aviation turbine lubricants in commercial aircraft are overwhelmingly ester-based synthetic lubricants," Barnes says. "These products have a natural



Daubert Cromwell recommends using their Nox-Rust 1100 VCI Oil in enclosed spaces to ensure they are protected from corrosion. Daubert Cromwell image.

affinity for water and absorb water vapor from the atmosphere at every opportunity. Once contaminated with water, turbine lubricants begin to form corrosive acids, which can become quite harmful to engine components over time."

Exposure to elevated water contamination over time can also loosen deposits inside the engine's lubrication system, he noted. This can present issues during test flights, or when the aircraft is returned to service.

Meanwhile, the practice of packing large numbers of parked aircraft into whatever space is available presents "an unusual challenge in itself," Barnes says. "This crowding means engines cannot be operated or exercised and, consequently, water contamination may accumulate in their lubrication systems. Another challenge is personnel changes and ensuring there are enough people available to manage all this maintenance work."

Other Vulnerable Areas

Most aircraft systems are vulnerable to corrosion during periods of extended inactivity. Some of the most vulnerable surfaces – beyond those inside aircraft engines – are fuel tanks, fuel and hydraulic lines.

For instance, the cavity of air above the fluid line is called the 'headspace'. During normal operations the air within the headspace, which may contain moisture is frequently exchanged and exhausted. During idle periods air inside the headspace is not exchanged, and the moist air remains trapped in the headspace.

"Throughout the day the airspace heats and cools," says Scott Kotvis, Daubert Cromwell's vice president of Global Business Development. "Each time it cools, moist warm air condenses, creating water droplets that act as a corrosion electrolyte." Airlines that use products like Daubert Cromwell's Nox-Rust 1100 VCI Oil in such enclosures are protected from corrosion. But those that don't may experience headspace corrosion in their aircraft, just by leaving them parked and doing nothing.

The Consequences Are Real

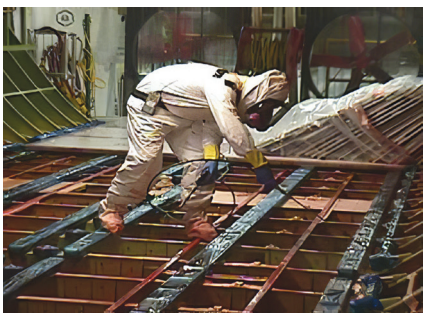
The unexpected consequences of storing aircraft quickly during COVID-19 were highlighted in July 2020, when the FAA released Emergency Airworthiness Directive (EAD) 2020-16-51 for all parked Boeing 737 Classic (CL) and Boeing 737 NextGeneration (NG) aircraft. It applied to the engine bleed air fifth stage check valve on the CFM56 engines that power the 737CL (CFM56-3 series) and the 737NG (CFM56-7 series) on aircraft that were stored for seven or more consecutive days.

"This emergency AD was prompted by four recent reports of single-engine shutdowns due to engine bleed air 5th stage check valves being stuck open," says FAA EAD 2020-16-51. "Corrosion of the engine bleed air 5th stage check valve internal parts during airplane storage may cause the valve to stick in the open position. If this valve opens normally at takeoff power, it may become stuck in the open position during flight and fail to close when power is reduced at top of descent, resulting in an unrecoverable compressor stall and the inability to restart the engine. Corrosion of these valves on both engines could result in a dual-engine power loss without the ability to restart."

ACF-50 (Anti-Corrosion Formula) lubricant 'creeps' into tight seams, lap joints and around rivet heads to displace moisture and corrosive fluids such as orange juice, Coke and salt water. Learchem image.

In other words, the corrosion on these valves could lead to B737CLs and B737NG's experiencing dual engine failures in flight – just because they had been parked for seven consecutive days or more!

The life-saving remedy to this problem was simple aircraft maintenance, specifically "inspections of the engine bleed air 5th stage check valve on each engine and replacement of the engine bleed air 5th stage check valve if any inspection is not passed," says FAA EAD 2020-16-51. The fact that maintenance solved the problem underlines how important preventative maintenance is during COVID-19, both before an aircraft is parked and then while it is sitting on the ground.



Many operators have repositioned planes to more favorable dry environments. Even so, aircraft can still deteriorate over time in dry storage conditions. Zip-Chem image.

Protecting Parked Aircraft Through Preventative Maintenance

If there is a moral to the tale above, it is that aircraft require preventative maintenance prior to being parked, and then while on the ground until they are returned to service.

"Corrosion never sleeps, so if the aircraft is in storage of being flown it still needs to be on a corrosion protection program," says Mark Pearson. He owns Learchem, which makes the ACF-50 (Anti-Corrosion Formula) lubricant that 'creeps' into the tightest seams, lap joints, and around rivet heads to displace moisture and corrosive fluids such as orange juice, Coke, and salt water. "Corrosion is like the insidious COVID 19 virus, except it causes havoc to the airframe, avionics and engines rather than to people," he says.

Pearson's point is echoed by Zip-Chem's Pottier. "Airlines need to assess the condition of every airframe and powerplant that they plan to park for corrosion issues that need to be addressed," he says. The place to start this assessment is by referring to the specific Aircraft Maintenance Manual (AMM) guidelines developed by the OEM and the operator's engineering staff "to protect and preserve their aircraft for storage and subsequent return-to-service," he says. In doing so, "they must be vigilant in the process."

This approach is endorsed by Boeing. "The AMM Storage procedures (preservation tasks) provide detailed instructions on how to adequately protect the areas of airframe and engines that may be prone to corrosion," says Boeing spokesperson. "These tasks include cleaning procedures, application of protective coatings and periodic repeat inspections. Boeing guidelines also advise operators to cycle engines on a set schedule which helps maintain the health of the engines and supporting components."

Zip-Chem recommends assessing the condition of every airframe and powerplant for corrosion issues prior to parking it. Zip-Chem image.

Taking Care of Airframes Before and During Storage

When it comes to taking care of airframes before and during storage,

ROCOL says any corrosion that is detected during routine inspections of parked aircraft needs to be corrected immediately to stop it from progressing further. Protective compounds should be reapplied as required, like the ones ROCOL makes, shown above. ROCOL images.

Simon Parnell knows what he is talking about. Parnell is aerospace sales manager for ROCOL, which makes aerospace lubricants and corrosion protection products that have been approved by commercial and defense OEMs/operators such as Airbus, Boeing, Rolls Royce and NATO. His company has also given serious consideration to the practice of parking aircraft during the pandemic, and has formulated some sound advice.

Before parking the aircraft, "the exterior should be thoroughly washed, with particular attention paid to wheel wells and landing gear to ensure the complete removal of any contaminants such as runway ice or snow removal compounds, sand and dirt to help prevent any corrosion issues," says Parnell. "Once the aircraft has been fully cleaned and any corrosion removed or treated, carry out usual lubrication procedures using a general airframe grease or landing gear grease then apply corrosion protection compounds, particularly to unpainted metal parts."

Once the aircraft has been parked, regular maintenance is a must. "If possible, inspect each aircraft on a seven-day cycle," Parnell says. "A visual inspection every seven days that includes bodywork and protective coverings will highlight any corrosion damage that needs to be addressed through further cleaning, corrosion removal and the reapplication of corrosion protection compounds."

That's not all. A more detailed inspection of the airframe should be done every 14 days, with the inspector paying close attention to wheel wells and landing gear. Any corrosion that is detected needs to be corrected immediately to stop it from progressing further, while protection compounds should be reapplied as required. "Taking these proactive steps now together with a robust inspection routine will go a long way to keeping valuable assets flight fit for when they can be returned to normal service," says Parnell.

Protecting the Engines

Maintaining aircraft engines is a top priority for ExxonMobil, and something that Ed Barnes has thought seriously about.

"To prevent water contamination and, in turn, the risk of corrosion, there are a few maintenance considerations," he says. "First, engines on parked aircraft need to be periodically operated – long enough to heat the lubricant and drive-off any accumulated water contamination."

The actual schedule for these periodic operations can be determined by consulting with engine OEMs, and will vary depending on where the on-wing engines are being stored. "For instance, if an aircraft is parked in a desert location it will take longer for water to accumulate in the engine lubricant because of lower ambient humidity," says Barnes. "In this case, operating the engine for one hour every two weeks may be enough. However, thousands of aircraft are parked today in non-desert airports all over the world and their engines may require more frequent operation for various reasons."

Fortunately, there are steps that aircraft maintainers can take to check engine health on their own. Specifically, "we recommend periodically testing the turbine oil for water (ppm) and monitoring the total acid number (TAN), and then comparing these to the levels set by the engine OEM," Barnes says. " If the water cannot be eliminated by engine operation, and water

ppm or TAN are above engine OEM recommended limits, the operator has a few choices: Find a way to operate the engine more frequently, periodically change the lubricant to remove the water, or move to long-term preservation of the lubricant system by adding an approved preservative chemical to the lubrication system."

Engine lip skins also need to be inspected and protected on a regular basis. "What some airlines are starting to discover is that water and moisture are getting trapped underneath the cloth cover or plastic wrap that are covering their engines in storage," says Av-DEC's Jacobson. "This moisture can start to lead to corrosion on engine lip skins, which can result in expensive and time consuming repairs." According to Jacobson, there are a few commercially options available for sealing engine lip skins, such as Av-DEC's SF2470 sealant that provides effective moisture barrier while being easy to remove prior to return-to-service.

Lessons Learned

The impact of parking aircraft quickly during COVID-19 has provided aircraft owners and operators with valuable lessons about the importance of preventative maintenance. A case in point: "The pandemic's effects on commercial aviation have underscored the vulnerability of turbine oil to water contamination, and the resulting degradation of the lubricant," says ExxonMobil's Barnes. "We recommend airlines continue their focus on maintaining the integrity of their turbine oil."

Other lessons may take a while to make themselves apparent. For instance, "many of the airlines are currently spraying disinfection spray into their cabins between flights, and the potential corrosive effects if any might be seen in few years," says Av-DEC's Jacobson. "Also, many of the aircraft that are currently parked due to Covid-19 and the 737MAX grounding will need to be re-inspected before they get put back into service. As these inspections occur new corrosion issues might be discovered on the aircraft."

The bottom line? "As extended parking or storage has become the norm for airlines during COVID-19, we anticipate that those operators that have implemented a robust maintenance and corrosion protection regime will realize the benefits of lower costs and shorter lead-times to return fleets to flight," says ROCOL's Parnell. "Overall, we would like to think that operators will realize the value in using high quality corrosion protection products combined with a robust maintenance regime at all times." AVM

TECTONIC SHIFT IN FLEET PLANNING & MAINTENANCE

Kathryn B. Creedy

As airlines shrink, there is a silver lining – a vast disposal of older-generation jets, a fleet planning shift and the acceleration of the digital transformation.

"The industry is moving towards more efficient fleets that have larger average seating capacity and lower maintenance costs especially over the short-to-medium hauls," says Paramaguru 'Guru' Prakash speaking for himself, not as Information Technology manager for Boeing Distribution Services. "This will slow MRO spend since the expensive, late-life maintenance declines and intervals between scheduled maintenance lengthen with newer jets."

Stacey Morrisey, Vice President Engineering & Quality Technical Operations, American Airlines

Still, a parked fleet requires maintenance, and, according to American Airlines Vice President Engineering & Quality Technical Operations Stacey Morrisey American Airlines' 400 parked aircraft required 100,000 man-hours.

Return to Service (RTS) requires a lot of maintenance, Aviation

Consultant Bob Mann says. This work now includes MAX 8 RTS given FAA's re-certification in mid-November.

"RTS is an intensive task," Mann explains. "It requires a separate set of AMM-specified ground and flight tasks designed to validate system integrity and performance, then an engineering/maintenance flight test back into service. The huge scale of the entire industry's RTS will probably throw on-condition event codes of types and at scales that have never previously been seen and will test how maintenance and OEM organizations parse and efficiently utilize this data, while maintaining and supporting operational integrity."

Mann noted different airlines have different solutions.

"Southwest, is cycling through its entire fleet to keep them active," Mann says. "And, for all but long-term 'pickling' of fleets, this generally requires periodic engine starts, hydraulic system pressurization, control movement, rolling the aircraft forward several wheel rotations, all to keep seals from deteriorating and wheels and bearings 'taking a set' from lack of exercise. Southwest appears to be idling very few aircraft long-term, but to cycle the fleet through a two-to-three-day week, meaning most are idle less than the number of days required to force storage tasks. This approach will pay off when ramping up."

Delta TechOps, a division of Delta Air Lines, is a full-service aviation MRO provider. The knowledge gained working on other's aircraft and engines brings multiple benefits to the airline, experts say. Delta TechOps image.

Changing Strategies

Hitting that reset button not only reduces fleet complexity but changes acquisition strategies from growth to replacement.

"Airlines are optimizing specific fleet types for certain routes," Teal Group vice president Analysis Richard Aboulafia says. "They are also leveraging their perceived negotiating power in buying planes back and forth between OEMs. For those carriers offering MRO services, like Delta TechOps, it is to gain competence in work provided to other customers. They also may have disparate fleets especially if deals were harder to get out of after mergers.

Single-fleet airlines, like Southwest, reap the benefits of lowest cost and greatest commonality. But, operating a single aircraft can restrict access to markets. It may not be the future for the airline. Southwest image.

"It will be interesting to see if the A321neo will allow others to follow a single fleet type given its international range with a family of aircraft," he continues. "The pandemic is unlikely to change anything because the 737 MAX grounding was more disruptive, having led to doubts of other non-MAX 8 variants. It also created the risk Boeing will offer a new single-aisle type, even a complementary one, in the not-to-distant future, accelerating Southwest's decision on a second fleet type."

Yes, fleet simplification streamlines the operation but, "the simplicity of a single fleet type, such as the famous efficiency of Southwest's Boeing 737 fleet, restricts it from serving markets. It doesn't allow single-fleet airlines to check every box but the boxes they do check are at lowest cost and greatest commonality, which pays forward to airlines, employees, customers, investors."

Changing fleet decisions may bring Southwest's single fleet to an end, according to Aboulafia. In 2019, MAX groundings prompted new Southwest fleet evaluations of the Airbus A220 and the Boeing MAX 7.

"This is a day of reckoning for Southwest," says Aboulafia. "The MAX is the last 737 family. At some

Southwest appears to be idling very few aircraft long-term, instead cycling the fleet through a two-to-three-day week. This approach will pay off when ramping up, some experts say. Soutwest image.

point, when they need new planes for capacity expansion or for fleet modernization, they will need to move on from the 737 to whatever the next generation brings because the MAX 7 might not be their best option for smaller routes. Its larger engines may mean it is not as appealing as previous shrink models. If they conclude that this is the case, and that they still want something in the 100/130-seat class, the A220 would be logical."

Even so, Southwest has always taken advantage of deals it can make with Boeing on white tails, coloring its fleet decisions in the past.

Immediate Benefits

"This streamlining of the fleet provides a number of benefits to the airline, particularly by removing complexity from the operation," Morrisey told Aviation Maintenance. "From Technical Operations to Flight and Flight Service, Airports and every team in between, reducing the number of fleets has the benefit of making what we do simpler and more effective."

Morrisey sees multiple fleet types as a competitive advantage allowing service to different size cities difficult to serve with only a single type.

"This greatly improves the scale of the network and, since we aim to attract more schedule-sensitive passengers, our fleet mix allows us to build more schedule options," she says. "While it introduces an additional element of complexity, the tradeoff is being able to better serve our customers."

American's VP Morrisey says multiple fleet types are a competitive advantage allowing service to different size cities and more schedule options. American image.

American is now down to two mainline flight deck types. "This benefits our operational performance through training efficiency and streamlined maintenance," she says. "Overall, we try to make things as similar as possible within a specific fleet type including Boeing 737s and Airbus A321s, which gives us the same consistent cabin layout on each fleet, making the aircraft more interchangeable throughout the network and operating day."

Universal Synaptics CEO Kenneth Anderson III agrees.

"A one size fits all business strategy does not exist," he says. "Aircraft such as the B737-900 or A220 provide better customer experience. Replacing outdated fleets positively impacts reliability and fuel economy. It is in the best interests of airlines to minimize fleet types to reduce the complexity of managing varying maintenance requirements specifically during a time where a reduction in force has led to those with the most experience taking on different roles or retiring. Fleet trends prior to Covid-19 maximized load factors while reducing fuel and maintenance cost, without compromising customer

requirements. Post Covid-19, fleet trends have started to take shape but with applicable factors weighted much differently."

Shifting Life Cycle

"Covid prompted a shift in maintenance fleet life-cycle view," Mann says. "The normal view is to manage fleets for greatest returns on lowest investment over their economic lifetime which is normally 20-plus years, consuming green time and staging checks to optimize fleet operational and maintenance line utilization. Suddenly, the view is a quick acid test of fleet viability vs. complexity costs and cash burn during a multi-year demand desert. As a result, some middle-aged fleets are facing early demise, if utilization will be impaired for years to come. This requires a re-set of fleet plan and route assignment as the network recovers. Furthermore, this lessens the viability of acquiring or retaining an aircraft type and configuration unique to route."

In the current pandemic, companies are pulling many levers to shave costs, according to Prakash. "Beyond standardizing the fleet by optimizing aircraft design that can improve efficiencies, maintenance is leveraging technology with robots performing digital crack inspections on engine parts using advanced sensors rather than humans. Similarly, maintenance is using drones for aircraft inspections that helps reduce the time from up to six hours to between one and two hours. Finally, on-demand 3-D printing has replaced lengthy orders for replacement polymer parts such as screen surrounds and tray latches."

All this was part of a process predating Covid. In the summer of 2019, American operated nine fleets. As it heads into 2021, the number of mainline fleet types is now four.

"This past year we integrated all of our parts into a single system and are now completing a multi-year

American says it is completing a multi-year migration of all of their aircraft into one operating system. American image.

Republic now operates a single Embraer fleet which saves money on inventory costs from its pre-bankruptcy multi-certificate, multi-fleet type operation, according to their VP Maintenance Tom Duffy. Republic image.

migration of all of our aircraft into one operating system," says Morrisey, one of the few women operational VPs in the industry. "Innovation doesn't stop because of this pandemic. Less fleet complexity means we can focus our efforts on improving our processes that underpin our maintenance machine. With fewer aircraft types, we don't need to store as many spare parts for younger fleet types."

Training also benefits. "One of the great things that we have seen is the evolution of distance learning for our frontline AMTs," she reported. "It's been a great option in addition to some in-person training, to more easily accommodate our team members specifically in cities currently under Covid-19 travel restrictions, allowing them to stay current on their fleet qualification requirements no matter where they are. The new distance learning helps us quickly deliver training in new stations to accommodate network changes that fly different fleet types to various cities where a particular fleet did not operate previously."

Republic Airways Vice President of Maintenance, Tom Duffy

Regional Dancers

Regional airlines must perform a "pretty sophisticated dance" when it comes to maintenance, according to Tom Duffy, Republic Airways vice president of Maintenance.

"We only get paid when we fly, so we have to work with our partners who want the minimum amount of heavy maintenance when an aircraft is out of service," he explained, noting the airline flies for all three major carriers. "They need to be able to schedule the aircraft efficiently throughout the year, so it is always a shuffle to ensure aircraft availability."

The airline now operates a single Embraer fleet which saves money on inventory costs from its pre-bankruptcy multi-certificate, multi-fleet type operation. It is now down to two heavy maintenance operators and has a lower mechanic training footprint.

Republic owns the vast majority of the 215 aircraft is has under contract today. The regional is responsible for maintenance and reimbursement is baked into its capacity purchase agreement contracts.

Digital Transformation

wPerhaps the biggest benefit to retiring older aircraft is the promise of health monitoring systems on newer aircraft. While normally not good for MROs, it does reveal a path to the future.

"Right now, the hype is bigger than the reality," says Richard Brown, Naveo Consultancy managing director. "The majority of MRO spend is generated by mature, mid-life aircraft between five and 17 years. MROs are mostly dealing with metal fuselages, pneumatics, hydraulics and electronics but increasingly they will be dealing with composites and advanced avionics and electrical systems which offer far greater prognostic and diagnostic capabilities compared to the mid-life-to-mature aircraft. Those aircraft do not have the sophisticated health monitoring systems of the Dreamliner, the A220 or A350. While a lot of people are excited about the wealth of data available from aircraft, this highly digital fleet is relatively small but growing."

Duffy's experience with digital aircraft extends back to 1988 and the Airbus 320. Indeed, when he arrived at Republic, he lobbied for the Embraer EJet because of the digital tools it offered.

"Changes coming from data analysis is not officially endorsed by international regulators on transport category aircraft yet," he told Aviation Maintenance, noting Republic is part of the ICAO task force working on acceptance. "Airlines and OEMs have been pushing but regulators are still concerned. Still Republic has enough experience with it to know it is the right thing to do. We are already using downloaded data and tools to diagnose and identify faults. We can also receive information during the flight via ACARs. So, combined

with our historical knowledge of the aircraft and systems, we can determine how we need to respond."

Brown pointed to the popularity of the engine and OEM health monitoring solutions and Airbus's Skywise system, a digital platform designed to increase dispatch reliability and customer satisfaction. Other OEMs and MROs have developed or are developing their own monitoring capabilities including Lufthansa Technik's Aviatar and Air France KLM E&M's Prognos.

"These systems are meant to achieve the holy grail of aviation maintenance – taking an unscheduled event and turning it into a scheduled event," says Brown. "So, if an airline knows an APU is going to fail, they can replace it before it fails. Now, it is fly to fail and then deal with the unplanned disruption. If you can use predictive analytics to look at how the component or engine or system is performing you can predict failure and save the industry billions of dollars in the cost and compensation associated with disrupting passenger flights. The implications on the supply chain is huge because OEMs and parts suppliers make money on spares."

Two other advances also promise to streamline maintenance.

"OEMs and engine makers are looking at how parts perform in real time and in real life," Brown explained. "They are looking at whether the performance in a harsh environment like the Middle East means different wear compared to a milder one like, say, Iceland. If they can discern the differences these environments have on aircraft and engines, they can customize maintenance programs to the operator for more cost-effective maintenance. We must re-evaluate the way we think of MRO to the way the operation and aircraft is performing which not only benefits airlines but encourages good behavior."

Prakash agrees. "Advances like Cloud computing and Internet of Things (IOT) gathers engine health monitoring data quickly and efficiently," says Prakash. "With the use of smart data analysis, predictive tools and engineering expertise to add additional insight, engine OEMs are helping airlines reduce fuel usage, optimize routes, ensuring the right equipment is in place to service engines more quickly and to maintain the highest levels of availability. Using these advanced tools OEMs can maximize the operational life of engines and help operators become more predictive and less reactive in terms of repairing and replacing their aircraft engines."

Brown noted real-time monitoring is becoming standard offering

Shannon Group: Ready for the Rebound

MRO and aircraft leasing are critical components of the aviation cluster located in Ireland's Shannon region. Aircraft Leasing started in 1975 with the formation of Guinness Peat Aviation by Dr Tony Ryan, who also founded Shannon Aerospace in 1989. Costing eighty million old Irish Pounds, (about €230m in today's money), it was the largest building under one roof at the time.

In total Shannon Airport has ten operating hangars of over 58,000 square meters, there are up to fifteen base maintenance lines and up to five painting lines across two dedicated painting facilities. Maintenance capability covers most types up to 787 and painting up to 747-8 sized aircraft, delivering almost two million direct labour working hours a year.

The co-location of MRO and aircraft leasing works very well; technical support services have naturally grown to support lease transition, and supporting this activity requires agile property solutions. Shannon Group has invested heavily in recent years, enabling the sector with the development of shared working space, workshops and offices. "Shannon Group as a government body, and as owners of Shannon Airport, are optimistic that aviation will rebound with a bow wave of maintenance activity required to get the fleet back into full service. Our focus now is to continue to support the growing cluster of aviation companies located here through our €130 million investment programme. In recent weeks we lodged planning applications for a four-story office block suitable for aircraft leasing and technical services, and a multi workshop space ideal for Part 145 repair station activity." Says John Drysdale, Business Development Manager, Shannon IASC. In 2020 the most recent hangar build entered service with International Aerospace Coatings. The €18m facility was designed with sustainability at the forefront, featuring LED lighting, maximum natural light and a heat recovery system for exhaust air. Since entering operation, and during the Covid pandemic, several 747's, 777 and most recently an A350 have been painted at the facility.

For more information contact John Drysdale, john.drysdale@iasc.aero

Removing complexity from their operation has helped American by making their maintenance operations more efficient and effective. American image.

the potential for more on-wing, on-aircraft maintenance all designed to keep the aircraft flying, reduce disruption and reduce the amount of time the aircraft is out of service.

That is exactly what another tool offers. A development from Netherlands Aerospace Laboratory (NLR) uses artificial intelligence operators can schedule a bundle of small maintenance tasks between flights.

"FlexPlan only uses readily available information, namely the Maintenance Planning Document, aircraft maintenance status, aircraft configuration, flight schedule, and a list of maintenance facilities," wrote NLR Principal Arjan de Jong in an August 2019 post. "FlexPlan is a tool that automatically creates maintenance programs comprising of small packages and a tool that plans these packages optimally between scheduled flights. The result is a comprehensive maintenance program that schedules maintenance around your flight schedule and is sufficiently robust to facilitate last-minute changes if your flight schedule is disrupted. And, since FlexPlan adheres to the task intervals specified by the original equipment manufacturer, you do not face regulatory issues."

The question is how MROs will be integrated into this brave new world. Brown indicated MROs, need to think about how they plan and deliver maintenance.

"This transformation takes a mindset and skills change," he says, "because you also must believe what the data is saying is correct. You must trust that removing a part before failure is the right thing to do but as we build expertise this will become easier. But the industry must do a better job of explaining the savings they have achieved on health monitoring. Skeptics need to be reassured it's all worthwhile. So far, OEMs, MROs and airlines are reluctant to talk about the benefits – to allow airlines to compare the different solutions. The industry also needs to do a better job of promoting the advantages of this technology on the bottom line and in passenger satisfaction."

Duffy wants to take subjectivity out of maintenance. "So much of maintenance is subjective, making it difficult to identify what is really going on," he explains. "The question is whether the deterioration that happens during normal operations is affecting how a component is performing."

He pointed to the four Embraer air data smart probes, saying aircraft mechanics need a less subjective way of determining performance.

"We compared the photos of probes to the data retrieved from the aircraft and can prove that subjective human evaluation can't be directly related to system performance determined with aircraft recorded data. We are pushing Collins Aerospace to move us to a science-based, performance monitoring system to eliminate this subjectivity. That is a fundamental change we want to get to."

He also dreams of an aircraft coming into the gate and the captain reporting a problem. "I see a maintenance tech opening a panel and taking a photo with a smartphone," he says. "Because of Google recognition, we identify the part, it asks whether we want to replace it. If yes, the smartphone works with sourcing the part and, when it's delivered, the instructions for replacing it is delivered on the smart phone. The entire transaction is logged into the maintenance system digitally and are aircraft records are automatically updated. I know all this exists now so it will happen."

That would be a brave new world. AVM

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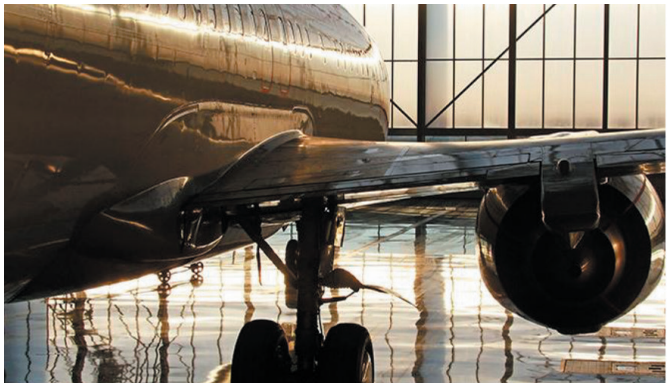

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Q&A

WITH AERO NORWAY CEO GLENFORD MARSTON

Joy Finnegan

Aero Norway CEO Glenford Marston

Aero Norway has built its reputation as an exclusive CFM56 engine provider, priding themselves on high standards, EGT margins, Competitive turnaround times and long-term client partnerships. The company also says they try to "harness the special characteristics of strength, focus and independence that embody the Norwegian way of life." We spoke to CEO Glenford Marston to see how this specialist shop is doing amidst the pandemic and what advice he may have to offer others trying to survive this unusual time.

In one year we have seen a dramatic change in the aviation industry. How has this change impacted Aero Norway?

MARSTON:

We have, of course, seen a significant impact upon Aero Norway as a result of the pandemic and have adapted our working practices to support our customers as well as protecting our team. Although we have been busy and have been fortunate that we have kept our skilled workforce intact, we will certainly not be reaching 2019 revenue levels due to the reduced number of shop visits. We have seen more CFM56-3s coming to the shop for induction and are carrying out repairs on CFM56-5Bs and CFM56-7Bs, but fewer engines are coming in for major overhaul.

Aero Norway's has always been on supporting our customers and as part of this we are undertaking short and hospital workscopes on engines as a bespoke service. More and more engine MROs are gearing up for these short workscopes as demand increases, and even though not our core business model, we are offering these services for existing customers. Another shift we have observed is that customers are sending us engines which we would ordinarily work on in-the-field because of restrictions in flying and quarantines in place. However, we are still carrying out field work for target customers or existing customers requiring additional support.

Aero Norway is seeing more CFM56-3s and are carrying out repairs on CFM56-5Bs and CFM56-7Bs. However, Marston says fewer engines are coming in for major overhaul.
Aero Norway images.

What is your view of the outlook for airlines/ aviation vis-à-vis the pandemic?

MARSTON:
With fewer people flying, and many aircraft grounded we can expect to see significant reductions in fleet sizes as operators are forced to restructure. I also anticipate increased numbers of Classic freighter engines in the shop as the demand for air cargo continues to rise. This restructuring will affect all MROs as there will be more engines available for teardown or part out. It may also help customers and Aero Norway as we will be able to acquire materials which were difficult to source in 2019. There is potential for 2021 to be to be a good year for that at least.

Has your backlog been impacted?

MARSTON:
Many shop visits which were planned for our customers did not materialise. We had initially forecasted that we would induct 102 engines this year however we reassessed our predictions early on and changed our goal to 87 engines this year. The impact of this has been a visible shift in workscope ratios from heavy engine core performance to hospital visits. We had initially predicted 65-70 percent heavy engine full core performance workscopes for this year but this is becoming a 50/50 split between heavy to light engine workscopes in Qs 3 and 4 of 2020.

What is Aero Norway doing to weather the crisis?

MARSTON:
We are in preparation mode for better times. We had committed to necessary investment in modifications and upgrades and have used this quieter period to carry these out. At Aero Norway we are constantly reassessing, re-evaluating and looking for ways to improve our processes in pursuit of reduced turn-around times. In 2019 we invested in a state-of-the-art high-speed grinder, which was followed by an upgrade to our plasma spraying machine and most recently to our static balancing machine. We are also carrying out numerous small projects around the shop to benefit our customers and this time has given us the opportunity to complete these.

In terms of our team, our skilled workers have modified working patterns to accommodate social distancing measures, and we have followed all the guidelines set by the Norwegian Government with regard to restrictions to visitors in to the shop, and business travel. Our mechanics, engineers and technicians are currently only working four days a week, and some have been redistributed within the facility where there is demand and they have the relevant skills. We are proud to have kept our team intact during this challenging time and have all taken a 20 percent reduction in pay to accommodate the change in workload.

Do you envision more focus on the CFM56-5BS and -7B engines for the future or are you adding new models to your offerings?

MARSTON:
As a CFM56 specialist repair station our intention has been to add the LEAP capability to our offering and we have recently finished all necessary assessments. We have accessed the manuals for the 1a and 1b and have evaluated the levels of workscopes required for the introduction into our shop. In light of the current situation, however, we have decided to put this on hold until Q4 2021 and will not make any more investments until that time.

Our focus has always been to get more 5B and CFM56-7Bs into the shop, and in 2019 63 percent of our inductions were CFM56-5Bs and CFM56-7Bs, with 37 percent CFM56-3s. Our forecast for 2020 was 72 percent CFM56-5BS and CFM56-7Bs, and 28 percent CFM56-3s and we had paved the way to encourage those customers into

CEO Marston says the company is using this quieter period to carry out modifications and upgrades in preparation for better times.

the shop, however the actual split in inductions between CFM56-5BS/CFM56-7Bs and CFM56-3s has been 52 percent to 48 percent. Although this is not the worst-case scenario by any means, it is certainly not what we had envisaged and planned for. We would of course like to focus more on the CFM56-5Bs and CFM56-7Bs, however supporting our customers remains a priority and we have already agreed to support their CFM56-3 requirements until 2026.

How are you helping your clients deal with the challenges brought about by the pandemic?

MARSTON:

One of the biggest issues for our customers at present is cash flow and we are working closely with them to understand their immediate needs. Many are requesting customised workscopes designed to reduce costs or lengthened payment terms that will allow them to carry out necessary works. Our survival is linked to their survival. We have many smaller customers and for them particularly the option of being able to have flexible payment plans is important for their business, and they really appreciate that.

We spoke with Rune Veenstra, chief business officer for Aero Norway, a year ago. He mentioned at that time, the supply chain was struggling to keep up with demand for shop visits. Has that changed now? Is the supply chain better? Has anything been done to improve it? Or is the slower pace of operations the only change?

MARSTON:

There are still some supply chain issues. Although there are many aircraft parked, people are not interested in purchasing material as they are waiting to see how the market will unfurl. There are some parts which are currently more readily available, for example new parts, however most of our customers prefer to have used parts which offer them some cost savings. The only real benefit seen by our logistics team has been more leverage when closing a deal.

When our parts are sent for repair, we maintain an open dialogue with the OEMs and third party workshops as many of them are working at a reduced level with some only operating two days a week. This does affect TATs in terms of the time taken for parts to be returned to us, however we are endeavoring to work closely with the repair teams to ensure that our end customers are not affected.

Aero Norway is known for being flexible and customizing for their clients. Give us some examples of how Aero Norway customizes offerings for their clients.

MARSTON:

Early on in the pandemic we invested in five CFM56-3 engines to support our customers which were introduced to our refurbish and sell programme. Although the CFM56-3 is a legacy product for Aero Norway, we have the skilled technicians to extract the best EGT margins and consequently generate greater efficiencies and economies for our freighter customers. Within our facility we have converted major module build space into four additional repair bays to satisfy the volume of lighter workscopes currently coming into the shop as well as investing in the training, fixtures and tooling to support it.

Currently we are seeing customers sending in three engines, for example, with a view to getting two back to revenue service. One engine would therefore be a donor engine to repair the other two reducing our customers' costs, as well as giving us the opportunity to also harvest some good materials for ourselves. We have previously done this with CFM56-3s, and continue to do so, but this has now also been extended to CFM56-5BS and CFM56-7Bs. With so many aircraft grounded this is certainly a growing trend and we are carrying out these workscopes for owners, lessors and operators alike.

With every challenge comes opportunity. Where are you seeing opportunity amidst the pandemic? Have there been any bright spots in the crisis?

MARSTON:

We are continually looking for opportunity, and one of the main opportunities for us would, of course, be sourcing good material/parts. At Aero Norway we have an engine programme where we buy assets, rebuild them and recycle them back to the market. We would like to focus more on CFM56-5BS and CFM56-7Bs and are waiting for the price to be right. However we are still not in a position to be able to gauge the price escalation for this year from CFM, to find out how they will support us and whether they will be looking to clear their backlog of material. We have never lost our focus on the -3 and we still have a significant number of -3 customers who we will continue to support. But we did not expect so many CFM56-3s to be entering the shop for large workscopes such as full core performance and LLP replacement. This

year CFM56-3s will account for around 50 percent of the engines which will pass through the shop.

Are there any other challenges in the engine MRO marketplace right now (in addition to the pandemic)?

MARSTON:

MARSTON: Every MRO is facing challenges right now as replacement parts are the drivers of cost. We can control the cost of the workscope management, but especially now, all customers are looking for added value. Management of material is the main challenge: how it is moved around, and what support we can get from suppliers and the OEM.

Do you predict there will be pent up demand for engine services when the pandemic ends?

MARSTON:

Engines will always need shop visits, and this cannot be avoided. There will certainly be a pent-up demand, however this will very much depend on the resurgence of air travel. Engine service requirements are driven by usage and currently we are seeing more of the classic freighter engines as air cargo booms. However, we are still actively bidding to secure 5B and 7B engine inductions for the future.

The old saying goes "Hindsight is 20/20." Knowing what we know now, what would you have changed or done differently two years ago to prepare for the current situation?

MARSTON:

With the benefit of hindsight, I would of course have made some strategic buys and reduced the inventory of materials for engines that will not be entering the shop. For example, purchases we made to support CFM56-5BS and CFM56-7Bs would not have been made, and we would have had more CFM56-3 engines ready to go. This pandemic may create a marketing place where material purchased for use in 2020, will diminish in value; we could then have waited until 2021 to buy the same material at a reduced cost.

How should aviation MRO businesses be preparing for the future?

MARSTON:

Due to the uncertainty surrounding the timescale for recovery, which could be up to four years we need to be more cash conscious going forward. I think the upturn will take some time and I do not expect to get back to 2019 levels in the near term.

ATR = FAST & FLEXIBLE

Ian Harbison

ATR is working hard to ensure its customers stay flying through COVID-19 and into the future with an interesting series of initiatives

Laurent Caballe, VP Products and Services, says around 60 percent of the ATR 42/72 fleet has remained flying during the pandemic. This is partly a reflection of a customer base that includes many airlines in remote areas and islands, where aircraft are absolutely vital in a crisis like this one, delivering key equipment and personnel where and when needed. It is also a reflection of the feeder role that ATR operations play for some airlines. With long haul services being slashed, there are fewer transfer passengers, so the smaller ATR can replace an Airbus A320/Boeing 737 sized aircraft to maintain important routes into major hubs while reducing operating costs for the airline.

Where airlines have grounded aircraft, the company has been providing engineering advice through Operators Information Messages (OIM), for example, how to avoid corrosion in the propellers during storage. He notes that operators are mainly choosing to park their aircraft. Airworthiness authorities require that they have to fly at the end of three months or they will be put into storage, a more complicated expensive option that also requires more time to get them back into service. The simplest way of avoiding this is by rotating aircraft in and out of the operational fleet.

As many ATR operators also tend to be smaller airlines, the company developed its General Maintenance Agreement (GMA). This has been running for 20 years and has grown to cover over 70 percent of the worldwide fleet (under Power By the Hour terms), with more than 390 aircraft with more than 60 customers. It has also attracted larger airlines as well.

The GMA can be customised to

suit the individual needs of airlines, depending on where they are in the world and their specific operating conditions, but the essence of GMA is repair, overhaul, pooling services of Line Replaceable Units (LRUs) and transportation of LRUs to the airline's facilities. For the first, ATR has a network of repair shops and by consolidating the work from several sources, can negotiate better prices. A faulty part is returned and replacement issued from one of three spares centres - Paris, Singapore and Miami. After repair, it is returned to the pool. The spares centres carry around $350 million in stock and 95% of orders are normally fulfilled in less than two days. Each operator has its own leased pool stock at its main operating base, the components held being based on actual consumption trends to avoid holding seldom used items, but it has access to the main pool as well. ATR says aircraft covered by GMA fly an average of 300 more flight hours per year compared to non-GMA aircraft, which amounts to $1 million of extra revenue over 10 years.

Payment is based on monthly flight hours, with a defined minimum level. Given that many operators are currently running a reduced schedule, Caballe says ATR has adjusted payments, as far as possible, in line with actual hours flown to help with reducing costs. Similarly, the monthly rate for stock access has been reduced as well. However, it has also reached out to non-GMA operators by allowing them temporary access to both the repair network (on a time and materials basis) and highly discounted standard exchange spares, helping their cash flow as well.

A further incentive is 'Spares Day', when components are offered with attractive price reductions. The first was held recently with a mix of parts including high consumption items. This is another way of ATR being able to assist customers in difficult times.

As GMA provides ATR with a detailed overview of trends in spares consumption and repairs, it has a team dedicated to engineering analysis. This can reveal an issue relating to a particular airline as it stands out from the rest of the worldwide fleet. Solutions can include upgrades, troubleshooting advice, training or specific maintenance procedures.

In recent years, leasing companies have become significant purchasers of ATR aircraft and the company is now offering complementary CAMO services as part of GMA. Leasing companies also want quick transitions

With smaller passenger loads due to the pandemic, the ATR can replace an Airbus A320/Boeing 737 sized aircraft to maintain important routes into major hubs while reducing operating costs for the airline. ATR Image.

Sixty percent of the ATR 42/72 fleet has remained flying during the pandemic. This is partly a reflection of a customer base that includes many airlines, like cebu pacific air, shown here, that operates in remote areas and islands where these aircraft are absolutely vital.
ATR image.

between clients and this work often includes modifications. In addition, there is a constant improvement programme as requirements change.

Caballe says airframers cannot be too dogmatic about what happens to the aircraft. As this is not their core business, the response time can be long and it may also be expensive. Instead, ATR is taking a pragmatic approach, appreciating that there is considerable expertise elsewhere in the industry that can be harnessed.

In October, it released two new editions of its Upgrades Catalogues. They offer 120 solutions, such as cabin reconfigurations, inflight entertainment systems, avionics upgrades and passenger to freighter conversions. These can be carried out by ATR Service Bulletin or external Supplemental Type Certificates (STC) and minor modifications. In the last two years, ATR has developed a network of external Design Organisation Approval (DOA) partners: Aero Engineering Services, Akka Technologies, ECM Skyservices, Eirtech Aviation Services, PMV Engineering and Recaero.

A good example of this cooperation came earlier this year when there was an urgent need for light cargo solutions in response to the pandemic. In less than a month, ATR, Akka, PMV and Recaero came up with proposals for quick/temporary cargo conversions that allowed four additional tonnes of payload to be carried for the ATR 42 and 7 tonnes for the ATR 72.

The first solution was simply putting cargo on the seats or inside seat bags, restrained with straps that are either attached to the seats or fixed to the seat tracks. The second, called 'floor-to-floor nets configuration' saw removal of the seats and cargo placed on the floor and secured with nets attached to the seat tracks.

Last year, the ATR's A-check intervals were extended from 500 hours to 750 hours and the company says it expects to have C-check intervals increase from 5,000 to 8,000 hours. ATR Image

Caballe notes that the company has continued to gain GMA contracts during the crisis. One of the most important in recent times, signed in May, was with Finnair. Nordic Regional Airlines (NoRRA) operates a fleet of 12 ATR 72-500s on behalf of Finnair, feeding traffic to the major carrier's Helsinki hub. On an historical note, Finnair may be a late comer to GMA but it took delivery of its first ATR in 1986, MSN 006.

The significance of this deal, he explains, is that it is for 10 years, which is longer than most, and that it goes much further than usual, tying the OEM closer to the airline. For example, ATR is committed to aircraft reliability and availability improvement, while its engineering department and those at Finnair and NoRRA will be collaborating. The latter will include the monitoring and analysis of in service events with the aim of improving troubleshooting capabilities and developing new maintenance procedures. He adds that careful analysis may lead to items being removed before they fail but this is not really predictive maintenance like the Airbus Skywise program, as the aircraft does not generate enough data.

That careful analysis has also been used to benefit the entire ATR community. Last year, A-check intervals were extended from 500 hours to 750 hours and the next step, expected in 1Q 2021, will see C-check intervals increase from 5,000 to 8,000 hours.

Finally, he says that all these efforts will ensure that airlines operating ATR aircraft will be well placed in a post-Covid future, where regional aviation will have a key role to play in terms of connecting people and economies, stimulating economic recovery and growth. AM

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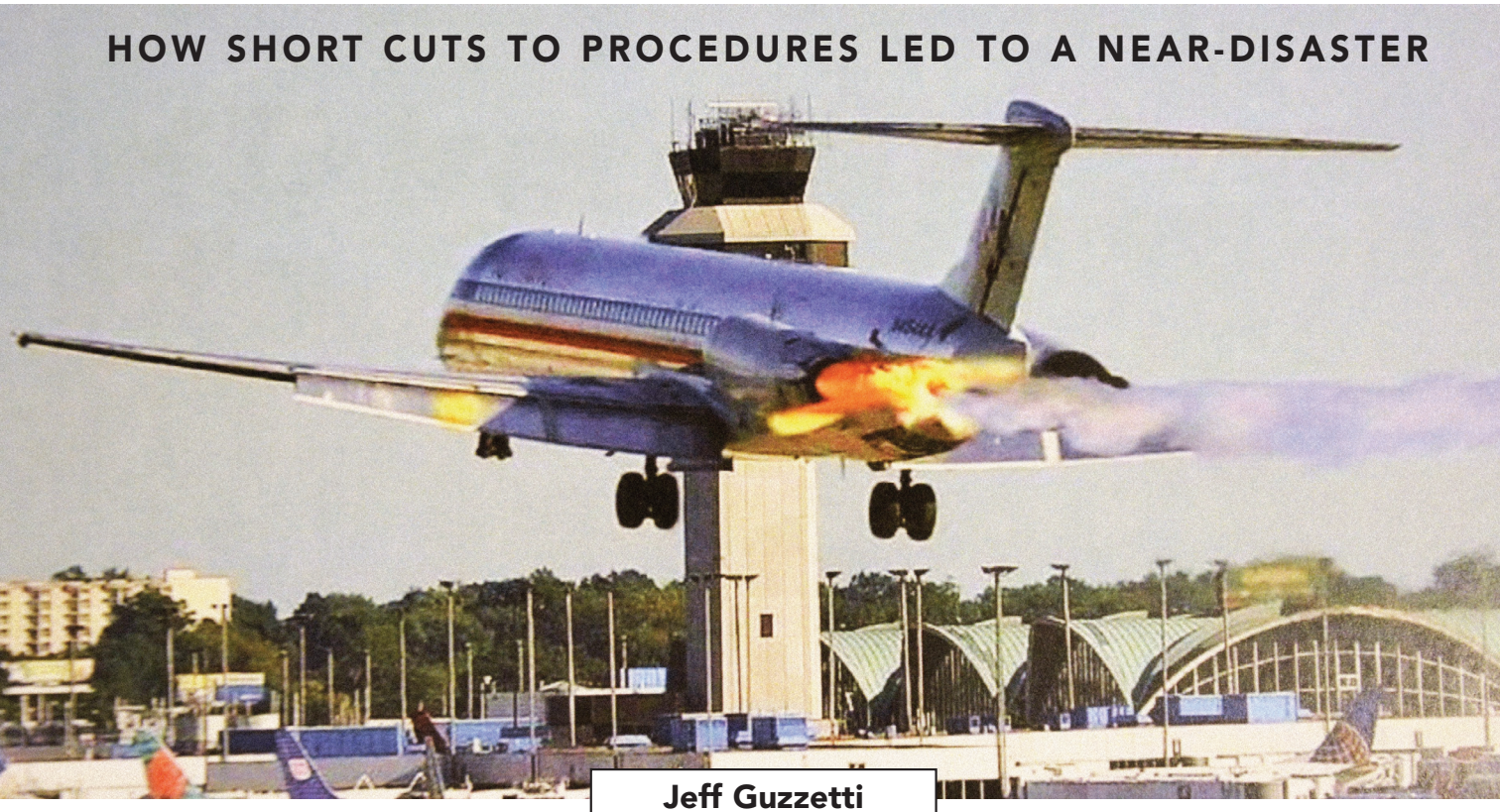
"FIRE! LEFT ENGINE!"

HOW SHORT CUTS TO PROCEDURES LED TO A NEAR-DISASTER



Jeff Guzzetti

There is no doubt that fatal airline accidents, especially those involving maintenance, have decreased significantly over the last two decades.

That's a good thing for three reasons: (1) Less people are killed; (2) Increased public confidence in aviation maintenance, and (3) the resources that were once tied up in the messy aftermath fatal accidents can now be applied to no-injury events that, but for the grace of God, and the redundancy of our aviation system, could have been catastrophic.

Nowadays, the biggest bang for the investigation buck can be found with deep-dives into the circumstances of no-injury airline incidents in order to cull out lessons learned to prevent potentially deadly crashes.

Case in point: American Airlines flight 1400 — a McDonnell Douglas MD-82 that experienced an in-flight engine fire after takeoff from Lambert-St. Louis International Airport (STL), Missouri, on September 28, 2007. Fortunately, the flight crew conducted a successful emergency landing, and the 2 pilots, 3 flight attendants, and 138 passengers deplaned safely on the runway. No one was hurt, other than the left engine that suffered the fire. I was working at the NTSB at the time but was not involved in this investigation.

Regardless, I was proud to be a part of an agency that would commit investigator resources on an event that did not garner much public attention but was likely chock full of concerns about the operation of a large scheduled airline.

Engine Problems

The crew and passengers of flight 1400 were ready to go at the gate but attempts to start the left engine failed. The pilots called for a mechanic to help. A few minutes later, a mechanic instructed the captain to initiate the manual engine-start sequence by holding the engine-start switch while the maintenance personnel outside manually opened the left engine's air turbine starter valve (ATSV). The engine started and the flight was on its way. As the airplane climbed through an altitude

Investigator documents the left engine damage following the emergency landing.

Side view of fire-damaged left engine damage.

Close-up view (looking aft) of the left engine after the fire was extinguished by Airport Rescue and Fire Fighters (ARFF).

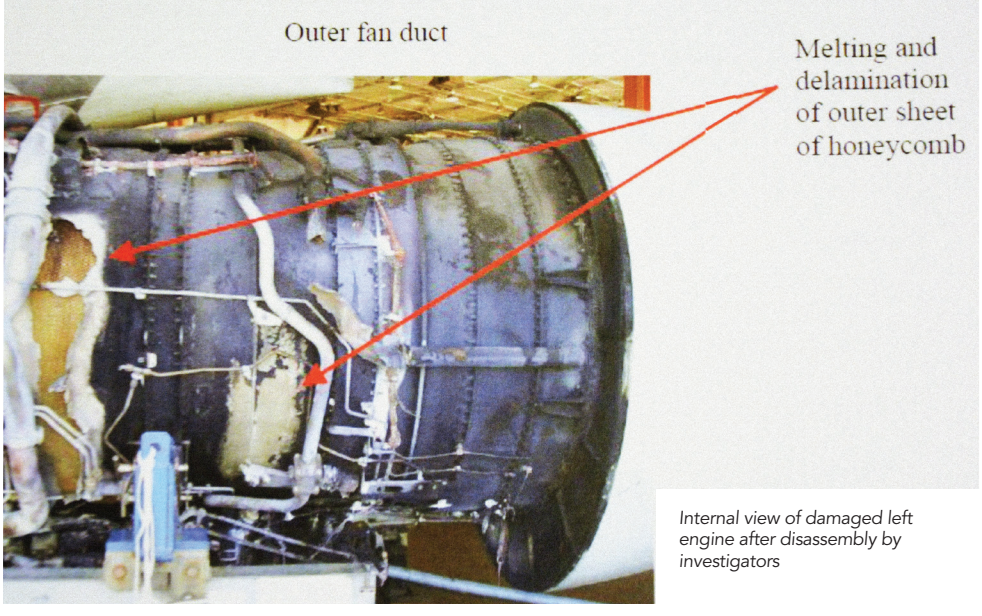
of about 500 feet above the ground, the cockpit Engine Fire warning bell rang out.

"Fire! Left Engine!" called the first officer, as captured on the cockpit voice recorder (CVR). The captain immediately turned back to STL as the first officer declared an emergency. The airplane began to experience electrical problems resulting in the loss of the captain's primary flight and navigation displays. Attempts to start the auxiliary power unit (APU) for backup electrical power were not successful. The nose landing gear would not retract. Everything was going to hell in a hand basket (see graphics A-C, above).

The crew abandoned the approach and elected to go around. As flight 1400 flew past the tower, the controller radioed "there is quite a bit of black soot on that engine...the fire was real." The crew manually lowered the nose gear, lined up again for landing, touched down safely on the runway and came to a stop. Airport firefighters arrived immediately and reported that the engine was still on fire! They put it out quickly and the passengers deplaned safely.

The Investigation

The NTSB did not immediately launch a full go-team. Instead, they "staked down" the damaged airplane by sending a field investigator to St. Louis from one of the NTSB regional offices that I managed. The next day, a "mini go-team" consisting of an investigator-in-charge (IIC) and three specialists in Operations, Powerplants and Maintenance Records arrived in St. Louis.

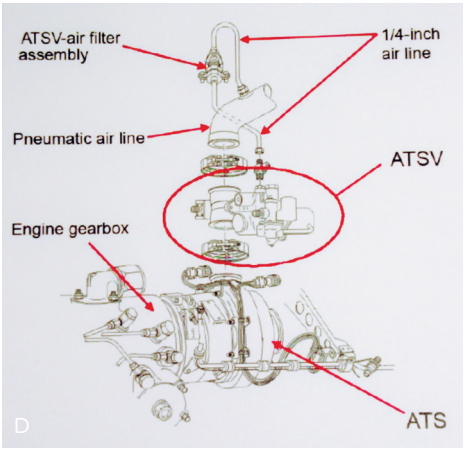


Internal view of damaged left engine after disassembly by investigators

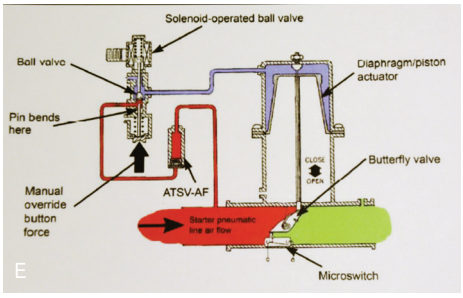
The wounded MD-82 was equipped with a Pratt & Whitney JT8D engine start system with a pneumatic air turbine starter to convert compressed air into rotational power sufficient to accelerate the engine to start. At the time of the accident, the established inspection interval for the ASTV was inadequate.

The system includes an ATSV equipped with an air filter, an engine-start switch, and a pneumatic line (See graphic D page 40). The ATSV was an electrically controlled and pneumatically operated butterfly-type valve. If the electric start does not work, mechanics can utilize a lever arm with a manual override button. The ATSV filter comprises an inner screen consisting of a coarse stainless steel filter and an outer screen consisting of a finer stainless steel mesh (see graphic E). The ATSV filter comprises an inner screen consisting of a coarse stainless steel filter and an outer screen consisting of a finer stainless steel mesh (see graphic F page 40).

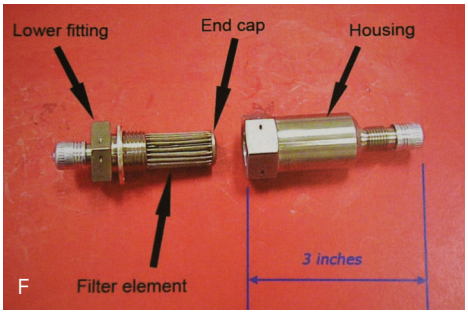
The ATSV air filter assembly components were removed from the burnt engine (see graphic G page 41)



Isometric exploded view of the Air Turbine Starter Valve (ASTV) and how it interacts with the engine gearbox. At the time of the accident, the established inspection interval for the ASTV was inadequate



Schematic diagram showing the function of the Air Turbine Starter Valve mechanism



A new exemplar filter assembly that is part of the Air Turbine Starter Valve mechanism

and examined by NTSB. The filter element was found fractured near the fitting braze joint and much of the filter element material was missing.

The remaining material was found adhered to the inner wall of the filter housing. Examination of the manual override button and ball valve housing revealed that the override button was buckled in an S-shape on the end of the pin closest to the ball valve and that the pin end was deformed with a concave indentation, as if someone had tried to use a pry bar on it.

At the time, the airline's MD-80 Maintenance Procedures Manual contained one approved manual engine-start procedure, which stated that maintenance personnel must open the ATSV using an approved, specialized wrench to turn the wrenching flats on the upper end of the butterfly valve shaft and request that the flight crew activate the engine-start switch. During post-accident interviews, mechanics complained that the approved procedure was "very time consuming" and could take about 20 to 40 minutes to perform because the required wrench was not part of the standard tool kit. So, they usually chose to use a "prying device" to reach, depress and hold down the ATSV's manual override button, which is accessed through a small panel located on the forward lower cowl door.

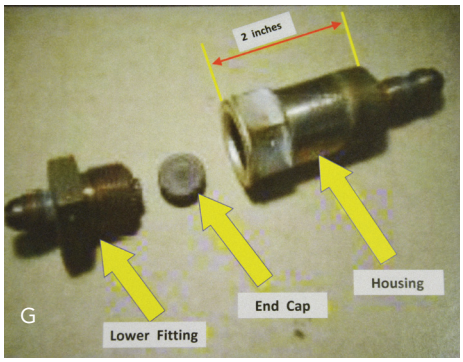
Investigators surmised that the ASTV filter element disintegrated, allowing the end cap to become free, which blocked the air flow and caused the engine no-start condition. Damage to the override button from a pry bar resulted in the uncommanded opening of the ATSV during the high-power engine conditions at the beginning of the takeoff roll and caused the air turbine starter to freewheel until it sustained a catastrophic internal failure. The open ATSV and resulting failed air turbine starter allowed a hotter than typical airstream to flow into the engine nacelle area and likely provided the ignition source for the in-flight fire.

Maintenance Records Tell a Tale

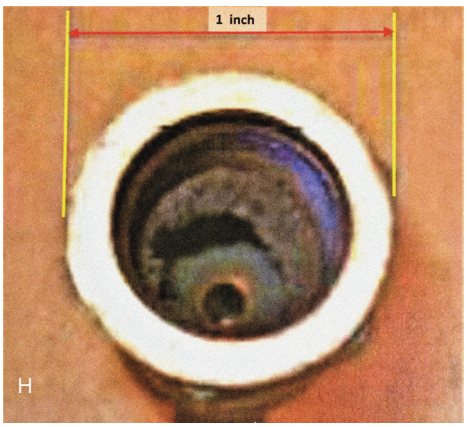
During the 12-day period preceding the accident, the left engine ATSV was deferred and/or replaced a total of six times without resolving the engine no-start condition on the accident airplane. Over that time, the airline's technical services personnel, who were assigned to review and act on alert items reported by line maintenance, issued three "Action to be Taken" notices in response to the alerts, indicating that they were aware of the repeated engine start failures and ATSV changes -- but these actions failed to address the systemic issue. Instead of forbidding additional ATSV replacements until maintenance could properly troubleshoot and correct the problem, the airline continued to allow the airplane to be dispatched with deferrals against the left engine start system.

About four months after the STL engine fire, another uncommanded ATSV-open event occurred with an American Airlines MD-82 in in Salt Lake City. The airline removed the ATSV filter from the airplane and sent seven more serviceable filters to the NTSB for evaluation. Three of the seven filters revealed evidence of the onset of fatigue in the filter elements' outer mesh. In addition, the airline sent 15 more serviceable ATSV filters to the filter manufacturer for inspection — five had damaged mesh and required replacement.

The NTSB determined that the early-stage fatigue fractures within the outer mesh were too small to be seen by the naked eye or when using 7-power magnification as recommended in the ASTV component maintenance manual (CMM). In addition, investigators



The ASTV filter from the accident airplane was destroyed in the fire. However, the airline experienced a ATSV malfunction in Salt Lake City shortly after the St. Louis accident, and the filter was removed for examination, as shown here.



An examination of the filter assembly from the Salt Lake City incident revealed that the filter element had detached and was damaged.

found that the approved test method did not adequately detect early-stage fatigue cracks in the filter. The NTSB concluded that the inspection criteria for the ATSV-air filter were inadequate to detect early-stage fatigue fractures of the outer mesh of the filter element and that, because of the filter design, the inner mesh of the filter element could not be inspected for evidence of fatigue (see graphic H above).

In addition to the pry bar use, investigators also learned that airline maintenance personnel did not clean the accident ATSV filter in accordance with its C-check cleaning procedures and, therefore, missed an opportunity to identify and replace the damaged filter. The filter element disintegrated, allowing the end cap to become free, which blocked the air flow and caused the engine no-start condition.

Adding insult to injury, the NTSB discovered that the pilots failed to properly allocate tasks during the emergency, including checklist execution and radio communications, and this adversely affected their ability to conduct essential cockpit tasks.

Continuing Analysis and Surveillance System (CASS)

The FAA provides guidance to operators regarding Continuing Analysis and Surveillance System (CASS) programs in Advisory Circular (AC) 120-79, "Developing and Implementing a Continuing Analysis and Surveillance System." CASS is a risk management system required for commercial air carriers (per FAR 121.373 and Part 135.431) that comprises a continuous cycle of surveillance, investigation, analysis, and corrective action. The system provides a structured process of collecting and evaluating information to identify factors that could lead to an accident.

American Airlines had a CASS system, but it obviously was not robust enough to alert the company to recognize the recurring failed engine starts, ATSV replacements, and MEL deferments as a possible serious problem that needed to be systemically addressed. The NTSB stated that the unresolved ASTV maintenance problems were not adequately addressed through daily conference calls with maintenance and engineering staff conducted as part of the airline's CASS program.

In addition, a CASS program is meant to ensure that an airline is following its inspection and maintenance procedures, but the investigation found that the airline was not complying with several maintenance program requirements including the use of approved manual engine-start procedures and appropriate tools to perform ATSV filter cleaning procedures during C-checks, and to correctly document the work accomplished on the accident airplane.

The Probable Cause and Words of Wisdom from NTSB

During the Board Meeting to close out this investigation, the NTSB determined that the probable cause was "maintenance personnel's use of an inappropriate manual engine-start procedure, which led to the uncommanded opening of the left engine air turbine starter valve, and a subsequent left engine fire, which was prolonged by the flight crew's interruption of an emergency checklist to perform nonessential tasks." The Board also stated: "Contributing to the accident were deficiencies in American Airlines' Continuing Analysis and Surveillance System (CASS) program."

The Board issued eight safety recommendations to the FAA, including one to establish an interval for servicing an engine component and another to evaluate the history of air start-related malfunctions in MD-80 airplanes. The Board also recommended that the airline evaluate and correct deficiencies in its CASS program.

"The airline's own internal maintenance system…failed to do what it was designed to do," said then-Chairman Mark Rosenker. "And that allowed this sequence of events to get rolling… Following the appropriate maintenance procedures would have gone a long way toward preventing this mishap."

Board Member Kitty Higgins added her own view: "It seems to me it was a series of people taking short cuts that accumulated on this particular day into what could have been much more catastrophic." AVM

WASTE WATER

ACHIEVING WASTEWATER TREATMENT COMPLIANCE WITH EFFICIENT SYSTEM FOR AEROSPACE INDUSTRY

Del Williams

Automated wastewater treatment systems help the industry remain in compliance with EPA and local standards, while significantly reducing the cost of treatment, labor and disposal

In the manufacture, maintenance and cleaning of aircraft, the aerospace industry must meet EPA and local wastewater requirements for effluent, including those under the Clean Water Act. Under the Clean Water Act, the EPA has identified 65 pollutants and classes of pollutants as "toxic pollutants", of which 126 specific substances have been designated "priority" toxic pollutants. Failing to do so can result in severe fines that quickly escalate.

Typically, manufacturing military or commercial aircraft, jet engines, helicopters, or specialized parts can involve using process rinse water. This can be utilized while producing, deburring, or finishing aluminum, titanium, or composite parts. Water is also used for plating metals, molding composites, and manufacturing electronics. For example, in defense, to improve wear and tolerance, aerospace components can use cyanide cadmium plating, a process that produces a toxic waste that must be treated.

In addition, in the maintenance and cleaning of aircraft, washing may be utilized to rid everything from components to fleets of any dirt, debris, or residues that could degrade performance or aesthetics. In the commercial airline portion of aerospace, even running onboard amenities such as toilets and sinks can produce wastewater.

For the aerospace industry, this means installing a wastewater treatment system that effectively separates the contaminants from the water so it can be legally discharged into sewer systems or even re-used.

However, traditional wastewater treatment systems can be complex, often requiring multiple steps, a variety of chemicals and a considerable amount of labor. Even when the process is supposedly automated, too often technicians must still monitor the equipment in person. This usually requires oversight of mixing and separation, adding of chemicals, and other tasks required to keep the process moving. Even then, the water produced can still fall below mandated requirements.

Although paying to have aerospace industry wastewater hauled away is also an option, it is extraordinarily expensive. In contrast, it is much more cost effective to treat the industrial wastewater at its source, so treated effluent can go into a sewer and treated sludge passes a TCLP (Toxicity Characteristics Leaching Procedure) test and can be disposed of as non-hazardous waste in a local landfill.

Fortunately, complying with EPA and local wastewater regulation has become much easier with more fully automated, wastewater treatment systems. Such systems not only reliably meet regulatory wastewater requirements, but also significantly reduce the cost of treatment, labor and disposal when the proper Cleartreat separating agents are also used.

Cost-Effective, Automated Wastewater Treatment

In contrast to labor-intensive multiple step processes, automated wastewater treatment can help to streamline production, usually with a one-step process, while lowering costs at aerospace facilities.

An automated wastewater treatment system can eliminate the need to monitor equipment in person while complying with EPA and locally mandated requirements. Such automated systems separate suspended solids, emulsified oil and heavy metals, and encapsulate the contaminants, producing an easily de-waterable sludge in minutes, according to aerospace industry consultants at Sabo Industrial Corp., a New York-based manufacturer, distributor and integrator of industrial waste treatment equipment and solutions, including batch and fully automated systems, Cleartreat separating agents, bag filters, and accessories.

An automated wastewater treatment system can eliminate the need to monitor equipment in person while complying with EPA and locally mandated requirements. Sabo Industrial image.

The water is typically then separated using a de-watering table or bag filters before it is discharged into sewer systems or further filtered for re-use as process water. Other options for de-watering include using a filter press or rotary drum vacuum. The resulting solids are non-leachable and are considered non-hazardous, so will pass all required testing.

These systems are available as manual batch processors, semi-automatic, automatic and can be designed as a closed loop system for water reuse or provide a legally dischargeable effluent suitable for the sewer system. A new, fully customized system is not always required. In many cases, it can be faster and more cost effective to add to or modify a facility's current wastewater treatment systems when this is feasible.

However, because every wastewater stream is unique to its industry and application, each wastewater treatment solution must be suited to or specifically tailored to the application. The first step in evaluating the potential cost savings and effectiveness of a new system is to sample the wastewater to determine its chemical make-up followed by a full review of local water authority requirements, say aerospace industry consultants at Sabo Industrial.

The volume of wastewater that will be treated is also analyzed, to determine if a batch unit or flow-through system is required. Other considerations include the size restrictions so the system fits within the facility's available footprint.

Separating Agents

Despite all the advances in automating wastewater treatment equipment any such system requires effective separating agents which agglomerate with the solids in the wastewater so the solids can be safely and effectively separated out.

Because of the importance of separating agents for wastewater treatment, Sabo Industrial uses a special type of bentonite clay in a line of wastewater treatment chemicals called ClearTreat. This line of wastewater treatment chemicals is formulated to break oil and water emulsion, provide heavy metals removal, and promote flocculation, agglomeration and suspended solids removal.

Bentonite has a large specific surface area with a net negative charge that makes it a particularly effective adsorbent and ion exchange for wastewater treatment applications to remove heavy metals, organic pollutants, nutrients, etc. As such, bentonite is essential to effectively encapsulate the materials. This can usually be achieved in one-step treatment, which lowers process and disposal costs.

In contrast, polymer-based products do not encapsulate the toxins, so systems that use that type of separating agent are more prone to having waste products leach back out over time or upon further agitation.

Today's automated systems along with the most effective Cleartreat separating agents can provide aerospace industry facilities with an easy, cost-effective alternative so they remain compliant with local ordinances and the EPA. Although there is a cost to these systems, they do not require much attention and can easily be more economical than paying fines or hauling. AVM

For more information visit saboindustrial.com.

Looking at the World Through SmartGlass

By Joy Finnegan

The company Research Frontiers developed light-control technology that enables any window, sunroof or skylight to control the transmission of light by electrically aligning nanoparticles in the film. The product is being used in aircraft and business jets like those from Textron, Honda and Epic and can be installed as an aftermarket modification. Aviation Maintenance spoke to the company's vice president of Aerospace Products, Mike LaPointe to learn about the product and how it came to be.

Mike LaPointe
Vice President of Aerospace Products
Research Frontiers

What is the history of SmartGlass?

The roots of SPD-SmartGlass technology began with Dr. Edwin Land, founder of Polaroid Corporation. Research Frontiers, the developer and licensor of SPD ("Suspended Particle Device") SmartGlass technology continued the early work done by Dr. Land and others had done in the area of light-control. The industry was built via a licensing business model - through license agreements with over 45 companies around the world, The SPD-SmartGlass industry has a robust supply chain infrastructure to serve the global market.

Why was it developed?

Glass and other types of transparent materials have been highly valued across many applications (e.g. buildings and transportation vehicles) for centuries, enabling people when indoors to continue to enjoy views and maintain their connection to the outside world. The downside to the use of transparent panels is that visible light, glare and heat can become too intense. SPD-SmartGlass provides the solution by enabling users to precisely control and manage these elements.

What industries are already using SmartGlass?

Research Frontiers' SPD-SmartGlass technology is being used in tens of thousands of cars, aircraft, yachts, trains, homes, offices, museums and other buildings around the world.

How long has it been in use for aviation applications?

The first installation of SPD-Smart EDWs (Electronically Dimmable Windows) on aircraft was in 2001, on a Learjet 25.

You talk about the glass being "tunable" – please explain what that means.

SPD-Smart EDWs on aircraft switch from transparent to over 99 percent light-blocking, and any state of tint in between. This enables the passengers to "tune" the level of tint to any level between clear and dark, by use of any type of switch that can vary the voltage applied to the EDW, similar to a dimmer switch for light bulbs or LEDs.

Is the tunability one extreme or the other – clear or dark or is it adjustable like a rheostat?

It is infinitely tunable. Unlike other types of glass, with the touch of a button passengers can instantly change the tint of SPD-SmartGlass windows onboard aircraft from dark to clear and anywhere in-between. This allows passengers to get the optimum ideal amount of shade or light and to preserve views without the clunky pull down shades that are typically found on most aircraft. Moreover, SPD-SmartGlass windows can be in tuned on a window-by-window basis so that each passenger can get the exact amount of light they are looking for.

Please explain technically how the glass works. Are there any special considerations for aircraft operation?

The foundation of SPD-Smart aircraft EDWs use SPD film enclosed between thin plastic layers. Within this film are microscopic particles. When no electrical voltage is present, the particles absorb light and block it from passing through the film. When an electrical voltage is applied, the particles align so that light can pass through. Adjusting the voltage to the film provides a range of transparencies (i.e. very dark to fully clear) where light transmission can be rapidly varied to any degree desired depending upon preference or pre-programmed requirements. The SPD film is laminated between two layers of substrates (polycarbonate, acrylic, chemically strengthened glass, etc.), and this EDW then sits in a window shroud. Historical installations include a scratch lens inboard of the EDW to protect it, however, recent advancements in chemically strengthened glass demonstrating FAA/EASA compliance offer the SPD-SmartGlass industry the opportunity to have a single panel function not only as the EDW but for the scratch lens as well. The SPD-Smart EDW system is 28Vdc that integrates into the aircraft electrical system.

SPD-SmartGlass windows can be in tuned on a window-by-window basis so that each passenger can get the exact amount of light they are looking for. Research Frontiers image.

And the electrical current doesn't impact any avionics equipment onboard?

That is correct. All components: the SPD-Smart EDW panel, the controller, the master switching unit, the emergency power supply, the control switch, and all of the wiring harnesses have gone through full DO-160 testing to ensure all of the components do not emit any EMI/RFI signals on to existing avionic equipment.

Aircraft pressurization is not an issue?

The SPD-Smart EDW is not a structural window, and is located on the interior side and is non-structural. This panel feels what the passenger feels, so a cabin altitude of 8000 feet or less.

Can SmartGlass be used in any size aircraft window?

Yes, including any shape and on curved panels.

Are these windows FAA/EASA approved now?

Yes, they are both FAA and EASA approved via STC, PMA, and OEM TC.

Are they installed and flying in aircraft now?

Yes, they are standard equipment on new production aircraft including King Air 350i, King Air 250, King Air C90GTx, Honda Aircraft HondaJet, Epic E1000, and others. Including aftermarket installations, SPD-Smart EDWs have been installed on over 50 models of aircraft.

What products are available now for aircraft?

The product is available for passenger windows; cockpit lateral windows; cockpit sun visors; and cabin partitions.

What are the benefits of using SmartGlass in an aircraft?

The overarching benefit of SPD-Smart aircraft EDWs is improving the passenger experience. Passengers and crews can "tune" the amount of light coming into the aircraft cabin, at the touch of a button – to preserve views, reduce unwanted glare, and manage the optimum amount of healthy daylight for passenger well-being. Cabin-wide control of the amount of light and glare entering the aircraft improves the flying experience for all, instantly transforming the cabin interior, and synergistically complementing other systems, such as mood lighting and in-flight entertainment systems. Aircraft windows are a primary path for heat, noise, glare and other environmental elements entering an aircraft through the window opening. These unwanted elements – cabin heat while the aircraft is on the ramp, and cabin noise during the entire flight – are well known to cause passengers discomfort, fatigue, jet lag and other ailments. SPD-SmartEDWs, with their multilayer configuration of films and interlayers, provide all passengers with a cooler, quieter, and more comfortable cabin. AVM

4 Reasons Halogen Lights Provide a Long-Lasting Alternative to LEDs

John Fogel

Even in the age of LEDs, halogen landing and taxi lights shine. Although many new aircraft come standard with LEDs, halogen remains more cost-effective for older planes for several reasons. One is the enduring popularity of halogen as most existing aircraft were manufactured before the introduction of LEDs. When you consider that the average lifespan of an aircraft is 20 years, it's no surprise that halogen lamps are a fixture on 90% of existing aircraft. In addition, some airlines refurbish aircraft to extend the life of their fleet, making it likely that halogen lamps will be around for years to come.

Here are four reasons why halogen PAR (parabolic aluminized reflector) lamps make an excellent, cost-effective alternative to expensive LED lights:

1) Halogen is cost-effective for existing aircraft fleets that continue to dominate the skies

One LED lamp can cost more than 20 times the cost of a halogen bulb. If replacing halogen lamps on a single aircraft is a substantial investment, consider the cost of installing LEDs for an entire fleet. For example, one major airline maintains approximately 1,300 aircraft. About 1,000 of these are Boeings and Airbuses that were manufactured when halogen lamps were the order of the day. Most of these aircraft still require two landing lights and two taxi lights, meaning that the cost of replacing halogen bulbs with LED lights would cost around $1.2 million. With COVID-19 wreaking havoc on travel plans and federal relief held up by congressional gridlock, few airlines are able or willing to invest this kind of money in lighting.

2) Long life means less maintenance needed to change out bulbs, downtime and delays

While halogen bulbs don't have the same longevity as LED lights, a halogen PAR landing light can last 100 to 300 hours, provided it is not damaged during landing or takeoff. A halogen taxi lamp can last even longer—up to 1,000 hours in many cases. An aircraft that locates its lights on the wing, behind a room temperature vulcanized silicone shield that must be unbolted and removed to access the lights, may require a full day to replace lighting, whereas an aircraft that places lights in easier to reach locations can be serviced in as little as an hour.

3) Brightness and durability last throughout the life of the lamp

Well-made halogen lamps will maintain candela output (the measurement of illumination produced by an output beam) that exceeds industry standards. Halogen lamps can withstand countless takeoffs and landings thanks to advancements in the design of filaments and the light weight of lamps. However, it is worth noting not all halogen lamps are created equal. Some lower quality lamps produce less than half the industry-mandated candela output, which can increase the chance of collisions and other accidents. Poor visibility is also a common source of complaints from pilots tasked with providing a smooth flight—and safe landing—for their passengers.

4) Halogen is regularly available, and high-quality options are available from different manufacturers

When it comes time to replace the lights on their aircraft, airlines should make sure they purchase high quality halogen lamps that produce at least 700,000 candelas from reputable manufacturers, follow instructions in the IPC (Illustrated Parts Catalog) and change gaskets according to the recommended manufacturer's schedule. To find a reputable manufacturer, airlines should consider the quality of the lab and procedures used for product testing, the quality of the materials used, whether the manufacturer adheres to all IPC requirements and the availability of robust customer support.

Finding a long-lasting, cost-effective lighting solution during lean economic times is vital because replacing lights can be a labor-intensive and time-consuming process. With COVID-19 disrupting travel plans, airlines must find cost-effective options for their taxi and landing lights. For existing aircraft, replacing lights with halogen bulbs provides a durable, economical alternative to LED lighting. In addition to better pricing, high quality halogen bulbs can reduce maintenance costs and lost revenue due to delayed flights. For airlines to thrive during tough times, halogen lamps offer a combination of efficiency, durability and affordability that is hard to beat. AM

John Fogel, Halogen Product Manager at Amglo, has worked with the company for more than 10 years in product development, qualifying products with the FAA, and building partnerships. For more information, visit www.amglo.com

By Jason Dickstein

Customer Bankruptcies: Protect Your Right to Get Paid

We are going to take a break from our series on how to construct an SMS system to look at ways to protect your right to get paid.

There are valuable strategies for protecting your right to get paid for your work. These strategies become especially important in tough economic times. Several air carriers filed for bankruptcy or insolvency protection at the beginning of the Covid-19 pandemic, and it looks like another wave of bankruptcies could be around the corner, especially among smaller airlines in certain markets.

This article examines bankruptcy priorities, and offers several strategies for increasing your potential to get paid when you are selling articles or providing services to a company that subsequently becomes insolvent. If you are intrigued by what you see here, then further investigation with an attorney may be appropriate.

What is Bankruptcy/Insolvency?

There are typically two main types of bankruptcy filings for aviation businesses – liquidation and reorganization. We will refer to the businesses that are seeking this sort of legal process as "firms."

In the United States, liquidation is commonly known as a "chapter 7" filing, based on the chapter in the U.S. Bankruptcy Code. Firms who are entering a liquidation will sell off their assets in order to pay creditors. The firm may continue operation for a short time if continued operation will benefit the creditors.

When a firm thinks it can emerge from bankruptcy with the court's help, it can file for a reorganization, or Chapter 11. In such an event, the firm would use its bankruptcy trustee to help reorganize its debts. The trustee is an administrator who is appointed to protect the creditors' interests, and who typically has powers to help liquidate or reorganize the firm. The firm may operate as a debtor-in-possession and essentially serve as its own trustee, under close court monitoring.

One of the key powers of a Bankruptcy Court in the United States is the power to decide whether a contract shall be assumed, rejected, or otherwise terminated (note that the U.S. Bankruptcy Code gives courts the power to continue executory contracts even when the contract says that it is terminated for bankruptcy). If you have an outstanding contractual obligation and your partner files for bankruptcy protection, then the court could terminate the contract or it could order you to continue performing under the contract.

Outside the United States, the bankruptcy proceeding is often called "Insolvency," and it may vary from the United States norms that are described in this article. For instance, some countries permit liquidation but do not have a corollary to the reorganization portion of the U.S. Bankruptcy Code.

Bankruptcy Priorities – Who Gets Paid?

When a firm files for bankruptcy protection, any efforts to collect on outstanding debt owed by the firm immediately cease and all claims against the firm must go through the Bankruptcy Court.

The outstanding debts of the firm are typically paid according to "priority." The first priority is for the administrative expenses of the bankruptcy trustee. This encourages trustees to work actively for the firm, because the trustee knows that he or she will get paid. The second priority is for certain claims made by a Federal reserve bank related to certain loans. The third priority is for certain claims

that arise in an involuntary filing (most aviation bankruptcy filings tend to be voluntary).

The fourth priority is claim is for claims for employee wages and sales commissions, followed by the fifth which is for contributions to an employee benefit plan.

In all, there are ten priorities that get paid before any secured creditors are paid. And the secured creditors will then be paid from their security before the unsecured creditors. The unsecured creditors are paid last, and they typically get a pro rata share of anything that is left (which can be pennies on the dollar or can be nothing). The difference between unsecured and secured creditors is explained in the next section, where we also explain how one can become "secured."

There is usually a difference between debts from before the filing and debts incurred afterwards, especially in reorganization cases. In a reorganization case, the court wants to encourage companies to do business with the bankrupt firm in order to make the reorganization successful. As a consequence, it is normal for the court to order a priority for essential vendors. Those who are providing a good or service that is essential to continued operation will get paid for their post-filing transactions, and in some cases (where the good or service is sufficiently critical and cannot be obtained elsewhere) they may be able to negotiate the payment of pre-filing debt as a condition of continued business.

Normally, an independent repair station that performed work for an operator (that is now in bankruptcy) cannot find its way into the first ten priorities, but it can take steps to improve its ability to get paid in the event of a bankruptcy by taking steps to be able to reclaim unpaid property, or by seeking to become a secured creditor.

What Can I Do to Protect My Right to Get Paid?

One way to protect your right to get paid is to be able to assert ownership of an asset that appeared to be a part of the bankruptcy estate (but it was not because you owned it). If you sell parts to an air carrier, your contract could specify that they are placed in the air carrier's inventory as a loan but that they are not purchased until they are paid-for. This does create certain additional liabilities (including tort liabilities that may arise related to the goods that you own) and those liabilities need to be considered and addressed in a written document before this approach is used.

A related approach is one in which goods are sold and then can be claimed if they remain unpaid in the event of an insolvency (pre-filing). This is a short-time period right that arises under the Uniform Commercial Code – the right is only good for ten days, and demand for return has to be made (in writing) within ten days of delivery. Ten days is a very short time period, and most vendors will not be able to ascertain an insolvency within ten days of a delivery. If the insolvent customer misrepresented its solvency - in writing - during the three months before the delivery of the goods in question, though, then this waives the ten-day limit and you may be able to reclaim the goods more than ten days after delivery. With this in mind, it may make sense to ask some customers to make a written assertion of solvency: either on a periodic basis, or before certain key deliveries.

It is also possible in some cases to reclaim unpaid goods after a bankruptcy filing. The bankruptcy code establishes timelines for post-filing reclamation and key dates arise at the 20-day and 45-day marks after filing, so this is something that you should investigate quickly if your customer files for bankruptcy, while owing you money for deliveries.

Reclaiming unpaid goods is just one possible remedy when you customer is insolvent. Another option is to establish a security interest in the goods. A security interest doesn't give you the right to reclaim the goods, but it does give you a priority during the bankruptcy that makes your claims superior to those of the unsecured creditors.

When you have a security interest in good, then you get paid first out of the sales proceeds. Let's say that you sell a serialized

article worth $100,000 to customer X and secure the transaction with a security interest in the article. You are owed $100,000 and that amount is currently secured by the serialized article. If the bankruptcy trustee sells the article for $60,000 in an auction, then you would get the $60,000 and this would satisfy your secured interest. You would end up with $60,000 plus a 40,000 unsecured claim. While this is not as good as your original $100,000 expectation, it is better than a $100,000 unsecured claim that might yield only $1,000 after years of litigation.

One of the issues with securing a transaction is that you typically have to plan for the security interest. This means that it is something that you ought to plan with your legal consultants before it becomes necessary.

For repair stations, there are typically two different ways to secure a transaction. The first is that you can secure an interest by "contract" using a security agreement and a financing statement. This is often the way that a sale is secured. This requires the buyer (debtor) to sign certain documents related to the transaction, so it usually requires up-front negotiation to effect this ort of relationship, and it also typically requires documents to be filed in order to be effective against third parties (this is known as "perfection" of an interest).

The second way to secure an interest is that you can rely on a law that offers a specific path to assert a lien against property. In the United States, the specifics of this process will vary based on state law, but there is often a mechanism that allows a repair station to assert a lien against an asset on which it has performed work. Some states have aviation-specific laws and some states have laws that more generally apply to all sort of maintenance. A repair or alteration performed on an aircraft may permit the repair station to assert a lien against the entire aircraft.

Look at the laws in your state carefully! A common mistake is to try to rely on the "mechanics' lien" law (which in many states applies to real estate contractors and not to aviation mechanics). Because these laws are different in every state, it is important for a repair station to work with a lawyer to examine its own state laws to assess (1) when such a lien may be asserted, (2) against what sort of assets it may be asserted (e.g. just aircraft or can you assert the lien against a component), and (3) how it must be asserted (what is the technical process to follow to make the lien enforceable). AM

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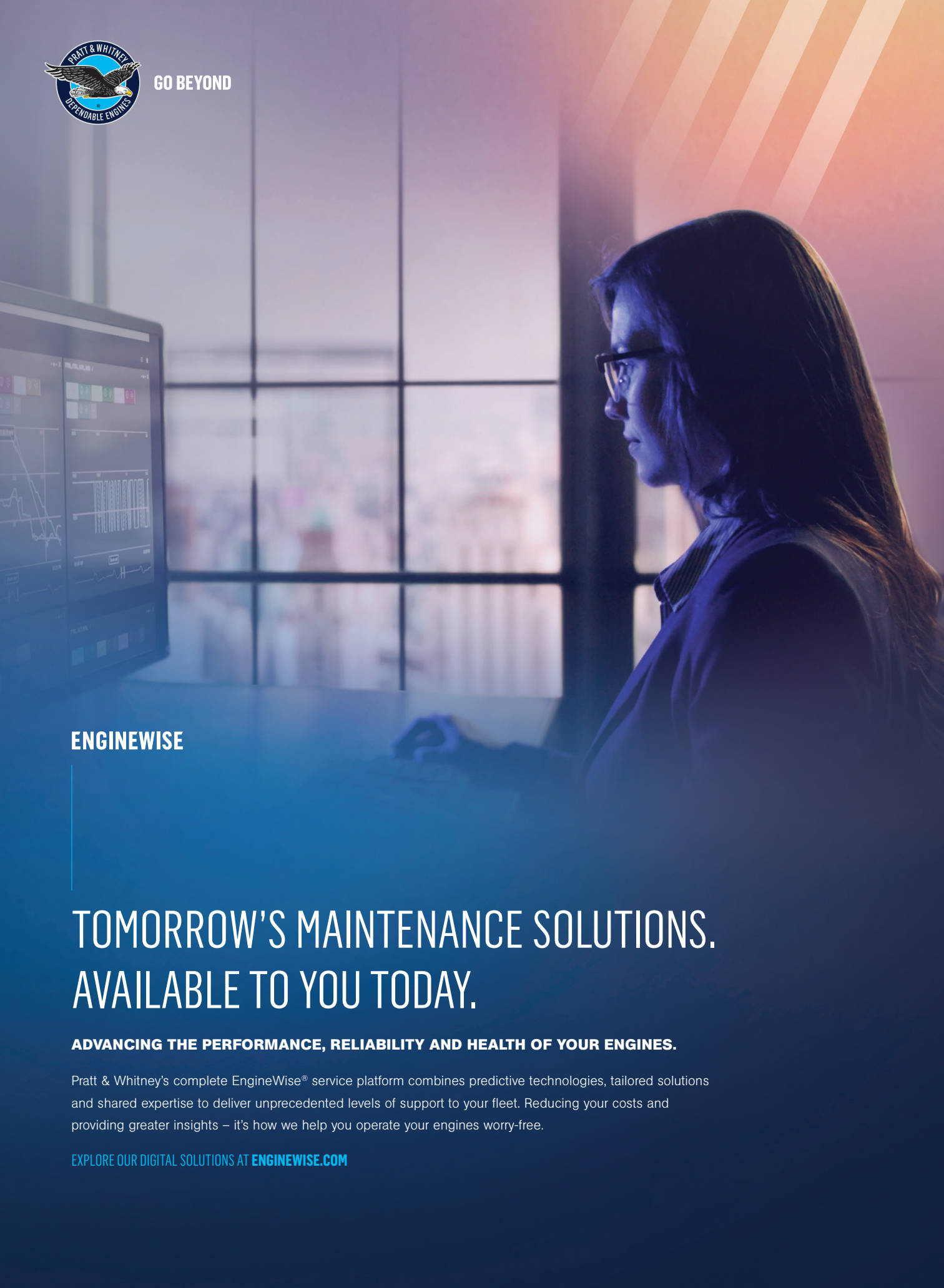

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