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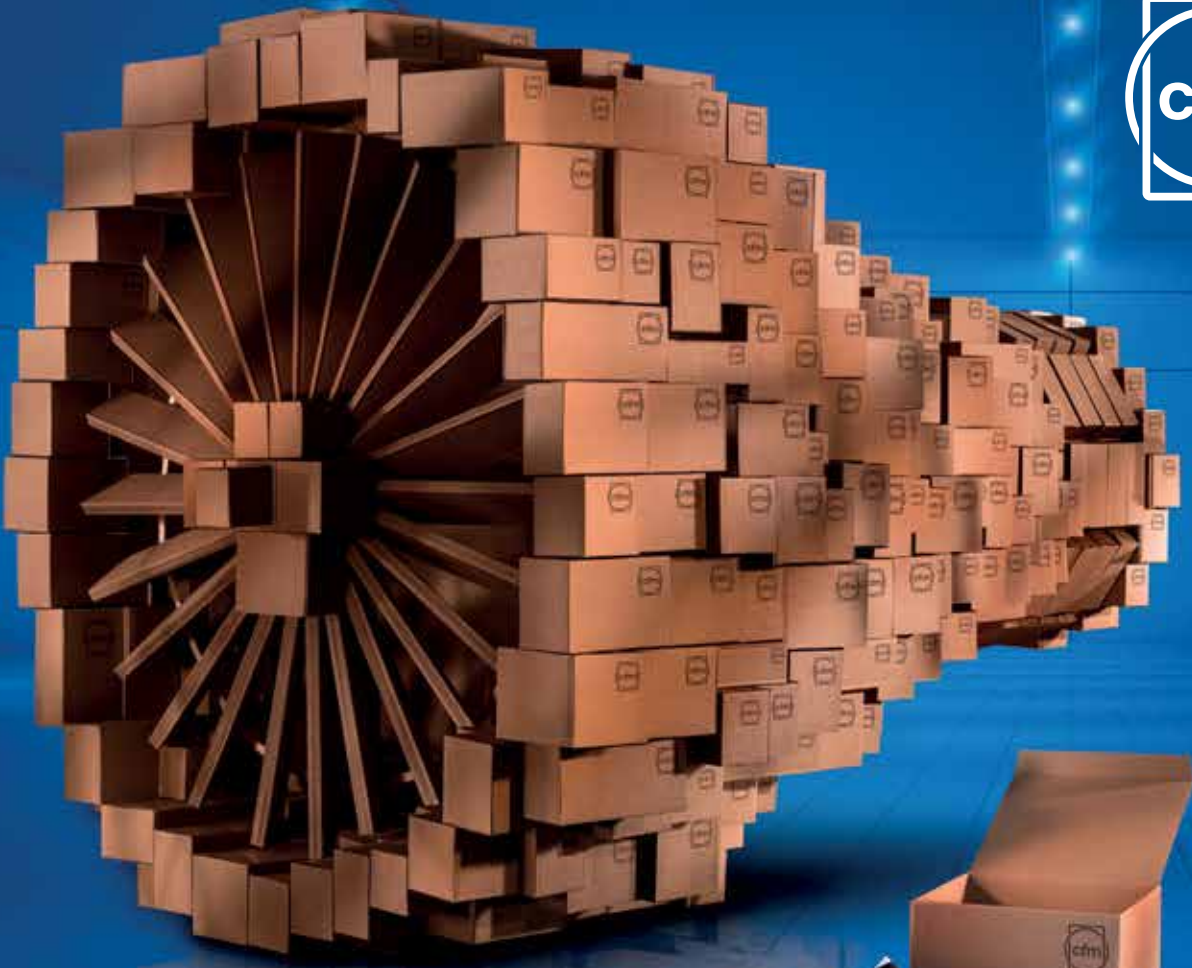


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FAA SAFETY EXPERT
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STARTS IN THIS ISSUE



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Where Shall We Begin

BY JOY FINNEGAN
EDITOR-IN-CHIEF



There is so much going on the MRO, aviation in general, the world and in this issue of our publication, that I hardly know where to start. So I will dive right in.

As we went to press, Southwest Airlines was in the process of speeding up inspections of close to 40 (and possibly as many as 88) aircraft in its fleet. These were aircraft that were purchased over the years since 2013 from foreign operators and the Federal Aviation Administration (FAA) became concerned that the aircraft may not meet safety standards. The aircraft were previously owned by as many as 16 foreign carriers.

The biggest issue concerned maintenance records for those aircraft. Southwest hired contractors to review maintenance records. The airline also used "authority delegated to it by the FAA to grant certificates that let it carry passengers on the planes," according to a report by the Associated Press. This concern has been ongoing since 2018 when an inspector found the issues in Southwest's records for those aircraft. After a thorough review, Southwest discovered 360 major repairs not mentioned by the contractors.

Clayton Foushee, director of the FAA Audit and Evaluation Office said the Southwest inspections showed 30 repairs that were unknown and 42 major repairs that did "not to meet FAA airworthiness requirements." Some required "immediate corrective action to bring the aircraft back into compliance," Foushee said. The audit memo added the data collected indicated that "a majority" of the planes in question to be inspected do not meet FAA airworthiness requirements.

When the issues were first discovered in May of 2018, FAA gave Southwest two years to complete the inspections

to verify all required maintenance and repairs had been done properly. But in October, the FAA inspector in charge of Southwest said the airline had only evaluated 39 planes, calling it slow to complete the inspections in a letter sent to the company and seeking additional information about those aircraft.

The Aircraft Mechanics Fraternal Association (AMFA) union released the following statement concerning the Southwest situation: "Recent reporting on Southwest Airlines 88 Skyline Aircraft indicates that the Federal Aviation Administration's (FAA) internal Office of Audit and Evaluation raised issues with the carrier's failure to ensure conformity with all FAA airworthiness requirements, which is a growing cause of concern to the Aircraft Mechanics Fraternal Association (AMFA)... In our view, these lapses occurred because of Southwest's choice to prioritize on-time performance over safety," AMFA National Director Bret Oestreich stated.

Meanwhile, the Boeing 737 Max Saga continues. Some are predicting a return to service for the aircraft in January while others are saying not before March. Southwest's pilot union issued a letter to its members saying, "Boeing is increasingly publicizing that they may have to shut down their production line due to running out of room to store completed MAX aircraft. There is some concern that this is simply another tactic to push the RTS timeline up, force operators to resume making payments on MAX aircraft, and transfer some costs, logistics, and responsibilities of storing and restoring the MAX to revenue service to respective operators."

Boeing says there are five key milestones they must complete with the FAA before return to service. The

first of the five, the FAA eCab Simulator Certification Session: A multi-day eCab simulator evaluation with the FAA to ensure the overall software system performs its intended function, both normally and in the presence of system failures, was successfully concluded and are now they are working towards the FAA line pilots evaluation and the FAA certification flight test. "We are working closely with the FAA and other regulatory authorities as we work towards certification and safe return to commercial service, and we are taking the time to answer all of their questions. With the rigorous scrutiny being applied, we are confident the MAX will be one of the safest airplanes ever to fly," a Boeing statement says.

Additionally, B737 NGs were found to have cracking in the pickle fork area as has been reported in the recent months. More than 30 aircraft were found to have the cracking sooner than would normally be expected. FAA issued an AD requiring inspections of aircraft prior to the accumulation of 30,000 total flight cycles, or within 7 days after the effective date of the AD and those inspections and corrective actions are underway. Qantas reported finding cracking under 27,000 cycles on two aircraft.

Finally, let me introduce a new feature in the magazine. Safety expert Jeff Guzzetti will be taking a look back at accidents over the years that have had a contributing factor related to maintenance. The first is on page 36.

These are cautionary tales that we can all learn from. Guzzetti, after a career at both the NTSB and FAA, is now heading a safety consulting firm. We are fortunate to have his expertise. Please let us know what you think of the series and if you have any accidents you would like him to include in the series. [EAM](#)



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Honeywell Forge to be Available on Lufthansa Technik's Aviator Platform

Honeywell and Lufthansa Technik are collaborating "to bring new level of predictive health management expertise to airlines. They say they will do this by offering Honeywell Forge for Airlines and Lufthansa Technik maintenance analytics on the AVIATAR platform. The companies says this will help airline operators increase the availability of their aircraft and reduce costs associated with operations, flight delays, and cancellations.

The collaboration will create a comprehensive data analytics solution for airlines — from the data pipe, to a platform that digitizes maintenance data, to realized benefits based on analytics and predictive tools.

"We are working to provide the world's airlines and other stakeholders in the industry with access to a comprehensive digital operations suite that will ultimately reduce operational costs, improve maintenance turnaround times, and get planes into the sky faster," says Dr. Christian Langer, vice president Digital Fleet Solutions at Lufthansa Technik. "We live in a data-driven world, and the more Lufthansa Technik can support better data analysis for maintenance and other services, the better it is for our customers. The inclusion and collaboration of Honeywell Forge analytics with the Lufthansa Technik offering will further foster that development to help improve airlines' operations at scale."

New aircraft can produce 50 times more data than many older aircraft still in service. That increase in data volume leads to greater complexity, but also provides significant opportunities to increase safety and efficiency. The data not only needs to be stored – it must be sorted, analyzed, interpreted, and translated into meaningful insights and actionable recommendations. Honeywell and Lufthansa Technik, two of the leading maintenance, repair and overhaul service providers in the world,



excel at that translation from data to insight. With inclusion of the Honeywell Forge analytics on the AVIATAR platform, customers can broaden their aircraft component coverage and depth, thus enabling customers to make faster and better operational decisions.

"Combining the power of Honeywell Forge Connected Maintenance with the capability of AVIATAR provides a new option for airlines looking for a total aircraft digital maintenance solution," says Jim Currier, president, Europe, Middle East, Africa, and India Sales at Honeywell, Aerospace. "Honeywell and Lufthansa Technik bring decades of experience with aircraft maintenance to this digital experience. This results in opportunities for airlines to reduce minimum equipment list failures by up to 35 percent while reducing flight cancellations or delays due to maintenance."

AAR to Adopt Donecle's Automated Inspection Drone

Donecle and AAR will work together to use Donecle's automated drone solution to improve the efficiency and reliability of visual inspections during base maintenance.

The drones will assist general visual inspections on both Airbus A320 and Boeing 737 families. AAR is Donecle's first MRO customer in the U. S. and the first one to use the drone operationally on the Boeing 737.



Following prior tests in its facilities, AAR chose Donecle's automated drone solution for visual inspections of the narrowbody aircraft it maintains in Miami, Fla. Donecle has also recently

delivered the latest release of its software which includes updated advanced analysis algorithms for defect detection. With this updated software, Donecle says inspectors can easily perform aircraft inspections. Damage as small as 1mm² can be detected on the images and are precisely positioned relative to airframe structural elements, for a better assessment of the criticality of the defect.

This leads to better planning on subsequent maintenance job cards. Reports are then automatically generated and stored on Donecle's cloud for full traceability.

"We are very proud to support AAR in its innovation process aiming at better serving its customers and keeping its position as a leading independent MRO in the USA and worldwide, while contributing to its internal digitization process," says Josselin Bequet, CEO and co-founder at Donecle.

Donecle says they are confident the solution will save time and workload and can also contribute to increased worker' safety by reducing the requirement to work at significant heights to perform inspections. With Donecle, operators monitor the drone's mission directly from the ground.

"As part of our continuing commitment to driving real business value using emerging technology, AAR is excited about this new partnership and the capabilities Donecle brings," says Matthew Kammerait, director digital product management, AAR. "We will continue to look for ways to drive efficiencies and maximize the value of our skilled labor and look forward to continued partnership from OEM's and regulators in maximizing the value these technologies can create."

UMBRAGROUP Expands with MRO Center of Excellence in Michigan

One year after the acquisition of Thomson Aerospace & Defense, the pioneering name in aviation ball screw actuation, UMBRAGROUP continues its path of growth and innovation as it inaugurated a new state of the art MRO operation in its Saginaw, Michigan plant. The ribbon cutting and grand opening took place in October and marks another step for UMBRAGROUP in providing expanded services to their customers.

"This new Repair and Overhaul center is a wonderful achievement for UMBRAGROUP," states Antonio Baldaccini, CEO and president UMBRAGROUP. "It allows us to offer expanded capabilities with excellent service closer to our customers in the target market of North America." Thomson Aerospace & Defense essentially pioneered aviation ball screw actuation in the early 1940's, and with their decades of related MRO experience, UMBRAGROUP says they were the logical choice for their strategic initiatives. "This inauguration marks another milestone for UMBRAGROUP in revolutionizing motion solutions for our aerospace and defense customers."

The MRO business in Saginaw is expected to grow revenues to more than \$13 million in 2020, which is just one example of the



many investments UMBRAGROUP is planning for the Thomson Aerospace & Defense business in Saginaw. During the next four to five years, the company intends to invest as much as \$20 million for plant and equipment modernization. The group says they are "always ready for new challenges and growth opportunities in today's highly dynamic and competitive global context."

Commerce Dept. Investing to Help Establish Training Center for Maintenance Technology

U.S. Secretary of Commerce Wilbur Ross announced that the Department's Economic Development Administration (EDA) is awarding a \$12.25 million grant to the city of Pensacola, Florida, to make critical infrastructure improvements needed to establish a maintenance training facility at Pensacola International Airport. The EDA grant, to be matched with more than \$36 million in state and local investment, is expected to help create 400 jobs.

"The new maintenance training facility being built with the help of this grant will prepare students for careers in the commercial aviation industry while also making the region's economy more resilient in the face of future natural

disasters," says Secretary of Commerce Wilbur Ross.

"I welcome the Department of Commerce's investment to establish a maintenance training facility at Pensacola International Airport," says Senator Marco Rubio. "This important investment in Pensacola's infrastructure will help to create hundreds of new jobs and opportunities for dignified work, as well as uplift the local economy."

This project will fund the construction of a 173,000 square-foot airport hangar, along with adjacent taxi ways and related infrastructure, at Pensacola International Airport. Designed to withstand 170 mph winds, the facility will support state-of-the-art maintenance, repair and overhaul operations, and provide a training center for commercial and technological aviation programs. This project was made possible by the regional planning efforts led by the West Florida Regional Planning Council.

ST Engineering Holds Hiring Fair for Pensacola Facility

In conjunction with the U.S. Department of Commerce \$12.25 million grant to help establish a new aircraft maintenance training facility at the Pensacola International Airport, ST

Engineering hosted a hiring event for their expanding facility in Pensacola. ST Engineering is trying to fill open aircraft mechanic positions and says they hope to attract people in the area with military background

At the event retired Marine Phil Jackson said he was trying to get back into the aviation industry. Jackson believes they won't have a hard time finding qualified candidates in the panhandle area of Florida. "Having this additional employer in the area in the business of aviation is great, between the Navy and Marine Corps, all the instructors and mechanics that come through here, I think they are not going to have any problems finding people," said Jackson.

ST Engineering representatives at the hiring event told applicants that even those without an A&P or other certifications may still have luck with certain job openings.



about people

Baker to Lead Collins Aftermarket



Collins Aerospace Systems announced that Gail Baker has been appointed vice president, Aftermarket Services, reporting

directly to CEO Kelly Ortberg. In her new role, Baker is responsible for leading the worldwide commercial and military aftermarket business and customer service organizations, including customer offerings, long-term aftermarket programs, spares, part repairs, asset management and technical and strategic support. Baker has been with UTC for more than 30 years. She most recently led the Intelligence, Surveillance, Reconnaissance & Space Solutions segment for Mission Systems.

New Leadership at Boeing in Wake of Max Issues and Earnings Report



Kevin McAllister is out as Boeing Commercial Airplanes division president and CEO. He has been replaced by Stan Deal, who had been most recently leading the two-year-old Boeing Global Services (BGS) division. Deal has been replaced at BGS by Ted Colbert.



Deal has led BGS since its inception and helped

define their new aerospace services development and delivery model for commercial support. New BGS president and CEO Colbert joined Boeing in 2009 and is a member of the Boeing Executive Council. Now as president and CEO of Boeing Global Services, he will take over where Deal has left off. In his prior role he served as chief information officer (CIO) and senior vice president of Information Technology & Data Analytics. In that role, Boeing says he oversaw all aspects of information technology, information security, data and analytics. He also supported the growth of Boeing's business through IT- and analytics-related revenue generating programs.

ATP's Machine-Based Learning Solves Aircraft Data Problem

ATP CaseBank launched a new machine-based learning application, designed to help improve the accuracy of documenting Air Transport Association (ATA) codes. The new feature is the latest in the continuing evolution of the company's ChronicX software suite. ATP Casebank says ChronicX is used by more than 25 percent of the world's commercial airline fleet to detect recurring or chronic issues on aircraft.

The company says that it is common for a medium-sized airline fleet producing 1,000 new records each day, to have 40 percent of defects not being flagged correctly to maintenance control due to incorrect ATA codes. The company says their new ChronicX ATA recoding feature can automatically predict the right four-digit ATA code for a defect based on its description, regardless of how it has been entered or reported.

In addition to providing four-digit accuracy at a 90 percent level, the new recoding application continuously learns from user feedback. This allows prediction accuracy to increase exponentially with

continued usage. Airline teams can recode all their defects with reduced effort and in a fraction of the time it would take with other systems and processes, ChronicX contends. The data they are working with is also more reliable, which can contribute to better informed decisions.

"The airline industry has struggled for years with the accuracy of the ATA codes being applied to maintenance issues and its impact on the data they rely on to ensure the safety of their aircraft," says James Geneau, chief marketing officer at ATP CaseBank. "By working closely with our global airline customers, our product team identified this as an opportunity where our in-house machine-learning experts could develop a solution for the industry. Maintenance technicians are extremely busy and focused on quickly getting planes fixed and moving," adds Geneau. "This new feature allows them to stay focused on the job at hand while maintenance control can rely on technology to ensure a higher degree of accuracy in the overall data needed to do their job."

XEOS Aircraft Engine Service Center Opens in Poland

XEOS, the new aircraft engine service center located in Sroda Slaska near Wrocław, Poland celebrated its official opening in September 2019. The company is a joint venture of Lufthansa Technik (51%) and GE Aviation (49%) and is a service center for GEnx-2B and GE9X engines.

It was built in 16 months, a record Lufthansa Technik says. The first commercial engine was accepted for repair in April 2019. By the end of this year about 20 engines will have been inducted for service there. And by 2023 the companies say the plant will repair more than 200 engines per year.

The grand opening ceremony was attended by representatives of the Chancellery of the President of the Republic of Poland and the Polish government as well as Ambassador of the Federal Republic of Germany Rolf Nikel and Christian Cardona, Political and Economic Consul of the US General Consulate. Carsten Spohr, CEO and Chairman of the Executive Board of Deutsche Lufthansa, Dr. Johannes Bussmann, CEO of Lufthansa Technik, David Joyce, Vice Chair, GE and President & CEO,



GE Aviation and Jean Lydon-Rodgers, President and CEO, GE Aviation Service.

"For decades, Lufthansa Technik has been known as a center of excellence in the maintenance, repair, and overhaul business of engines and engine components," said Dr. Johannes Bussmann, CEO of Lufthansa Technik. "The successful opening of the XEOS engine shop with our partner GE is a cornerstone for our long-term growth strategy to offer comprehensive MRO services also for the latest generations of aircraft engines." The JV partners invested about \$250 million to construct the facility, in total.

Able Enters 737 Market with Upgrade, Sale of Landing Gear Sets

Able Aerospace Services has entered into the Boeing 737NG landing gear aftermarket support arena with the modification, upgrade and sale of its first B737-800 landing gear sets. The sale, which includes three inaugural landing gear sets, was made to a large commercial airline.

"Able's track record in the commercial airline MRO market spans two decades and a wide range of services for Boeing and Airbus, including engine mounts, tracks, carriages and actuation assemblies," said Michael Vercio, general manager at Able Aerospace Services. "Based on the size of the Boeing 737NG fleet, we anticipate a strong demand for aftermarket services on this aircraft and are putting our knowledge and resources to work to meet that demand – expanding our facility and refining our processes to service a platform that we expect to be a significant part of our future."

There are nearly 7,000 Boeing 737NG in operation today. Able's new landing gear capabilities will serve commercial airlines, landing gear shops requiring

outsource support, and select third-party suppliers. The company has just completed a 60,000-square-foot expansion, in large part the company says, to accommodate this effort.

Able's first landing gear sets included modifications and upgrades to support B737-800 aircraft. It is now booking sales for additional landing gear sets to support B737-700/-800/-900 aircraft. During the next 12 to 24 months, the company is also planning the phased rollout of a comprehensive 737NG repair and overhaul service, as well as exchange options.

"Able is well-positioned to be a single source for landing gear repair and overhaul, combining our engineering, product development and repair teams to offer customers top-tier 737 support from a company they know and trust," says Jeff Miller, manager, Regional Sales at Able Aerospace Services and lead of the company's fixed-wing business line.

All Boeing 737NG upgrades are completed out of Able's 260,000-square-foot headquarters.

about people

STS Hires Mick Adams to Spearhead European Ops



Fresh off the heels of acquiring Apple Aviation and purchasing the former Monarch Aircraft Engineering (MAEL) wide-body aircraft hangar in

Birmingham, England, STS Aviation Group (STS) has appointed Michael John (Mick) Adams to oversee its European operations. Adams will immediately begin to manage Apple Aviation, the wide-body facility in Birmingham and all other existing STS entities in Europe. Adams brings nearly 40 years of industry experience with him having previously served as the vice president of Transformational Deals, the EVP of Etihad Airways Engineering and the managing director of Monarch Aircraft Engineering. "I'm thrilled to join STS Aviation Group, and I look forward to the rewarding challenge that will come from leading its highly motivated teams."

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Honeywell to Offer Avionics Tech Pub Libraries on ATP's Aviation Hub

ATP announced it has entered into an expanded partnership agreement with Honeywell and will be expanding the existing Honeywell technical publications available through their ATP Aviation Hub single source portal to include Honeywell's collection of Avionics libraries.

This will allow owner/operators and entitled management companies to manage and access their current technical and regulatory information for airframes, Honeywell engines, avionics, and other aircraft components. The addition of Honeywell's Avionics Libraries further expands the overall content available through ATP Libraries. ATP says it provides comprehensive technical publications and applicable regulatory information, that includes Airworthiness Directives (Ads).

"ATP is delighted to have signed an expanded partnership with Honeywell Aerospace and we look forward to building upon the success of our current relationship and our confidence in future opportunities together," says Rick Noble, CEO of ATP. "With this partnership, ATP's unique single-source platform for technical information, through the ATP Aviation Hub, makes it even easier for our network of over 45,000 users in 137 countries to access Honeywell information," Noble says. "The Honeywell Avionics Libraries allow users to locate information using the Hub's intelligent and powerful search capabilities across the most channels and devices in the industry - including mobile, web, desktop, and more."

CAS Components Awarded Five-Year Contract

Certified Aviation Services (CAS) Components signed a five-year agreement with a major cargo carrier. Out of a competitive pool of approved vendors competing for the service contract, CAS was chosen by the air carrier as their component repair shop.

This extensive contract requires full coverage on repair and overhaul of high flow pneumatics, air cycle machines and mechanical accessories. The agreement was specifically assembled to provide higher reliability and reduced turnaround time.

CAS says their internally designated engineering representative (DER) capabilities and a robust partnership with a parts manufacturer approval (PMA) house will be utilized on this contract. "While we have supported their operations for a few years now, this contract not only memorializes the relationship, but it allows CAS a much larger supporting role regarding component repair," Brad Caban, president of CAS Components says.

Unison Launches Hi-Performance Igniter Plug on Alaska Airlines' Fleet

Unison Industries signed a long-term material purchase agreement with Alaska Airlines for the purchase of its new Hi-Performance Igniter Plug for use on Alaska Airlines' CFM56-7 powered fleet. Alaska Airlines currently has more than 160 Boeing 737 aircraft in service.

Unison says the igniter enables Alaska Airlines to



almost double the lifespan compared to standard or legacy igniters, extending time on wing. The all-new patented technology improves spark life under harsh conditions, Unison says. During bench and field testing, the Hi-Performance Igniter succeeded in extreme temperatures up to 2,000°F. Alaska Airlines is Unison's launch partner for the Hi-Performance Igniter.

Unison will support Alaska Airlines with available material on-hand which will help reduce annual maintenance costs by decreasing the number of replacements as a result of increased intervals. Unison has the only CFM56 OEM-approved igniter plug by CFM, and it is currently being installed on all new CFM56 engines after receiving FAA approval in 2018.

"This product is a prime example of Unison's focus on continuous improvement for in-service fleets," says Tom Hoferer, Unison Industries president "We are proud to partner with Alaska Airlines and work hand-in-hand with them while leveraging our strong partnership across the engine OEMs."

"Our teams worked closely together for many months to ensure the product would be safe and reliable for use on Alaska's fleet," says Todd Martin, manager of Powerplant Engineering for Alaska Airlines. "We look forward to the increased reliability and decreased cost that this igniter brings to the airline,"

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Epic Aircraft Achieves FAA Type Certification

Epic Aircraft announced the Federal Aviation Administration (FAA) has granted Type Certification for its E1000 all carbon fiber aircraft design, concluding a rigorous seven-year program. "This is a remarkable accomplishment for our entire community," says Doug King, Epic CEO. "I want to thank our employees, who have worked so diligently to deliver this exceptional design, as well as our partners, suppliers and customers, who have faithfully supported us each step of the way. It has been a true team effort, along with the fantastic support of the FAA."

The Epic E1000 is based on the company's experimental Epic LT model which was introduced to the market in 2005 through an owner-assist build program based at Epic headquarters. "Transitioning that design into a certified version was the chance to offer a truly compelling product to the industry, a 'no compromises' aircraft that customers would really want," says King. Epic says it has more than 80 confirmed E1000 reservations from around the U.S., Canada, Mexico, Central/South America, Europe, Russia, South Africa and Australia.

"We had some opportunities to speed things up along the way, to get certification earlier," said King. "But that would have required some tradeoffs that we weren't willing to make. We consider performance to be our brand, so we decided to make it perform. And we did!"

The first seven E1000 customer aircraft are in various stages of



fabrication, bonding and assembly, with initial deliveries slated to begin this year. Epic has doubled its composite fabrication capacity, invested in tooling, equipment, curing ovens and refined workflows to accelerate E1000 production ramp. The company is currently running two production shifts, with plans to further expand operations. Production Certification is targeted for the first quarter of 2020.

"The FAA has a difficult job, overseeing a very challenging process, ultimately aimed at keeping us all safe," King says. "They have been a great partner, collaborating with us throughout the program, and certainly contributing to the structural integrity and safety of the E1000. We are very excited to begin this new chapter in the Epic Aircraft story."

TS&S Rebranding as Sanad Powertech

Mubadala Investment Company has announced a new positioning for its wholly owned company, Turbine Services & Solutions Industrial (TS&S). This Maintenance, Repair and Overhaul (MRO) provider for gas turbine and rotating driven equipment, has been rebranded as Sanad Powertech. Mubadala says the creation of the company's new identity follows the recent transition of TS&S Aerospace to Sanad Aerotech, a specialist company in aircraft engine MRO.

This latest development completes a refreshed go-to-market proposition for the company, which is designed with the customers' needs at the center and reflects the demands and opportunities of a modern industrial and aerospace ecosystem according to Mubadala. Sanad Powertech will continue TS&S Industrial's existing UAE and global maintenance and servicing contracts in the oil & gas and power generation industries. The refreshed brand also provides a new platform to build further momentum through innovation and technology investment.

"Sanad Powertech has a long-established track-record of engineering and technical excellence cementing Abu Dhabi's global credentials," says Badr Al Olama, head of Aerospace, Mubadala Investment. "This new chapter will continue the innovation and customer-centric culture that has been the cornerstone of its success."

Mansoor Janahi will continue as the company's CEO. Sanad Powertech says this positioning will also see the organization harness trends such as 3D printing, automation and Artificial Intelligence (AI) in its continued drive to create value for customers. "This transition reflects a new chapter in our journey. Sanad Powertech leverages a strong customer focused legacy while strengthening our commitment to utilizing the latest technologies to deliver world-class services," says CEO Janahi.



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Sabena technics Performs First B787 C-Check

Sabena technics has completed base maintenance operations on one of Spanish-based Air Europa's Boeing 787-8s and inducted another. The first aircraft has left the MRO's facility on-time after a C-Check. The second aircraft has already arrived at Sabena technics' premises in Bordeaux, France.

"Our teams handled this project with great enthusiasm, hard work and dedication and made sure to put safety and quality first," says Philippe Rochet, Sabena technics CEO. "We are thrilled to have Air Europa as our launching customer for base maintenance checks on the Dreamliner aircraft and look forward to increasing our B787 capability."

For the past two years, Sabena technics has also been providing Air Europa with airframe solutions for their fleet of A330s. "We at Air Europa are greatly impressed with Sabena technics' performance completing this first B787 C-check on time. A fluent co-operation between both our teams has also contributed to reach this goal. We remain fully confident with Sabena technics for future projects," says Alberto Lines, Maintenance & Engineering director at Air Europa.

Anticipating the increase of long range wide-body aircraft in Europe and the need to get more capacity to support its customers, Sabena technics will also be opening a brand new 10,000 square meter hangar in Bordeaux in January 2020.

The facility will be able to accommodate long-range wide-body aircraft up to a A350-1000/B777-9X or up to two B787s. simultaneously.



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Kaman Receives Boeing Award for the A-10 Re-Wing Program



Kaman Aerospace has been awarded an indefinite-delivery/indefinite-quantity (IDIQ) contract by The Boeing Company. This new work package is for the manufacture of wing control surfaces and

structural assemblies in support of the U.S Air Force (USAF) A-10 Thunderbolt Advanced Wing Continuation Kitting (ATTACK) program. Work for this program will be performed in its Jacksonville, Fla., facility. The USAF awarded Boeing a \$999 million contract to provide up to 112 new wing assemblies and up to 15 wing kits through 2030.

Kaman delivered flight control surfaces to Boeing for 173 aircraft under the previous Wing Replacement Program (WRP) that ran from 2007 through to 2018. Kaman will deliver wing structural assemblies, which include the inboard and outboard flaps, slats, and deceleron/speed brake assemblies, including upper and lower speed brakes, trim tabs, and leading edge assemblies.

"Kaman Aerospace Jacksonville is honored to be selected by Boeing as a key supplier on the A-10 Thunderbolt Advanced Wing Continuation Kitting (ATTACK) program," says William Zmyndak, vice president and general manager of Kaman Integrated Structures and Metallics. "Our established manufacturing 'know-how', experience with A-10 structures and knowledge of the Boeing requirements puts us in a 'ready now' position to execute this program. We have developed a great working relationship with Boeing to support our mutual Customer, the U.S. Air Force, in their efforts to extend the life of this iconic aircraft to 2030 and beyond."

Turtles Fly Too Charity Saves Sea Turtles

Turtles Fly Too (TF2) has extended its air rescue operations of sea turtles, whales and sea mammals on the Atlantic and Pacific. NOAA Fisheries and US FWS have partnered with TF2. TF2's air rescue operations will be conducted in the Pacific from Alaska to Mexico. On the Atlantic side, from Canada to the Caribbean.

TF2 supports Center for Coastal Studies rescue team on the Atlantic and on the Pacific the SR3 rescue team by air transporting the team and gear. These are emergency flights for the purpose of freeing whales from fishing gear. These rescue missions are considered dangerous as rescue members have died. All whale rescue missions are done on an immediate emergency response basis. TF2 air transports to specialized animal hospitals where the mammals receive necessary care and are released back to the wild.

The Cape Cod sea turtle cold stun has started with the first rescue of a Kemp's Ridley turtle. The west coast will be starting soon with their sea turtle cold stuns of the Olive Ridley species. To be a part of TF2 rescue missions please sign up at <https://turtlesflytoo.org/become-a-volunteer/> or email Leslie Weinstein at Leslie@turtlesflytoo.org. Volunteers who fly T2F missions receive a 501c3 public charity charitable donation acknowledgement letter for tax purposes.

Spirit AeroSystems to Acquire Select Assets Of Bombardier Aerostructures and Aftermarket Services Business

Spirit AeroSystems has entered into an agreement to acquire select assets of Bombardier aerostructures and aftermarket services businesses in Belfast, Northern Ireland (known as Short Brothers); Casablanca, Morocco; and Dallas, United States, for \$500 million. In addition, Spirit AeroSystems will assume approximately \$300 million in net pension liabilities, and approximately \$290 million of government grant repayment obligations.

"The Bombardier operations bring world-class engineering expertise to Spirit and add to a strong track record of innovation, especially in advanced composites," says Tom Gentile, Spirit AeroSystems president and CEO. "Belfast has developed an impressive position in business jet fuselage production, in addition to the world-acclaimed fully integrated A220 composite wing. This acquisition is in line with our growth strategy of increasing Airbus content, developing low-cost country footprint, and growing our aftermarket business."

Gentile added that the Spirit team is excited about the opportunity to expand its operations into Northern Ireland and Morocco. The addition of the entire work package for the A220 wing and its technology are critical for the future of next-generation aircraft.



The acquired Bombardier operations employ more than 4,000 people at three sites comprising approximately 3.4 million square feet. The backlog of work includes long-term contracts on the Airbus A220 and A320neo, along with Bombardier business and regional jets.

The expected revenues of the acquired Bombardier operations will be approximately \$1 billion in 2019. The transaction, which is expected to close in the first half of 2020, is subject to regulatory approvals and customary closing conditions.

AFI KLM E&M Sets Up Teardown Management Subsidiary

AFI KLM E&M has been developing an aircraft teardown business for several years to improve supplies of component and engine spares. In 2018, the group finalized the purchase of two Boeing 777-200ERs. The engines on these aircraft, GE90-94Bs, were checked and returned to conformity, before



being made available via their maintenance shops, as an exchange solution for airlines. Several hundred parts from these same aircraft will be re-certified before being sold on or used to supply their global network of spares pools and repair shops, which the company says will result in contributing to improving service levels and cutting maintenance costs for customers.

AFI KLM E&M says is structured to be able to take advantage of the potential of these components and engines that can be re-used after teardown. As an airline MRO, it says it can assist the fleet plans of its customer airlines, enabling it to source the investment opportunities that are opening up on the teardown market. The teardown activities will be carried out in-house by KLM UK Engineering, which has approval for single-aisle aircraft teardown, at Bonus Tech for engines and other partners.

The recovered assets are inspected, overhauled and re-certified for use before supplying maintenance shops and spares pools worldwide. Alternatively, the company says they may be sold on the used parts market via their AAF Spares joint-venture. The AFI KLM E&M Teardown Management entity centralizes management and coordination of all these activities.

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Engine MRO Boom: Perfect Storm of Demand

By Charlotte Adams

AAR image

According to the Oliver Wyman MRO Forecast 2019 engine MRO will have some ups and downs over the next decade. “In the first five years, new engines are expected to lengthen the interval between shop visits with less need to replace life-limited parts and to conduct other scheduled maintenance,” that forecast predicts. They say that the new gen engines are more fuel-efficient but use more expensive materials and complex technologies that “can be quite expensive to replace or repair when the time comes.” Still, most engine shops are full right now and seeing unprecedentedly good times.

T

he commercial engine MRO market is thriving despite widespread geopolitical and economic uncertainties.

Continued high demand for air travel, low fuel costs, new-engine issues, and new-aircraft delivery problems, are among the factors keeping older models of aircraft and engines flying.

Engine makers are focused on smoothing the rollout of new models, providing opportunities for traditional players. Since most of the MROs are also allied with the OEMs, they can win business when OEM capacity comes under strain. But a big challenge is finding slots for shop visits and locating parts to build up engines. Capacity is expanding at a rapid clip.

“We are getting to the point where engine shops are all at capacity. There are very few out there that are not full,” notes Paul Richardson, AAR’s vice president of sales for the parts supply

business, Europe, the Middle East, and Africa. AAR manages the engine overhaul process with MRO partners and provides non-core component service, as well as parts support.

Large MROs are involved not only in touch labor but also in areas such as component repair; engine trading, leasing, and exchange; used serviceable material (USM); and teardowns/part-outs. So dips in one area are balanced by boosts in others.

Fuel prices today are 40 percent lower, compared to the average price from 2010-2014, notes Bill Dwyer, services marketing leader, GE Aviation. “In that sense, it’s a tailwind to mid-life aircraft, especially since interest rates have risen 2 percent in the last 24 months.” Higher interest rates and relatively low fuel cost mean that the capital cost of new aircraft outweighs the fuel efficiency benefit financially, he explains. The fastest growing engines are those which entered service in the past five to eight years, such as the GENx. GE Aviation boasts an engine services backlog of \$206 billion.

“Supply chains have clearly been tight, with



the simultaneous introduction of multiple new aircraft programs to address higher fuel costs from 2008-2014," he says. "However, we believe the worst is behind us, and significant resources have been put into mitigating production capacity constraints."

StandardAero anticipates that the commercial engine market will grow at a roughly five percent compound annual growth rate (CAGR) during the next few years. The company expects to enjoy robust growth in this market with the ramp-up of its newly industrialized RB211-535 program and its presence on steady growth platforms such as the CFM56-7B, CF34-8, PW127, and PW150, according to Alex Trapp, senior vice president of business development.

MRO demand today is a "perfect storm," says Martin Friis-Petersen, senior vice president for MRO programs with MTU Aero Engines. MTU Maintenance has a portfolio of around 30 engine models across the entire lifecycle and a capacity of more than 1,100 shop visits within its network. Key volume engines such as the V2500 and the CFM56 are being served in three different



StandardAero anticipates that the commercial engine market will grow at a roughly five percent compound annual growth rate (CAGR) during the next few years. The company expects to enjoy robust growth in this market. StandardAero images.

locations, increasing flexibility.

In addition there have been "teething problems" in the market regarding new engine types, such as the LEAP and GTF, says Marc Wilken, senior director product sales, with Lufthansa Group Key Account Management & Engine Lease. These have led to an increasing demand for short-term solutions and earlier capability build-up, he adds.

LEAP and GTF teething problems mean that new product lines need to be up and running earlier than estimated, which calls for a fast and focused ramp-up of new facilities. LHT also has "introduced temporary product lines in Hamburg for both the GTF and the GENx-2B in order to support our customers."

The grounding of the 737 MAX also introduces an uncertainty factor into the

short-to-medium-term evolution of the world medium-haul fleet, notes Michael Grootenboer, AFI KLM E&M's senior vice president, engine product. It means that existing engine types like the CFM56-7B are staying on wing longer, pending the MAX return to flight, and that they may see more significant work scopes when they do come off, he adds.

Popular Types

At the moment the MRO market is dominated by CFM56 and V2500, Wilken says. These stalwarts will account for the majority of yearly engine overhauls until the end of the 2020s, he predicts.

But shop visits for the newer versions of V2500 and CFM56 engine families – the V2500-A5, CFM56-5B, and CFM56-7 – will peak by the mid-2020s, MTU's Friis-Petersen says. Demand for services for older legacy engines, such as the CF6-80C2, has continued longer than expected – thanks to low fuel prices and high air transport demand, where demand for aircraft and engines exceeds delivery rates. Also, new-generation engines are entering the shops earlier than originally anticipated and will ramp up in the next decades. "All this has led to our shops being fully loaded worldwide."

AFI KLM E&M is likewise seeing strong demand across all of its product lines, Grootenboer says. The CFM56, both -5B and -7B, have yet to reach their peak volumes. And demand on the GE90 is also strong.

Moreover, "in [recent] years we have witnessed a ramp-up of new engines at a speed that has never been seen before," he says. AFI KLM E&M sees this as an opportunity, as it "has proven to be a frontrunner in industrializing maintenance on new platforms like GENx, LEAP, and imminently on the Trent XWB." We anticipate continued strong market growth with Asia seeing the largest increases, Grootenboer says.

In terms of sheer volume, the V2500 and CFM56 continue to see huge demand for MRO services, with reasonably steady growth, StandardAero's Trapp agrees. But in pure percentage growth, it's the GTF, soon to be followed by the LEAP. "The widebody market is smaller but heavily growing, with programs maturing like the Trent 700 and GE90, continued in-service activity with CF6 and PW4000, and the introduction of new engine programs like the Trent 1000, GENx, and Trent XWB."

With over 7,000 engines in service, the V2500 engine will be in high demand for the next decade or more, predicts Joe Sylvestro, vice president, global



AAR manages the engine overhaul process with MRO partners and provides non-core component service, as well as parts support. AAR image.



One of AAR's growth strategies is building up its engine pools. They look for unserviceable engines in the market, overhaul them and make them available for sale, lease or exchange. AAR image.

aftermarket operations for Pratt & Whitney. "We expect the PW4000 and PW2000 engines to still be in service and continue to be an important part of our overall engine portfolio, just at lower rates than the prior decade." In fact, PW2000-powered B757s are in very high demand in the used aircraft marketplace, he adds.

Parts Squeeze

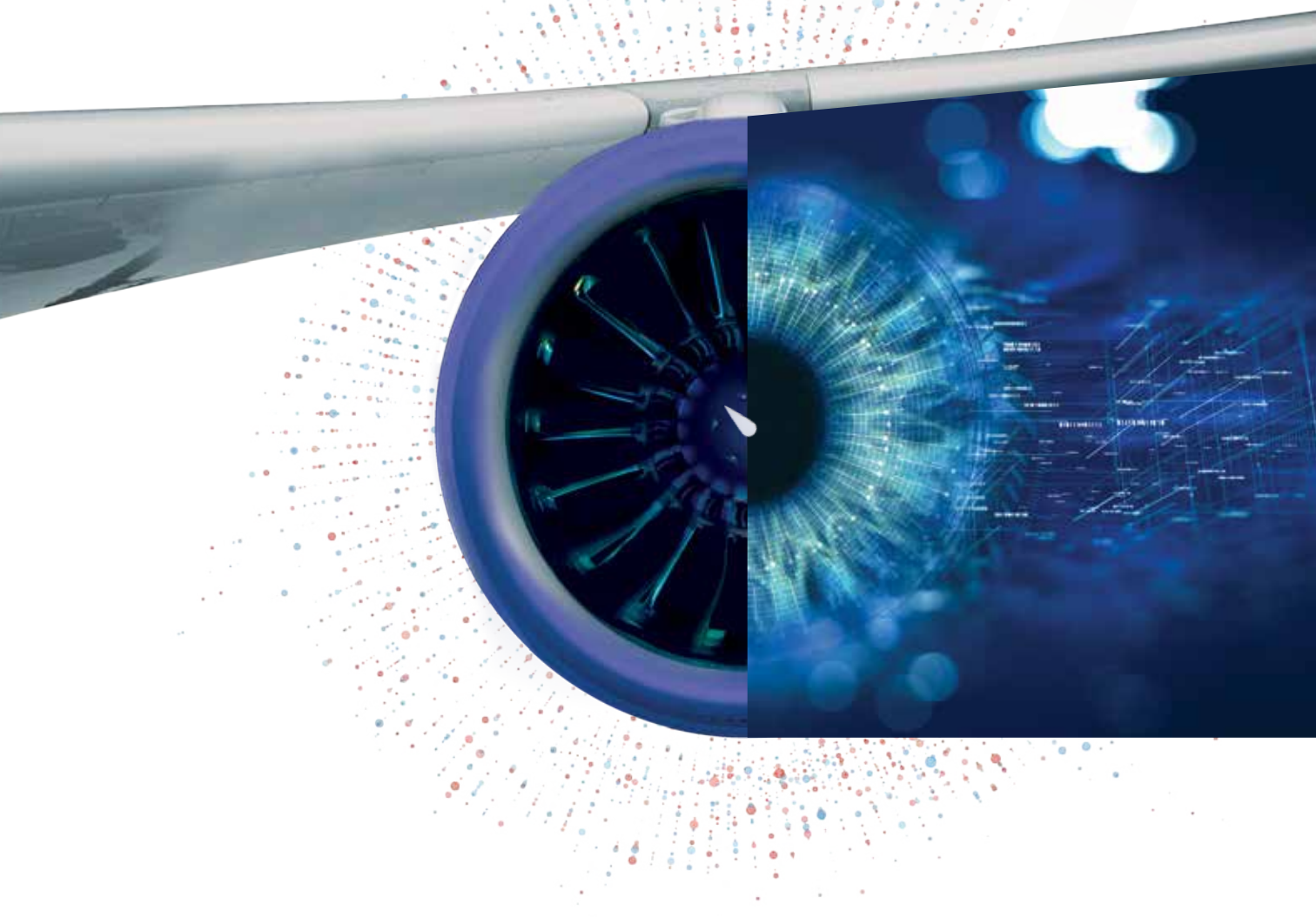
It's challenging to find new parts to support legacy engines, AAR's Richardson says, as OEMs tend to focus on new engines. MROs are seeing longer lifecycles in the shops. What was once a 60-day

window may become a more than 90-day window in large part because of the time required to collect the inventory to build the engine.

"The biggest growth constraint for engine MRO providers is the availability and timely supply of certain new parts from engine OEMs," StandardAero's Trapp asserts. "Currently, and for several months now, demand is outstripping supply in forging and casting suppliers, as new-generation engine program production and aftermarket requirements have collided with aftermarket demand from legacy engine programs."



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Rune Veenstra, chief business officer for Aero Norway, says the supply chain for engine MROs is struggling to keep up with the high demand for shop visits. Aero Norway images.

StandardAero has “partially repaired engines sitting in our shops waiting for specific parts, which is constraining physical capacity, extending turn times, and disallowing delivery of engines back to our customers,” Trapp says. Because legacy aircraft continue to fly -- which is a positive trend -- “there is a scarcity of used material, driven by less retirements and high consumption demand.” At StandardAero, “we are seeing extremely high demand for our services across all engine platforms, yet an inability to provide the capacity to

service all of the demand due to lack of parts availability,” he says.

One of AAR’s growth strategies is building up its engine pools, Richardson says. These engines, which have been “basically put through the shop ahead of time,” will help customers who may not have been able to get a shop visit. It means finding an unserviceable engine in the market, overhauling it, so that it’s a “high-cycle, strong engine,” and making it available for sale, lease, or exchange. The trick is to find an engine that -- with relatively little

investment -- can be made serviceable again, he says. “That’s the ideal candidate.” The company is looking at “increased flow” for RB211-535s and CFM56-7s, for example.

“We will be opportunistic, based on market movements, but also tailor solutions to support the customer,” for example, by building assets to a tailored work scope, he says.

As part of its “global yet local” strategy to be close to customers, MTU just opened an MTU Maintenance Lease Services office in Singapore. This makes sense as, by 2029, around 40 percent (vs. today’s 23 percent) of the world’s fleet will be operating in the Asia-Pacific region, a large proportion of them on lease, Friis-Petersen says. And more than 2,000 aircraft are expected to be retired in Asia in the next 10 years. So with the Singapore office, “we are ideally placed to support asset owners with their large maturing and migrating fleets.”

StandardAero notes that MAX issues have created an opportunity, as airline demand “has been backfilled by aircraft powered by engines on which we perform MRO services, such as CFM56.” On the other hand, parts supply challenges have led StandardAero to “constantly deploy creative solutions for creating induction slots,” Trapp says. For example, it partially builds engines “to be ready to receive the last remaining parts upon supply and [to be] released immediately thereafter.” StandardAero also uses its repair development capabilities to create new repairs, and uses its supply base “to procure used material or tear down engines for parts where appropriate.”

We know that, in general, customers are looking for quality and fast turnaround time, he says. “We also know that on mature platforms, the requirements can skew towards cost and customized solutions facilitated by ... used serviceable material, component repair and repair development, asset acquisition disposition, engine exchange programs, [and] creative work-scoping.” This allows room for solutions such as module-level MRO and lifecycle-optimized build lives. As an independent MRO, he says, StandardAero has a long history of providing these solutions across market sectors, engine platforms, and products manufactured by all of the major OEMs.

AFI KLM E&M also “is constantly developing innovative repair solutions to lower the cost of ownership” and address tightness in the supply of replacement parts, Grootenboer says. Some examples are fan mid shaft repairs for the GE90 and GENx at its facility in Amsterdam and GENx combustor repairs in its subsidiary, CRMA.

AFI KLM E&M also is experienced in sourcing and using high-quality USM at competitive prices, via its large USM trading network. Moreover, Bonustech in Miami provides dedicated engine



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Pratt & Whitney says they have made significant investments, including facility upgrades, innovative customer training platforms and new service tools, that allow them to be more responsive and to better support their engines. Pratt & Whitney image.

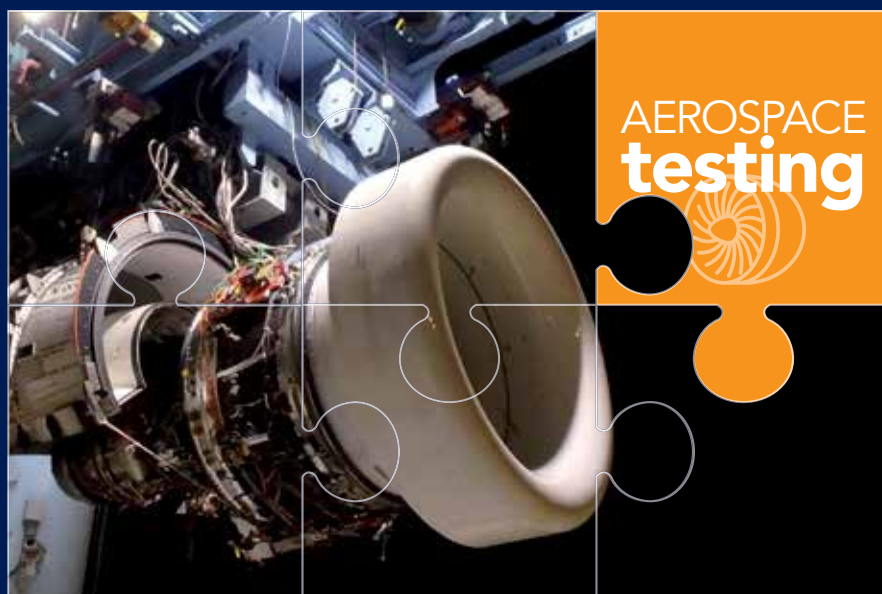
teardown capabilities within the AFI KLM E&M footprint, and the MRO adapts its use of USM to build customers' engines to their preferences and specifications.

Growing Capacity

Pratt & Whitney has invested about \$450 million since June 2016 at its Columbus, Ga., facility to upgrade equipment, expand production, increase capacity, expand GTF engine maintenance capability and capacity, and construct a new GTF engine overhaul facility, Sylvestro says. An estimated capital investment of nearly \$85 million will outfit Eagle Services Asia with capabilities such as an environment control system and an engine flow line system.

P&W's GTF network currently includes itself, MTU, JAEC, Lufthansa Technik, and Delta TechOps. The OEM likewise boasts 10 third-party repair suppliers — Turbine Controls, StandardAero, TWIN MRO, ACMT, Lewis & Saunders, FAG Aerospace (Schaeffler), American Cladding Technologies, Tube Processing, MDS Coating Technologies, and MB Aerospace, Sylvestro says. P&W also has invested in its West Palm Beach facility.

MTU is adding capacity at all its locations. On the mature engine side



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it is introducing the CF6-80C2 in MTU Maintenance Canada alongside the V2500. MTU Maintenance Zhuhai, which services current-generation engines such as the CFM56 and V2500, is slated to expand by 50 percent — to 450 shop visits p.a. — in 2021.

In Hannover, MTU is adding 22,000 square meters of hall space. On the new engine side MTU Maintenance is adding LEAP capabilities via MTU Maintenance Zhuhai, and is building its LHT JV, EME Aero, in Poland specifically for the geared turbofan family. It is expanding Airfoil Services Sdn. Bhd, the Malaysia-based JV with LHT and planning a new parts repair site in Serbia. MTU Maintenance Serbia, to start operations in 2022, will create 400,000

repair hours.

The Zhuhai shop also has inducted its first LEAP-1B quick turn engine. “We will build up to full overhauls of -1B engines over the course of the next year or so and, according to our licensing agreement, introduce -1A services at a later date,” Friis-Petersen says.

“The supply chain for engine MROs is struggling to keep up with the high demand for shop visits,” agrees Rune Veenstra, chief business officer for Aero Norway, which repairs and overhauls CFM56-3, CFM56-5B and CFM56-7B.

The forecast going forward shows that there will be more shop visits for the CFM56-5B and 7B for the next five years, he says. “This will create high pressure in

By the Numbers

Oliver Wyman estimates in its Global Fleet & MRO Market Forecast that the world market for engine MRO services will grow from \$33.4 billion in 2019 to \$50 billion in 2029. The report forecasts that the compound annual growth rate will rise from 3.6 percent in the first half of the decade to 4.6 percent in the second.

Frost & Sullivan’s estimate tracks the initial number closely, putting the commercial engine aftermarket in 2018 at \$32.06 billion, according to Tim Kuder, senior industry analyst for commercial aerospace. He estimates MRO market share for GE engines at 31 percent, CFM International, 33.3 percent, Rolls-Royce, 14.4 percent, Pratt & Whitney, 11.1 percent, and International Aero Engines at 8.9 percent.

Aero Norway is an independent engine MRO delivering globally recognised flexible workscopes for CFM56-3C/5B/7B series engines.

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In October 2019 GE Aviation and Lufthansa Technik launched XEOS, a facility in Poland that will specialize in overhauling GEnx-2Bs and GE9Xs, Dwyer says. EME Aero, LHT’s GTF joint venture with MTU Aero Engines, is ramping up on schedule. LHT also is launching a wholly-owned subsidiary in Hungary for engine parts and accessories repair and overhaul, slated to begin operations in 2022. Meanwhile LHT’s shop in Hamburg can simultaneously handle CFMs, V2500s, and LEAPs.

StandardAero has expanded its large engine capacity through the acquisition of high thrust test cells, allowing the MRO to win and industrialize the RB211-535 program. And it has expanded component repair capacity in existing locations in Cincinnati and Miami.

New technology

Pratt & Whitney recently introduced its Track app, which provides access to order information with a few taps of a finger, Sylvestro says. Customers can track spare parts orders, component repair orders, and engine overhauls, using filter and search options that improve order visibility.

LHT, meanwhile, has set up a new data aggregation, processing, and sharing company, called AVIATION DataHub. The MRO currently holds a 100 percent stake but plans to add other shareholders and partners from the aviation industry.

LHT announced this summer that Croatia Airlines is using the predictive maintenance tool, AVIATAR. Swiss International Air Lines, another AVIATAR user, has reported steady improvements in its processes, the MRO says, thanks in part to the proactive replacement of components. **AM**



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“I’ve been an engine module technician on CFM56 and CF6 engines for 10 years. Thanks to this experience I have joined the LEAP team. I’m determined to provide the best quality and TAT to meet our customers’ expectations, while always looking for ways to improve our processes.”

Leandro Rodrigues Oliveira, Engine Module Technician

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

* LEAP engines are products of CFM International, a 50/50 joint company between GE and Safran Aircraft Engines.

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While the perception may, or may not, be accurate, to most of us, the only element of the current business jet that hasn't benefitted from any real advancements have been the requirements and procedures for maintenance and inspections. Sure iPads and electronic documentation are making inroads, but everything else is pretty much where it was back when Lear 35s and Gulfstream IIIs were factory new.

Whether you're a maintainer or an owner/operator, you'll be happy to know that's all going to change. And it will happen sooner than you think. Every business jet manufacturer is committed to developing and implementing new capabilities, materials and services to help their customers get the most value and reliability out of these amazing aircraft.

To learn more about what's coming, Aviation Maintenance magazine assembled a virtual roundtable of leaders from Embraer, Falcon Jet, Gulfstream and Textron Aviation, (Bombardier and Honda Jet were both contacted, but declined to participate, ED), to find out what these leading OEMs are doing to introduce new technologies and materials to bring significant technological advancements to aircraft production, inspection, and maintenance.

Dassault Falcon Jet

When it comes to introducing new technologies or manufacturing techniques into the development and production of its business jet line, Dassault Falcon Jet has the advantage of being able to pull from its deep roots in high-performance military aircraft for inspiration.

"When it comes to engineering and development, we really benefit from the duality of our history in the defense and business aviation sides," John Loh, Dassault Falcon Jet's vice president of Customer Service said. "Our R&D activities related to improving our maintenance programs in both





Falcon says they benefit from their history in defense and use that knowledge in their business aviation service and support offerings. Falcon images.

sectors are a constant focus for us."

Because of that ongoing effort and stimulus from its commercial and defense customers, the company has identified a number of new technologies and processes which range from using drones for aircraft inspections to new diagnostic apps, to advanced fleet maintenance data analytics, to a new paint application process, and many more.

"We recently implemented our FHDB (Fault History Database) as part of our fleet diagnostics program, which will allow us to do some advanced troubleshooting," Loh said. "We're looking at it to help detect fleet-wide issues earlier in their cycle. In addition to lowering maintenance costs, we're using the data to help substantiate the extensions of certain maintenance intervals."

Loh said that Falcon is taking the use of real-time data and diagnostics a step further with their new 6X. "The 6X will have FalconScan, which uses patented algorithms that monitor about 100,000 parameters throughout the aircraft. As we collect that data from each aircraft, we can then leverage it fleet-wide and apply it in a learning mode," he said.

Along with FalconScan, the Falcon 6X (and the Falcon 8X) also benefits from new manufacturing techniques



Falcon is using advanced fleet maintenance data analytics for troubleshooting.

called HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screening). These additional tests are part of a comprehensive effort to ensure that the airframe is fully mature by the delivery of the first aircraft. The testing exposes equipment and systems to extremes of vibration, humidity, temperature, pressure and other in-flight phenomena exceeding those that the aircraft will be subjected to in service.

While you might not think of it as “new technology,” Falcon is putting considerable research into mitigating airframe corrosion through improved painting processes.

“On fastener lines, adhesion of the external epoxy paint is problematic due to the presence of unfavorable coatings on the heads. Even after the reactivation of these surfaces by grinding, paint adhesion might remain insufficient,” Loh said. “Dassault Falcon Jet has explored several solutions with the need to comply with the high aesthetic standard required for business aircraft.”

aircraft after structural repairs or prior to a repaint. We are now using it as part of the new aircraft completion process.”

Embraer Executive Jets

Rafael Leite, Embraer’s director of Customer Relations for South America stated that the company has made several significant strides in bringing significant technology advancements to its global operator base.

“A team of maintainability specialists was created to analyze the market’s and our customers’ maintenance requirements, taking into account maintenance learning from Embraer’s previous developments. This team was also responsible for influencing the program and finding product design solutions, resulting in a maintenance-optimized aircraft,” he said.

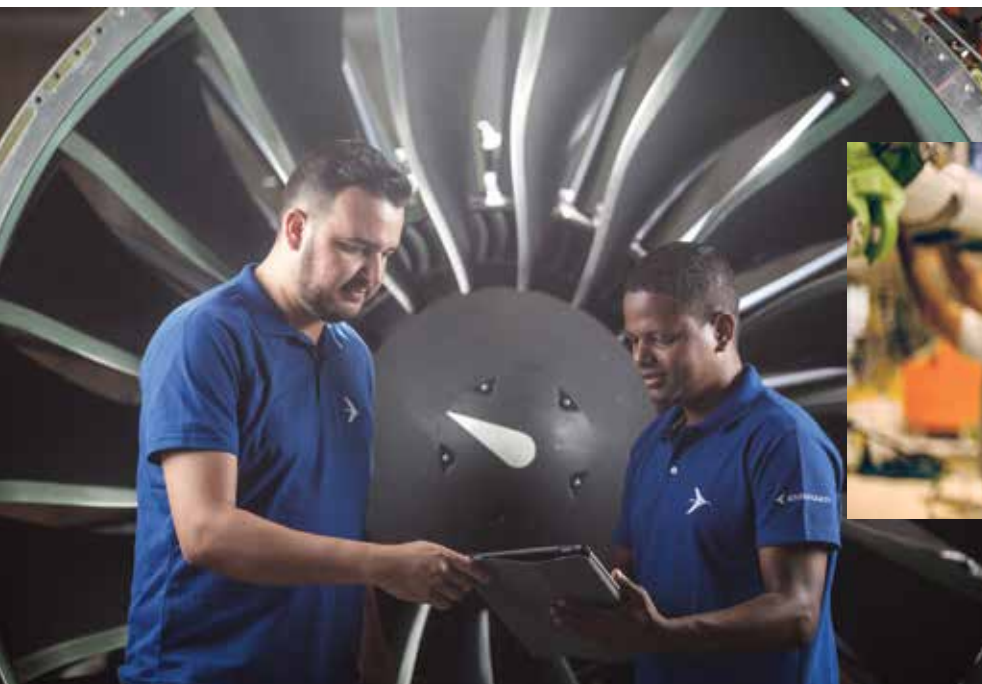
Leite explained that one of the tools that the company is implementing is the use of virtual reality and digital mock-ups. These next-gen systems have helped both designers

in special equipment and tools is possible. Maintenance procedures can be achieved while also reducing the aircraft’s equipment/component Mean Time to Repair (MTTR).

Of course, digital simulations are great tools for designers and engineers, but they can never replace actual data gleaned from aircraft in the field. The more you know about what maintainers and operators are finding the better.

To help gather, analyze and share this critical information on a global scale, Embraer Service and Support, EmbraerX (the division of Embraer dedicated to creating “disruptive businesses”) recently launched a new secure digital, collaborative platform called, Beacon.

“Beacon is working to better integrate the entire aviation maintenance ecosystem, starting with empowering the network of maintenance providers and mechanics who can partner with operators in need of unscheduled maintenance. For example, interruptions and AOG situations,” Leite said. “The ultimate aim of Beacon is to make the lives of maintenance providers and operators easier by streamlining current work processes and reducing spare capacity over time.”



Embraer introduced a new secure digital, collaborative platform called, Beacon, designed to make the lives of maintenance providers and operators easier by streamlining current work processes and reducing spare capacity. Embraer images.

“We finally adopted a scheme involving the use of aqueous solution-gelation (sol-gel) adhesion promoters. This ecologically-friendly technology allows the formation of a very thin, high-adherent polymer layer on the metallic surface,” he said. “Dassault Falcon Jet first adopted this technology for field

and engineers to identify design, maintenance and assembly issues in an early stage, as well as to study alternative solutions before starting the manufacturing process, avoiding costly corrections in more advanced phases of program development. By using these resources, a significant reduction

“By digitizing key steps in the maintenance process, Beacon helps operators connect with on-call maintenance providers near aircraft-in-need in a timely fashion,” he said. “This means that operators get more effective support while mechanics gain access to more opportunities.

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Beechcraft



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TEXTRON AVIATION

To reiterate, the ultimate goal is to reduce ground time by helping aviation professionals to communicate more effectively with one another.”

“Beacon is agnostic and fully dedicated to connecting problems with thoughtful solutions,” Leite said. “Again, we are starting by better connecting the maintenance part of the industry, but our vision is that over time Beacon will become robust enough to connect the entire ecosystem, which would include synchronizing parts, tools, etc.”

Gulfstream Aerospace

Unquestionably, the single-most significant statement Gulfstream has recently made regarding its commitment to servicing its fleet is investing nearly \$100 million dollars to open two, state-of-the-art MRO centers. The first was the 190,000 square foot facility at Appleton International Airport and the most recent is the 202,000 square foot MRO in Savannah.

And, as impressive as this service and support investment is, according to the

in-service fleet numbering approximately 2,800 aircraft, there are times when customers will have AOG situations far from help. And getting eyes on the problem no matter where it is, is the goal of one of the company’s more ambitious, new generation tools: remote witnessing and inspections.

“We began using this technology in 2018. It features live video streaming, for conformity inspections of supplier parts and for maintenance-related inspections,” explained Derek Zimmerman, president, Gulfstream Customer Support. “The technology allows us to inspect parts and components remotely, saving both time and money since a technician does not need to travel for an on-site inspection.”

As Zimmerman explained it, the former Director of Gulfstream’s Quality Organization developed the innovative inspection process after he realized that the medical industry had been using live video for years and that it could also work for aviation.

Since its introduction, Gulfstream has partnered with the Aeronautical Repair Station Association to develop FAA policy for the industry on remote witnessing and inspection activities, adding to Gulfstream’s position as an industry leader in innovation.

Textron Aviation

With a product line spanning King Air turboprops through the Citation family of business jets, no other manufacturer produces as many private and corporate aircraft as Textron Aviation. And in their decades of experience in manufacturing and product support, they’ve learned a host of valuable lessons that are put to use in their current lineup.

On the customer support side, the company has introduced a diagnostics system called LinxUs to help operators minimize downtime, especially those as a result of unscheduled maintenance.

“LinxUs provides fast fault notifications and expedites unexpected maintenance by isolating important details,” stated Kyra Shortt, senior vice president of Global Customer Support at Textron Aviation. “Aircraft in flight can receive



In addition to expanding their facilities, Derek Zimmerman, president, Gulfstream Customer Support says the company introduced live video streaming, for conformity inspections of supplier parts and maintenance-related inspections. The technology allows Gulfstream to inspect parts and components remotely, saving both time and money. Gulfstream images.



company, it’s one piece of an impressive effort. Overall, the company will complete two service center expansions and open three new service centers in 2019 and 2020, adding approximately 790,000 square feet of dedicated MRO hangars, offices and back shops in the U.S. and Europe.

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One of many service and support initiatives introduced by Textron recently is a diagnostics system called LinxUs, designed to help operators minimize downtime, especially as a result of unscheduled maintenance. Textron images.

See our exclusive interview with Textron's Senior Vice President of Global Customer Support Kriya Shortt, on page 32.

maintenance notifications is as little as six minutes through their personal aftermarket service account. The notification is facilitated through either ARES or Garmin data transfers."

While LinxUs provides the ability to notify operators of maintenance issues is a great step in improving aircraft uptime, the company is complementing that with the recent expansion of its Global Service Network. The goal of

this investment is to ensure that Textron Aviation aircraft owner/operators will have access to quality services no matter where they fly.

"Over the past year, we have established or expanded service options in Singapore, London, Canada, Australia, and the Philippines," the representative said. "We have also leveraged Able Aerospace to expand overhaul and repair options, providing more component repair, and overhaul and approved replacement parts solutions."

Capabilities like LinxUs help notify operators of pending maintenance issues and the expanded Global Service Network provides support, but the company aims to reduce the number of maintenance issues in the first place. To help achieve this goal Textron Aviation has taken significant steps to upgrade its manufacturing capabilities to help minimize airframe issues in new-generation aircraft.

"Over the years, Textron Aviation has introduced robotic drilling and riveting techniques in some areas of the factory to improve the production consistency of specific components at various stages of the manufacturing process," Shortt said. "This has led to improvements across the production line and in the overall reliability of each airframe."

"In addition, the new Cessna Citation Longitude's production program takes advantage of new technologies like monolithic machining, where major assemblies are milled out a single piece of metal rather than assembled from smaller pieces," she explained. "This reduces the number of parts and offers more precise tolerances for easier assembly and maintainability."

To help further reduce the chance for AOG situations, Textron Aviation recently introduced a new Aircraft Maintenance Data Hub to the Textron Aviation Customer Portal. The hub displays a summary of upcoming or overdue maintenance for all aircraft that have an active subscription with a recommended aircraft maintenance-tracking provider.

"This makes it easier for customers to understand service and support requirements for their aircraft," Shortt said. **AM**

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TEXTRON AVIATION'S KRIYA SHORTT TALKS SHOP



Kriya Shortt is the senior vice president of Global Customer Support for Textron Aviation. Last month at the NBAA convention in Las Vegas, Nev., Aviation Maintenance editor-in-chief, Joy Finnegan had the opportunity to sit down with her and discuss the challenges and opportunities of leading the global support effort for Textron Aviation, which now encompasses the Cessna, Beechcraft and Hawker product lines and more than 3000 employees spanning the globe. It can't be an easy task, but Shortt and her team of service and support professionals make it look that way. Here is that discussion.

AVM: Textron has put together three diverse companies: Beechcraft, Cessna and Hawker. How has that transition gone over the course of the past few years?

Shortt: We just celebrated five years together as one company. It is amazing how quickly the time has gone. I am proud of how we have been able to preserve the brands' heritage while identifying with our current customer base. The transition has been a success, particularly for our customers in terms of the level of support we can offer them. Many of our customers cross between the product lines. They might have learned to fly in a Cessna then moved into a King Air, and now they're in a Citation. So, it's been fun to see the points of connectivity across the customer base.

AVM: What about blending the workforce of those three brands? Was that difficult?

Shortt: We brought together three companies that, although similar, had nuanced differences, and we took the best practices from each brand, bringing them together to form today's Textron Aviation. Our combined heritage has propelled us into the future. The Longitude, having a blended engineering team, has

been an incredible success. However, there are also challenges associated with blending a workforce, particularly for us in the service industry. Brad Thress was my predecessor and he spent the first two and a half years of integration working diligently to make sure that our team had the abilities across our 145s to work on the products we serve.

AVM: What about the existing workforce?

Shortt: We've only added to it. We are continuing to invest in our skilled workforce by giving them the opportunity to go to King Air school or Hawker school, for example, if they have prior experience working at a Citation Service Center, to build on their capabilities and learning.

AVM: Can you give an example of a best practice you've implemented across the board. A situation where you looked at the way the two companies each did it and saw that Cessna did it one way and Hawker Beechcraft did it another way and then you chose one or the other?

Shortt: One that's relevant in our support organization would be around the model communiques that Beechcraft used to

talk to customers. Cessna traditionally communicated technical issues through service bulletins. Beech's model was, 'let's put together a model communique and talk about something that might be going on in the fleet and not wait for a technical service bulletin to be released,' while still giving information out to the fleet. We've adopted Beech's method, implementing model communiques across the Citation fleet, the Caravans and the Beechcraft product lines. It is a great way to keep our customer base informed.

AVM: Let's talk about the super diverse fleet that you have to support and the challenges involved with that.

Shortt: First, we think it is the ultimate blessing and privilege to serve our customer base. We have 18 service centers globally and a fleet that is constantly moving between them, which keeps us on our toes. It means we have to have the ability to put our hands on information as quickly as possible, even if it's a product that we don't see as frequently, so that we can have a positive impact on our customer. Our approach allows us to service the aircraft correctly the first time, which is something we're known for. But it also enables us to solve problems quickly and get the aircraft back in the air. In today's environment, operational availability is the true metric by which most customers measure how they utilize the aircraft.

AVM: How does Textron Aviation improve operational availability across the board?

Shortt: Our team has a direct hand in any new models that are going through engineering design certification tests. We're embedded with those engineering teams from day one, looking at how we can make their maintenance experience the very best it can be. Our team has the expertise to advise the engineering team of the impact their plans will have on us when the aircraft is delivered to the customer. From a maintenance perspective, equally, we are able to take into account all of our past experiences to achieve some of the best maintenance intervals in the industry. The other ways we improve our operational availability are through the investment that we have, not only in our physical footprint of service centers, but the augmentation of our mobile service vehicles. We have the largest mobile service fleet in the industry – between 70 and 80 vehicles.

AVM: Say more about your mobile technical capabilities.

Shortt: We dispatch go-teams made up of talented technicians to our customers. My counterpart, Brad Thress, who runs parts and distribution, has an intentional effort underway to understand what parts we need to stock in our outlying service centers to ensure that we can meet both scheduled maintenance needs as well as AOG needs. We also invest in continuing to grow the stock rooms and floor space to increase the SKUs we can carry around the world.

AVM: Tell us about an important process or product that you personally have implemented and what were the results of that?

Shortt: Due to the 20 years I have spent in sales and marketing, I am highly focused on the front end of the business. We have a great team that delivers technically adept, skilled work. We focus on the customer experience, understanding that our customers are people and, just like you and me, they emote, they have needs and they have demands on their schedules. Approaching customers solely from a technical standpoint doesn't always resonate. They need to feel heard and valued. I want that to be their experience when interacting with Textron Aviation

AVM: Is there training within the company that gives guidance about how to do that?

Shortt: There is. I bring my leadership team together every quarter to craft training for our customer-facing roles. It's a twofold benefit: from a process perspective, it benefits our customers, but it also adds value to our workforce. We help the team develop both processes and professional development skills as they continue to evolve in their careers.

AVM: What technologies of the future do you see impacting service and support?

Shortt: I'm passionate about technology and its ability to create efficiencies if used effectively. Earlier this year, we launched our maintenance data hub. Historically, we had many of our customers use Cesscom from the Cessna side and Camp from the Beechcraft side. But customers want choices. So, we've created an environment now where we can accept data from



The recently certified Longitude had a blended engineering team.

Camp, Sierra Trax, Traxall and Flight Docs. Now, our team can enter their maintenance transaction records (MTRs) directly from our iMRO system and they flow to those systems. More importantly, being able to have multiple data feeds gives us better visibility into the fleet, which means that we can understand what removals and installations look like on a given part, allowing us to drive better reliability into the fleet for our customers. The more robust our data feeds become, the more information we have. I'd like to think we can trend predictive

capabilities in our segment of the industry as well – I'm really excited by this concept. I like the idea of drones for incoming maintenance inspections, as airlines are doing. When I take my car to the dealer, they give me a video feed of what they're doing, so why wouldn't we have the same expectation in our industry?

AVM: Tell our readers a bit about your new 3D Tech Pubs.



3D Tech Pubs on the Textron Aviation 1View application, offer interactive step-by-step instructions. Technicians can quickly differentiate visuals to identify line replacement units, hardware, discarded parts and specialized tools.

Shortt: We are hands-on in the way that we work, but that doesn't mean we can't leverage technology to appeal to tomorrow's workforce. We can show our teams how we use technology smartly to help them bridge the gap between our hands-on environment



Textron boasts the largest mobile service fleet in the industry with 70-80 vehicles.

and the environment that they grew up in. My kids grew up gaming, so they're adept at using digital technology in other aspects of their lives. We are integrating more new technologies into our work, particularly through 3D Tech Pubs, the first of its

kind in the industry. The way that we design and engineer aircraft now using our ENOVIA platform allows us to take that and bring it into the Tech Pubs world. For a technician who is looking at doing a job, whether they've done it, they've never done it before, or maybe they did it several months ago, they can watch a virtual step-by-step demonstration of how that process is going to play out in real-time. It also makes them faster when they perform

the task on the aircraft in real life. The wiring diagram traces through to the pin-level, and in an environment where our aircraft are all fitted with more electronics, tracing wires is a skill that is going to be significantly differentiated when aided by technology.

AVM: Textron Aviation is a big organization. You have facilities all over the world. How do you implement change?

Shortt: Yes – we have 3,100 people on our team, spanning globally. I really believe the idea of one team working together is critical. I spend a lot of time listening to the team. Over the past year, I have held more than 100 roundtables globally to listen to the opinions of our technicians,

avionics techs, CSRs and leadership and understand the challenges they're facing. My aim is to champion our workforce and make their lives easier so that they can more effectively help our customers.

AVM: Give me an example of a time that you visited a facility outside of Wichita and you learned something that you wouldn't have otherwise learned.

Shortt: I learn something every single time I visit a facility! One of the things I learned last year as I started implementing these roundtables was that our team has a passion and a desire for more training. After hearing this from more than one site, I flagged the demand for more training to the operation side of my business. We began to think about how to create a training area that would be complementary to what we do on a broader company basis and meet the needs of our team. These conversations started in December of last year and by May of this year, we had a team in place to focus on professional development and customer care training. I am passionate about encouraging those joining the company, whether they are a brand-new A&P or coming from another area in the industry, to immerse themselves and be successful from day one, because without skilled, talented technicians on our team, we can't serve our customers.

AVM: What are your thoughts about the shortage of

mechanics? Is there a shortage of skilled technicians?

Shortt: I believe the shortage will become more and more apparent in the future, but currently, the numbers show that our skilled workforce is roughly eight years more mature than the rest of the North American workforce. We have good talent across our company, and I have had the privilege of celebrating a number of 40-year technician anniversaries this year. We are grateful for our committed team members, but we also understand that we need to continue to invest outside of the company to ensure the robustness of our manufacturing environment across the U.S., and ensure we have the skilled workforce to deliver maintenance to our customers. We recognize the importance of reaching tomorrow's workforce while they're still in school to encourage young people to consider careers in our industry. Our HR team, along with some key experts, created an Aviation Pathway curriculum that kicked off in August of last year. Young adults who take part, starting in the ninth grade, can graduate high school with a diploma and technical certificate, creating the potential for immediate employment within the aviation industry. For some students who perhaps don't want to take a four-year degree and haven't decided on their career path, the Aviation Pathway is a great option. At Textron Aviation, we're creating a way for them to be successful as young adults, as a contributing workforce. Then, as they mature and find their passion beyond the Aviation Pathway, they could work and earn a four-year degree through our tuition aid reimbursement program. Programs such as this are instrumental in developing a workforce. We recognize that we also need to reach the educators as well, so we have developed an external program where we bring school teachers onto our campus in the summer months to give them experience and exposure to our industry so that they can promote it to middle and elementary school students.

AVM: What about outside of Wichita - are there similar programs?

Shortt: We work diligently to craft relationships with tech schools near our outlying facilities. We have apprentice programs at a number of our sites, like Hallmark University in San Antonio. We bring in students who are going through their A&P program to work at our San Antonio site. It is valuable to us that the students at Hallmark University are not only Texas-based but from different regions. This means they are mobile

and keen to move into other areas to gain more experience. We have these programs at several other locations. We also work with Civil Air Patrol, which further increases our exposure in a different area. As we also partner with the industry, I have been discussing the topic with [NBAA President] Ed Bolen. We have to join together as an industry to promote the trades as a viable and robust career path. **AVM**



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CRACKS IN THE SYSTEM

Jeff Guzzetti



With this issue, safety expert Jeff Guzzetti will begin a series of in-depth analyses of accidents that had maintenance as a cause. Guzzetti is the president of Guzzetti Aviation Risk Discovery (GuARD), an aviation safety consulting firm that he formed following a 35-year career with the National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA) and other agencies. During his 18 years at NTSB, Guzzetti was a field investigator, “go-team” engineer and Deputy Director. He then served as an Assistant Inspector General at the Dept. of Transportation and testified before Congress regarding aviation safety audits. In 2014, Guzzetti served as the Director of FAA’s Accident Investigation Division in Washington, DC until his retirement in 2019. He is a graduate of Embry-Riddle Aeronautical University with a degree in Aeronautical Engineering and holds a commercial pilot certificate with multi-engine instrument ratings in airplanes, seaplanes and gliders.



Chalk’s Ocean Airways flight 101 was supposed to be just another milk run by the

oldest continuously operating airline in the world. Founded by Arthur “Pappy” Chalk in 1919, the airline had flown celebrities like Judy Garland and Ernest Hemingway to the Bahamas in the Golden Era of Hollywood and helped search for enemy submarines during World War II. Chalk’s seaplanes were glamorous icons of South Florida living, appearing in the opening of credits of the 1980s “Miami Vice” TV show and the ending credits of movie thriller, “The Silence of the Lambs.” That is until this fateful day, a week before Christmas, December 19, 2005, when the Grumman G-73T “Turbo Mallard” seaplane lifted off with 18 paying

passengers and two pilots for a scheduled flight from Miami to the Bahamas.

On that December afternoon 14 years ago, disaster struck. As the 58-year-old seaplane gently climbed toward the cloud ceiling, numerous fatigue cracks in the metal structure of the right wing grew a bit more — one last time — allowing the aerodynamic load to snap off the entire right wing.

A fireball erupted from the wing’s fuel bay and marked the airborne starting point for the fatal trajectory of the remainder of the aircraft into Miami’s shipping channel. Among the fisherman, surfers and holiday shoppers who saw the carnage, one witness snapped a photo milliseconds before the fuselage impacted the narrow channel’s shallow waters.

All 20 persons on board the seaplane were killed in a tragedy that was later

determined to be caused by not only cracks in the metal, but also by larger cracks in the maintenance system.

Eighteen months later in Washington DC, the National Transportation Safety Board (NTSB) held a public Board Meeting to discuss their findings and adopt the official “probable cause” of the accident. Investigators from the NTSB “go-team” that launched to the crash site had spent months poring over the wreckage examining maintenance logs, and interviewing airline employees. They then prepared concise presentations intended to walk the NTSB’s five Board Members and a public audience through the sequence of maintenance and management failures that led to the accident – failures that serve as stark examples of how poor maintenance practices can kill.

Aging Aircraft and Metal Fatigue

Manufactured in 1947, the twin-engine Mallard had flown about 31,000 hours and logged nearly 40,000 flight cycles. It was a prime candidate for metal fatigue and other aging factors such as wear, deterioration and corrosion which occur over time in all aircraft. Metal fatigue is a weakening of metal parts of a structure due to the stress of repetitive cycling or loading. If not identified and well managed by aircraft maintenance personnel and programs, these aging processes become significant safety concerns and can, in the worst case, lead to accidents.

NTSB metallurgists readily determined that the right wing separated at Wing

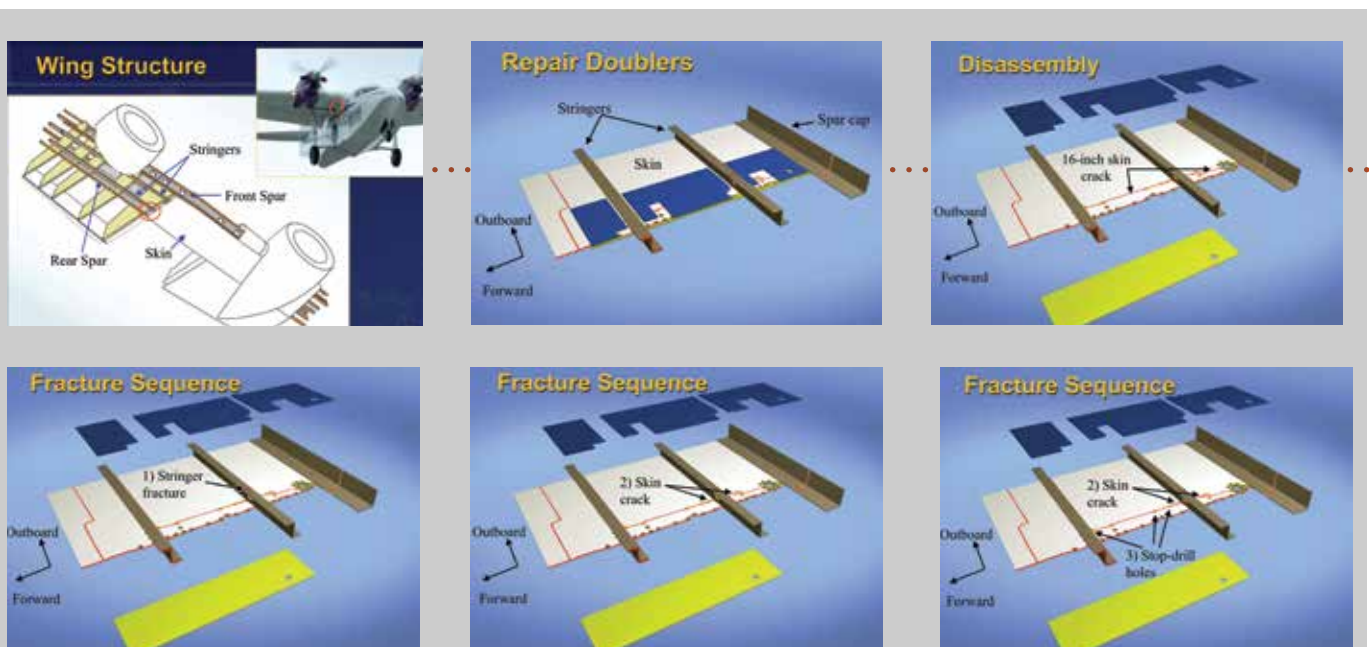
Station 34 (WS 34) due to preexisting fatigue cracks in the right wing's rear "Z-stringer," lower skin, and rear spar cap (see graphic 2, next page). Fatigue cracks rear their ugly heads as "beach marks" on a fractured component – marks like those made when the tide washes up on a beach and leaves parallel lines as it recedes (see graphic 2, next page). The metallurgists opined that the metal fatigue damage reduced the residual strength capability of the right-wing structure resulting in the wing's failure during normal flight operations.

Deficient Repairs

Investigators not only laid out the facts of the Chalk's flight 101 accident with large

screen presentations, they also put on a clinic about the principals of FAA Advisory Circular AC 43.13-1B, "Acceptable Methods, Techniques, and Practices - Aircraft Repairs and Inspections." The NTSB experts painted a vivid picture of how mechanics did not follow the structural repair methods in AC 43.13-1B in the area of the right-wing failure (see graphic 1 below). For example:

- One of the internal doublers at WS 34 partially covered the lower flange of the rear Z-stringer, suggesting the doubler was an attempt to reinforce the stringer. However, doubling only the lower flange did not restore the strength of the fractured stringer.
- Multiple-site fatigue damage was found



The NTSB presented a series of animated slides to depict the progressive cracking and failure of the right wing from the Chalk's seaplane. Each slide also depicts the structure components and areas of improper repair. The top left slide shows the overall view of specific area of the seaplane that was weakened by fatigue cracking, followed by the sequence of crack growth from left to right.

at the inboard fastener row for the doublers at WS 34, and this damage linked up to the area of the rear Z-stringer before the wing separated, indicating that repairs in this area were not effective.

Several rivets in the inboard row of rivets for the doubler repair at WS 34 were inserted through sealant near the fuel sump drain instead of the lower skin, resulting

in a failure to allow the transfer [of] the aerodynamic loads between the skin and the doublers in that area.

• Three stop-drill holes were noted in the area of the doubler repair to the lower skin at WS 34. The holes were evidence that the skin crack was detected at least three times before the doublers were applied and that the crack had extended twice from

the location of a previous stop-drill hole. Continued crack growth from a stop-drill hole is indicative of an underlying structural problem that was not properly addressed in previous maintenance actions.

- Sanding marks were observed at WS 34 around the rear Z-stringer fuel tank "slosh hole" and associated fracture surfaces,

suggesting that the sanding was an attempt to remove cracking that had been detected in the Z-stringer. Sanding is not recommended in AC 43.13-1B. The cracking was not completely removed and continued to propagate over time.

Unresolved Fuel Leaks Indicators

The wing of the accident airplane had been weeping fuel for months in the area of the right-wing separation. Major structural components in this area – and also in other areas on the plane -- had numerous pre-existing fatigue cracks. As these cracks developed over the course of years, they were manifested by fuel leaks and other repeated discrepancies. Attempts by Chalk’s mechanics to resolve these discrepancies were ineffective, literally stop-gap measures that did not correct the underlying damage to restore the load-carrying capability of the wing structure.

Losing a wing may seem like a freak occurrence, but trouble at Chalk’s was

widely known. The airline’s safety culture was anemic, as were the mechanics’ attempts to seal the wing cracks. Even the FAA inspectors who oversaw the airline knew about the many shortcuts being performed, but nobody addressed the root causes. In fact, three of the six captains who flew for Chalk’s left the company in the year before the accident due to their concerns about safety.

Buried in the NTSB’s record of pilot interviews are many startling concerns expressed by the pilots who left the company. Investigators reported things like: “He left Chalk’s because of maintenance concerns. He did not have another job lined up at the time he resigned.”

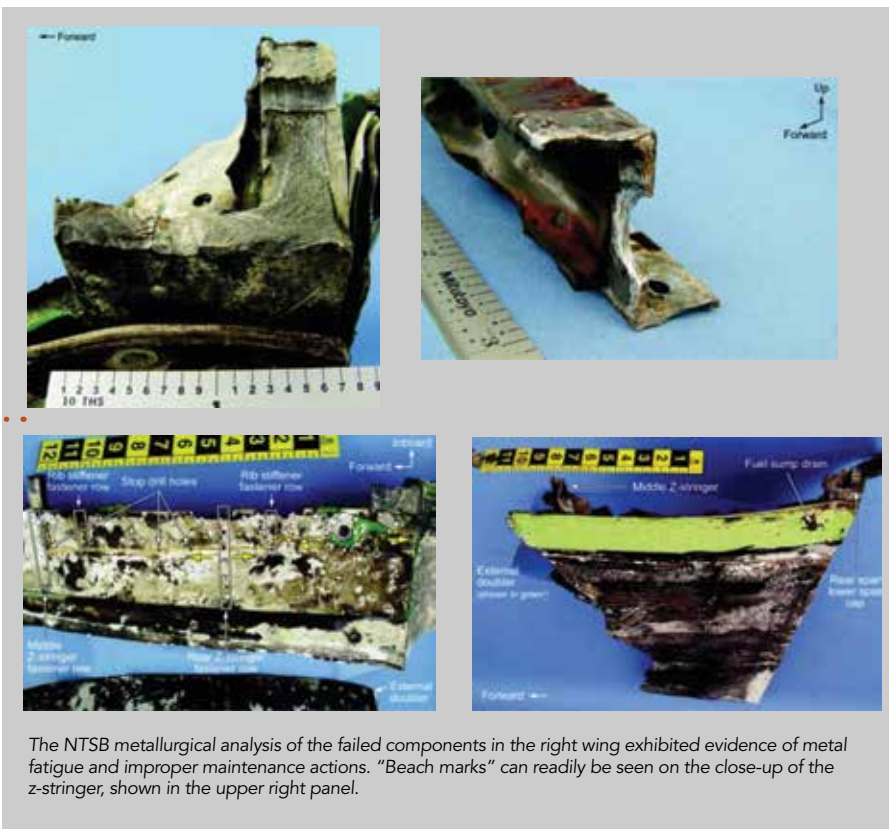
Investigators also cited from a 4,000-word letter written by another captain to the Chalk’s director of operations: “I have heard numerous times, ‘We’ll just have to make up a tag for an old part back there because we don’t have any,’ the letter stated. The former captain also wrote: “I have repeatedly heard directly from the mechanics that they don’t have the ability to fix a write-up, yet it’s always signed off the next morning.”

Insufficient Quality Control and Oversight

The Chalk’s seaplane was being operated under the same Federal Aviation Administration (FAA) Part 121 rule as any other scheduled commercial air carrier in the U.S. Part 121 provides the most stringent operating requirements for aviation, yet NTSB investigators were able to document that repairs were not performed using best maintenance practices like the ones cited above, as well as a laundry list of other maintenance deficiencies such as:

- The company’s quality control program was not effective
- Repair thresholds for crack damage were not established
- Repetitive maintenance gripes on the accident airplanes and its sister ships were not sufficiently addressed and resolved
- Comprehensive inspection of the Chalk’s fleet was not performed despite widespread and well-known problems with fuel leaks in two seaplanes that continued even after major repairs.
- Major structural repairs for the accident aircraft and a sister ship were not recorded
- Flight log entries were missing
- Inspections failed to address structural damage and shoddy repair workmanship. Some stringer fractures had existed for years, and non-conforming repairs were not corrected

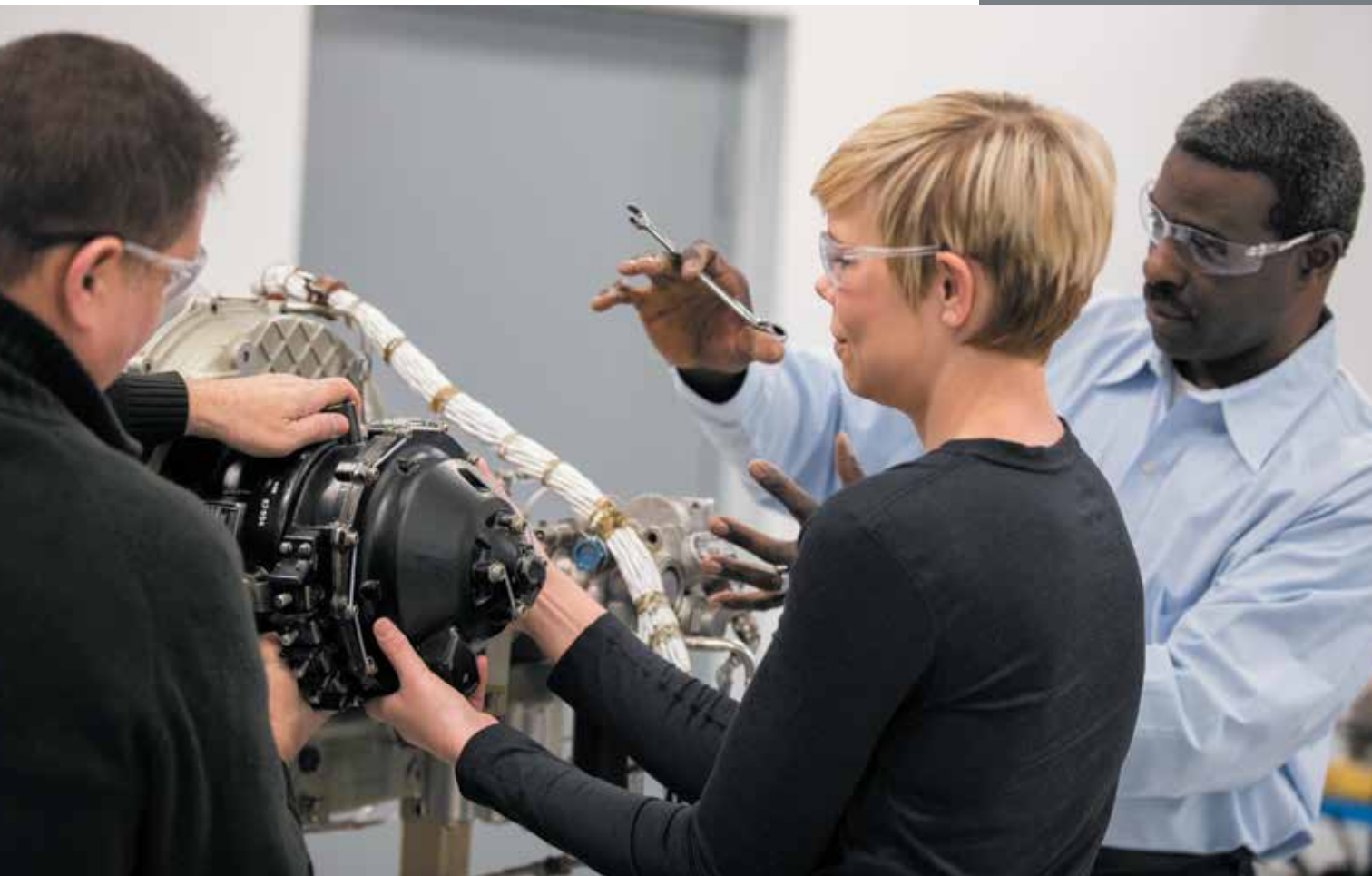
The Safety Board also focused on the FAA’s oversight of Chalk’s maintenance program during the public meeting. The airline was too small to have an engineering department to provide mechanics with solid technical guidance, and the aircraft manufacturer no longer provided those services. Instead, Chalk’s had individual contracts with many designated engineering representatives (DERs). The NTSB argued that this type of support did provide a solid understanding of the Chalk’s fleet. The situation was made worse by the fact that a structural repair manual was not



The NTSB metallurgical analysis of the failed components in the right wing exhibited evidence of metal fatigue and improper maintenance actions. “Beach marks” can readily be seen on the close-up of the z-stringer, shown in the upper right panel.

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issued for the G-73 seaplane because one was not required back when the plane was manufactured.

The Safety Board concluded that the FAA's procedures for maintenance program oversight for commercial operators of aircraft with limited manufacturer or engineering support were "insufficient" to ensure safety, and they issued recommendations to FAA to do something about it.

"Why this happened was about a different type of failure," said NTSB vice chairman Robert Sumwalt, who is now the NTSB Chairman. "It was a failure of Chalk's to identify and properly repair fatigue cracks in the wing, and I think to some extent it's the failure of the regulatory authority... to provide sufficient oversight of this operator."

Probable Cause

The NTSB determined that the probable cause of this accident was "the in-flight failure and separation of the right wing during normal flight, which resulted from the failure of the Chalk's Ocean Airways maintenance program to identify and properly repair fatigue cracks in the right wing," as well as the "failure of the FAA

to detect and correct deficiencies in the company's maintenance program."

The Chalk's fleet was an enduring icon for aviation, but it was as high-maintenance as it was glamorous. As a result of the accident, the airline went out of business.

This investigation highlights the importance of ensuring the structural integrity of older aircraft. While the aviation industry has made significant strides in this area over the past decade, operators continue to fly aircraft

beyond their original design service goals and aging aircraft will continue to be an area that bears watching.

The Chalk's flight 101 crash is a cautionary tale that emphasizes the role that pilots, mechanics, management and FAA inspectors have in establishing a positive safety culture. We must all strive to "connect the dots" of repetitive maintenance issues in order to prevent an unairworthy aircraft from taking off. **AM**



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There are many different aircrafts today with differing heights from the wings, fuselage, vertical and horizontal stabilizers to the ground. Maintenance of these aircrafts often require people to work at heights. Due to the variations in aircrafts and continual upgrades to aircrafts, it can be a challenge to have a fall protection system that will accommodate these changes. The key to solving this dilemma is to have a completely flexible system which will limit the fall distance regardless of a person's position on the plane. Traveling bridge fall protection systems are the systems to remedy this issue.

A traveling bridge fall protection system consists of a rigid horizontal rail known as a

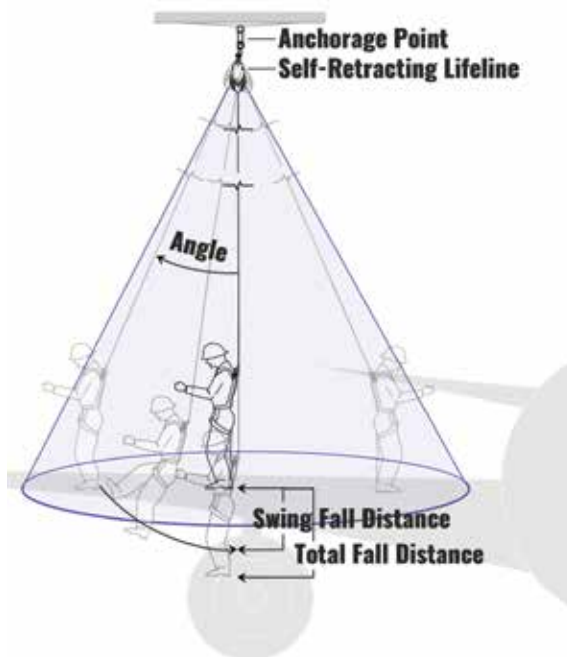


fall distances available, especially when combined with a class "A" self-retracting lifeline.

When a user falls while attached to a fixed overhead anchorage, gravity will move the user back directly under the anchorage point. This can create several problems for the user as there may be objects obstructing the swing movement. This pendulum-like effect will allow the user to fall an additional distance, the swing fall distance, causing the user to make contact with any obstruction or with the ground. ANSI Z359.0 2.191 defines swing fall distance as "The vertical drop in height experienced by the worker using a fall arrest system from the onset of the swinging motion to the lowest point reached during the swing." When a traveling bridge fall protection system is used the anchorage stays overhead eliminating swing fall making these systems the superior choice, when minimal fall distances and maximum mobility is required.

When designed properly the company, with proper training in procedures, will have the ability to move both the bridge and trolley as they change positions around the aircraft. This allows the anchorage point to remain directly overhead at all times, eliminating additional fall distance due to swing falls. ANSI Z359.2 defines swing fall as, "A pendulum-like motion that occurs during and/or after a vertical fall. A swing fall results when an authorized person begins a fall from a position that is located horizontally away from a fixed anchorage".

Collaborated efforts by Kaylie Lenz, General Manager for Lighthouse Safety, John Corriveau Regional Sales Manager and Trainer for Lighthouse Safety, Michael Bailey, P.E., SECB is the director of Engineering for Flexible Lifeline Systems. Kaylie, John and Michael have a combined experience of over sixty-five years in designing/consulting of Fall Protection Systems and are voting members on ANSI Z359 Fall Protection and Related Systems Committee.



bridge, which is attached to runways at either end. The bridge has a trolley that allows users to travel the full length of the bridge, while the bridge also travels the full length of the runways. This allows for complete coverage of the hangar floor, eliminating swing falls. The runways and bridge constitute a rigid system that provides some of the lowest

Manufacturer's require you to stay within 30 degrees of your anchorage point. Many aerospace companies have restricted this motion further by reducing the 30 degrees to 15 degrees from their overhead anchorage. Resulting in a reduction of your MRC (minimum required clearance). This is safer for the employee and aircraft they are servicing.

ART AT 40,000 FEET



Joy Finnegan, Editor-in-Chief

With thousands of privately owned aircraft and business jets in the worldwide fleet, how do you make yours stand out? To find out, one owner pulled together a crack team of experts including a scheme designer, an experienced paint shop and the paint manufacturer, to come up with something really unique. And the results are amazing.

A

Gulfstream 550 owner contacted Jonathan McCormick, owner of Plane Schemer - an aircraft scheme design service located in Gadsden, Ala., to design the paint for his newly purchased aircraft. McCormick says he knew

he could create something unique and fun for this open-minded customer. And that is exactly what he did. Located at the Northeast Alabama Regional Airport, McCormick says he "specializes in combining the beauty of flight and color to create incredible custom paint and vinyl designs for all aircraft types." But it took a team that included McCormick's design services, Constant Aviation's painting expertise and the unique matte paint Sherwin-Williams offered, to bring the scheme to life.

To start the process, McCormick says they brainstormed with the client and started putting ideas and concepts on paper. "We start based on their ideas and thoughts and then we add some of our Plane Schemer style to it," he says. Even if the client is not physically present, they

can host a live design session online. "We'll actually do a desktop share with the customer so they can watch us make the changes and we can talk through them," he adds. He says sometimes customers have only an abstract idea to start with or they may have seen a paint scheme on something else, like a motorcycle, and want to translate that to their aircraft.

In this case, there was no particular significance to the design but was something McCormick suggested after the client asked about using matte finish paint. The client had another aircraft, had used matte paint on it and wanted to do that on the G550 as well. They agreed on black and gray for most of the aircraft and a bright blue accent stripe. "So the primary colors of black and gray are matte but the blue accent was done in a gloss to make it pop a little more," McCormick says. He decided to also use a gloss paint underneath the pattern on the nacelles, winglets and tail which he refers to as a "carbon fiber effect." That gloss black became the pinstriping between the pattern, which also added visual depth to the pattern.

He says the design and approval process only took about



Constant Aviation took a paint scheme from Jonathan McCormick's Paint Schemer aircraft paint design service and brought it to life on this G550 using mostly matte finish paint. Constant Aviation image.



The Constant Aviation paint team is shown here with a PV1 that was a torpedo bomber in World War II. Constant donated the labor and Sherwin-Williams donated the paint for this paint job and the aircraft is now on display.

a week to finalize in this case. "One thing that I really pride myself on is talking to the client enough to get a good read on what they're looking for. If we're doing our job well, we'll be able to produce a design that they like very quickly. So that's really one of the biggest values to the service," McCormick says. McCormick started off in the business painting cars before moving into painting aircraft and ultimately starting his own business as a paint scheme designer. "I started off with the actual application so I know what's doable and what's not doable when we start the design process. I'll always work really closely with the paint facility if they've already picked someone."

In the case of this G550, the owner had chosen a paint shop already, Constant Aviation. Kevin Dillon, Constant's COO, oversaw the work at their Orlando, Fla., facility. Dillon says their goal on any paint work is to work closely with the client, designer, paint manufacturer and his team to ultimately produce a paint job that meets the client's vision. "We want to make it look the best that it can so that it matches the rendering. That's where communication and the visualization with the customer, the designer and the paint

shop come into play," Dillon says.

For example, on a complex paint scheme such as this one, the nacelles are particularly difficult because they're rounded and curved, as are the winglets. Other areas that may need adjustments, once they receive the renderings from the designer, include the tail and sometimes the registration numbers because of the way curves could throw off some of the work done in 2D renderings. Dillon says any curve or change on the fuselage can throw off the way a design may appear. This is when it is crucial to work with the designer and client to ensure everyone is happy with the solution. "We thought we were going to have to do a much larger modification to the original design. But we were able to work through it with Jonathan," Dillon says. In the end, only small adjustments needed to be made.

Also early in the design process, McCormick began working with paint manufacturer, Sherwin-Williams, to select the right colors and products. "Before the trigger of the spray gun is pressed, we are involved," says Julie Voisin, global marketing manager for Sherwin-Williams Aerospace Coatings. "Jonathan from scheme designers reached out



Specialty matte paint from Sherwin-Williams Aerospace Coatings made for a unique look on this Gulfstream. The only gloss paint is the pinstriping between the "carbon fiber effect" on the nacelles, tail and winglets and the blue accent striping. The scheme was laid out by hand. Constant Aviation image.

to us in the beginning." Voisin says it is important to consider not just color and finish but also the size and scope of the project so that they are recommending the best product for the job.

"When an aircraft is bigger, like a G550 or a BBJ, you need to make sure the paint is designed for that scope," Voisin says. She advises that in a larger project it is important to have a "wet edge" so it doesn't dry too quickly. Having a wet edge allows the painters

time to paint one section and move on to the next with the first section still wet. This facilitates blending the two sections of a large aircraft that will need to be painted in numerous sections. "Especially with a matte or semi-gloss that could really show up on the plane. We wanted to make sure that it was something that wasn't going to dry too quickly and would handle the heat and humidity of Florida."

In the last couple of years Voisin says their requests for matte finishes has

risen. "We are seeing semi-gloss and matte finishes be somewhat of a trend in the aviation business," she says. She added that the pricing is similar to a gloss paint and is more based around the pigments that are used rather than the finish.

And while it does have some unique characteristics, Constant says it is very similar to working with gloss paint. McCormick agrees but adds the matte finish in particular needs special attention during the painting process. "It pretty much has to be done all in one shot, pretty much all at the same time, the same temperature, same humidity levels, because the shine of the paint will actually change depending on the humidity and temperature in the paint booth at the time." He cautions that the gloss level can change depending on the humidity due to the length of time the paint takes to dry. The longer the time, the flatter it will become. "If it dries faster, the flattening agents don't have enough time to evaporate and it'll dry a little bit shinier," says McCormick.

In spite of that, all agreed that it is not difficult working with the matte finish. No special equipment is needed and the same spray guns can be used for gloss or matte. It was a special order



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from Sherwin-Williams, however. "We are really confident with the product. I mean, when it comes down to that intricate design, it's all about the mask being used and the expertise of the painters," says Voisin. "The biggest part is just controlling the environment for the finish. "I wouldn't say that it's any more difficult than any normal paint job," says Constant's Dillon. "We have a phenomenal relationship with Sherwin-Williams. They've actually set up an inventory here locally so that response times are quick. We work closely with them in all our sites."

Back to that unique scheme, McCormick says the toughest part of the carbon fiber design was definitely designing how to put it on the engines themselves. The design on the vertical stabilizer was much easier as they were able to provide Constant with a paint stencil to lay up on the flat surface. "The biggest challenge was the Coke bottle type shape of the engine. Essentially, we're putting hundreds of rectangles on an engine that's totally different shapes from front to back," he says. "We took measurements around the circumference of the inlet, the circumference of the center of the engine and on the exhaust side. With a little bit of math, we figured out how much the size of those carbon fiber design elements we needed to change as they went through the full engine. It required that entire design to be laid out by hand and to have some skilled guys do it."

McCormick's Scheme Designer company provides a 15-20 page paint layout guide that breaks down every section of the airplane and exactly where each stripe should fall on the aircraft. Once the paint shop has that document, they begin the layout and can consult with the designer throughout the process, as needed. "It's certainly one of the more complex paint jobs just on the layout," says Dillon, although he went on to add that it was not the most complex one they had ever done.

With a complex scheme or if it's a new product the shop has never sprayed before, Voisin says they provide support as needed, even going onsite. "I want to help them succeed in that

paint shoot from the beginning. We'd rather be involved at the beginning." However, in this case, both Constant and Sherwin-Williams were confident that onsite assistance wasn't needed. "I have to applaud the competency of the Constant Aviation team. We work closely with them and they know we're just a phone call away for any technical service questions," Voisin says. "If we need to bring a service representative on site, we

will. But in this situation, they had the right selection, they had a good scheme and we didn't have to go onsite."

Dillon says he enjoys working with all the paint manufacturers but that Sherwin-Williams is their primary vendor. "They're great people to work with and they put forth a lot of effort to try to make sure that we're successful in our business." Take a look at the results and judge for yourselves. [AVM](#)

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AIRBUS AND SNAP-ON

PARTNER TO PROVIDE TOOLING CERTIFICATIONS FOR ITS NEW FLIGHTPATH9 TRAINING PROGRAM

In this new partnership, Airbus and Snap-on look to create a pathway for high school students to prepare for careers in aviation maintenance, aircraft manufacturing and other aerospace-related jobs to help contend with the coming need for skilled workers.



Airbus estimates the aviation industry will need to hire 640,000 new technicians in the next 20 years,

according to its recently released Global Market Forecast for 2019-2038. To assist in this effort, Airbus is partnering with Snap-on to help train this next generation of technicians through a bold new program called FlightPath9, which prepares high school seniors for careers in aviation.

The FlightPath9 program targets southern Alabama high school seniors with a desire to work in aerospace. The nine-month course curriculum includes several aviation-focused Snap-on certifications that are facilitated through the National Coalition of Certification Centers (NC3). Snap-on certifications are designed to further the tool usage skills and hands-on knowledge of students. These include:

- Precision Measuring Instruments (in partnership with L.S. Starrett Corporation)
- Precision Electrical Termination (in partnership with Daniels Manufacturing Corporation)
- Structural Sheetmetal Assembly

The need for technicians spurred the latest partnership between Airbus and Snap-on. Snap-on image.

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Snap-on certification courses emphasize tool theory, application, and usage

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“We partnered with Snap-on because Airbus uses Snap-on tools in the U.S. Manufacturing Facility, and it had already developed these certifications for the aviation industry. It’s a good match for the students in the training program who will join the Airbus team upon successful completion of the FlightPath9 program,” says Michelle Hurdle, director of Economic and Community Development, Airbus Americas.

“The partnership Snap-on has with Airbus is a perfect example of the types of collaboration we seek within the aviation industry, helping to create a program that will improve the skills and knowledge of tomorrow’s technicians,” says John Gamble, education partnerships manager, Snap-on Industrial.

Snap-on certification courses emphasize tool theory, application, and usage: three areas of study that equip students with an essential foundation for proficiency, productivity, and safety. The certifications provide conformity to an established standard and will be integrated into the existing course curriculum being taught by FlightPath9, Embry-Riddle Aeronautical University and Airbus instructors.

FlightPath9 and Fast Track

The first FlightPath9 class started last month with 25 students who attend four hours of class two evenings per week in a training center near the Airbus aircraft production facility in Mobile, AL. FlightPath9 will lay the foundation of a career in aviation for students, some of whom may have little to no prior aviation or aerospace experience.

FlightPath9 is a nine-month program of training that students attend after school. Taking place two evenings a week, it adds up to 200 hours of instruction. Upon graduation, those students are then ready to enter Airbus’ Fast Track program.

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An Airbus program in the U. S. called FlightPath9 partners with local schools and other organizations to create new pathways to employment with Airbus for local high school students and others who have little or no aviation experience. Airbus image.

FlightPath9, they enter the second phase of training called Fast Track. Fast Track is a 12- to 15-week experience designed to give new Airbus hires training in the basic skills, knowledge and abilities for a career in aerospace maintenance. It teaches a program of global competencies for working

on aircraft. Students in the program hone their skills on aircraft assembly, including torqueing, riveting, gauging, reading blueprints, tool use, ergonomics and more. Students entering Fast Track will be full-time Airbus employees, earning a salary, benefits, etc. Fast Track is not limited to students from the

FlightPath9 program.

"These programs are really about inspiring kids, giving them STEM-focused education and awareness to aviation. Our goal is to impact the community as a whole," according to Hurdle. Students who successfully complete Fast Track will work on the assembly of Airbus' A220 and A320 aircraft.

In addition to earning certifications, eligible students can also receive special student pricing on Snap-on tools through Snap-on's Student Excellence Program.

For more information on Snap-on's certification program, call John Gamble (413) 441-5429; email, education@snapon.com; or visit <https://www.snapon.com/Industrial-Certification>. For more information on Airbus' FlightPath9 and Fast Track training programs, visit <https://airbusalabama.com/>. **AM**

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