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HANDOVER IN HAMBURG

August Henningsen (r), chairman of the board of Lufthansa Technik, retired on April 1, 2015, after 14 years at the helm. He is succeeded by Dr. Johannes Bussman (l). Both are shown here at the annual results announcement in Hamburg on March 17, 2015. See page 18 for our exclusive interview with Henningsen on the eve of his departure.

April 2015

DATA SECURITY
THE MORE MRO DATA IS PRODUCED AND EXCHANGED, THE MORE ELECTRONIC SECURITY YOU NEED



ENGINE MRO
NEW TECHNOLOGIES, OEM INITIATIVES AND THE INDEPENDENT SHOPS VIE FOR YOUR BUSINESS



PAINT UPDATE
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COVER STORY

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Henningsen Retires
After a 14-year journey as the chairman of the board of Lufthansa Technik, August Henningsen is stepping down. Here are some of his thoughts on the eve of his retirement.

On the cover: Lufthansa Technik's outgoing Chairman August Henningsen (right) and incoming Chairman Dr. Johannes Bussman (left) at the Lufthansa Technik Annual Results announcement in March 2015.

Cover image by Joy Finnegan



22 Electronic Data Exchange and Security

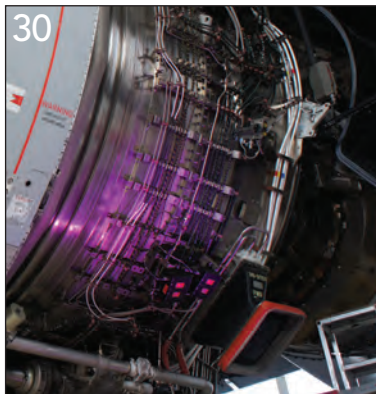
More and more information is being exchanged electronically. With cyber-security becoming a crucial issue, we take a look at how MROs are exchanging information electronically and how they are keeping that information safe.

30 Engine MRO

Engine work comprises the largest portion of MRO spend. We asked a few of the top engine manufacturers about their latest developments in engine support and services.

38 Paint

Aircraft paint and coatings are more than cosmetic. These products contribute to safety, fuel efficiency and aerodynamics.



CATEGORIES

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- TECHNOLOGY
- PRODUCTS/ TOOLS
- SPECIAL REPORT
- AFTERMARKET

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Transitions

BY JOY FINNEGAN
EDITOR-IN-CHIEF



What is it about transitions that I find so fascinating? I'm not sure. Maybe it is the unpredictability. Maybe it is the surprising new directions. Maybe it is the possibility of a crash and burn. Perhaps it is simply that life is full of them. Whatever it is, I am always intrigued by them.

In this issue we take a look at some major transitions taking place in our industry. On the cover you will have seen August Henningsen and Dr. Johannes Bussman. Henningsen ran Lufthansa Technik for the last 14 years and retired on April 1, 2015. Dr. Bussman is stepping into some very big shoes, as they say. During Henningsen's tenure, Lufthansa Technik grew by leaps and bounds, implemented cutting edge technology and became a world leader in the industry.

While Henningsen was chairman, Lufthansa grew to encompass more than 30 subsidiaries including some in the U. S. and the company claims 800 customers from disparate sectors of the business, from airlines to governments to VIP completions. Part of the success of the company can be attributed to the millions of dollars invested in buildings, infrastructure and innovation.

A perfect example of infrastructure investment is their new Puerto Rico facility. This new five bay facility will open in the third quarter of this year and is slated for overhauls of short- and medium-haul jets, beginning with the A320 for a U. S. customer. The company is also investing approximately \$63.4 million in a new wheel and brake shop in Frankfurt. The groundbreaking for that shop will occur this summer and it is scheduled to open in early 2017.

The company also says it is committed to investing \$212 million in innovation, research and development between now and 2018. This is about four times as much as in the previous five years, according to a statement by Henningsen at the results meeting in March.

While it's been amazing to watch and report about the changes and growth of LHT during Henningsen's stint as chairman, it will be equally fascinating to see what happens

next, under the guidance of Dr. Johannes Bussman. For our one-on-one interview with Henningsen in Hamburg, Germany on the eve of his departure, please see page 18.

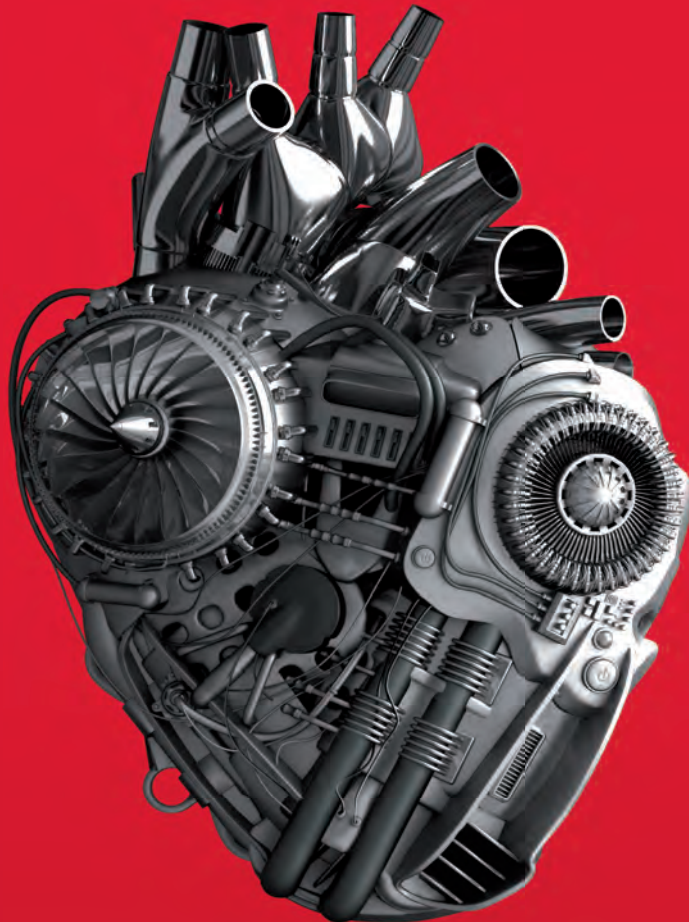
Another company that sees this period of time as transitional is engine maker, Pratt & Whitney. At that company's recent annual results announcement meeting, President Paul Adams called the coming year "transformational" and said the company will focus on "driving an aftermarket service model." This is a new slant for the OEM even though they have always serviced their engines.

But Adams, together with President Aftermarket Matthew Bromberg, says Pratt & Whitney is focusing on growing their service, support and back log in that realm. They said the company goal is to drive profitability and capture more of the market share for services and support. Engine shops of the world, be prepared for tough competition straight from the manufacturer. This is not earth shattering news but their commitment to this model seems to have renewed focus and energy. With the introduction of the geared turbofan later this year, the company says it will look to leverage their intimate knowledge of its design and use their economies of scale to better serve their customers. Big data was a buzzword bandied about during the meeting as well. For more information about how Pratt & Whitney will use big data, see our December/January cover story. For more from the Pratt & Whitney annual results meeting, see the Intelligence section, page 6 .

Speaking of data, another transition that we are in the midst of is electronic data exchange. With the big data movement and the necessity for increased speed of information in business, making sure that information is secure has never been more important. Especially with the hacking scandals in the news last year that included some of the largest and most technically savvy companies in the world like Sony, Google, Apple and Target.

According to the "Cybersecurity Market Report, Q2 2015 Edition," recently released by Cybersecurity Ventures, cybercrime is on the rise and demand for information security professionals will grow by 53 percent during the next three years. "Security will become the killer app for big data analytics," the report says. How is the MRO world handling this threat? For details on what we learned from experts in the technology and MRO fields, check out our report on electronic data security on page 22. **AM**

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2015 - Pratt & Whitney Focus on Aftermarket Service Model



From left to right, Pratt & Whitney President Paul Adams and Pratt & Whitney President Aftermarket, Matthew Bromberg spoke recently at the company's annual results meeting at their headquarters in East Hartford, Conn.

At their annual results meeting held in East Hartford, Conn., on April 2, 2015, President Paul Adams says the company will be focused on "driving an aftermarket service model...during a transformational year" for the company, celebrating its 90th year in operation. Adams called their results for 2014 "good" with \$14.5 billion in sales, \$2.1 billion EBIT (earnings before interest and tax) and a return on sales (ROS, a key indicator of efficiency) of 14.2 percent.

Adams went on to say that 2015 is shaping up to be a busy year for the company especially in the area of flight test. "[It] Will be as intense as we've seen in the last ten years," Adams said. The PurePower Geared Turbofan, PW 1100G-JM and PW 800 engines will be in intensive flight test phases.

The focus on aftermarket comes from a decline in the installed base, due to turn around for the company in 2015 and start an upward trend for several years with the entry into service of the PurePower Geared Turbofan Engine. Adams says they are "moving from development to the entry into service stage" for that engine, which received certification in December of 2014 and expected to enter service later this year.

Adams says testing has proven that the GTF technology is performing well and that the development-spend for the engine is mostly

done. The company says it has completed more than 16,000 hours and 31,000 cycles of full engine testing for this engine family. "With a 16 percent fuel reduction, 50 percent reduction in emissions, a 75 percent reduction in noise and being first into service, it's going to be tough for people to follow us," Adams said.

Even with the decline in the installed base however, he said the turn around comes in this year. "The geared turbofan has a 6,300 engine backlog," Adams emphasized. Pratt & Whitney has signed nearly 200 long-term agreements involving a projected spend of more than \$18 billion with key product suppliers from around the world. These agreements will help the company support increased production levels as it prepares for an expected doubling in engine production by the end of the decade.

Additionally, Pratt & Whitney redesigned the assembly lines for the GTF engine at its Middletown, Conn. facility as well as its West Palm Beach, Fla. facility. The company implemented an innovative overhead-automated horizontal moving assembly line. "The horizontal assembly line is a lean and more efficient way to build engines. Pratt & Whitney continues to advance manufacturing methods, investing significantly in our global manufacturing network and partnering to prepare for the upcoming production ramp," Joe Sylvestro, VP of manufacturing operations

said on the tour of the Middletown facility. Ladders and platforms have been eliminated and the engine can be adjusted up, down and rotated to help reach difficult areas.

Adams went on to stress the company's recommitment to the aftermarket service model. "We will grow engine service, drive profitability and capture a greater percentage of service," Adams says. The company boasts a \$57 billion service backlog.

"The aftermarket is always a dynamic place," says Matthew Bromberg, president Aftermarket at Pratt & Whitney. "With 12,000 active engines out there around the world, 6,000 professionals, 20 facilities around the world open 24/7, the aftermarket is always fun, exciting, dynamic. But this year in particular we are undergoing a monumental change." With the company's increased focus on aftermarket service and support, Bromberg has begun implementing business changes to reflect that focus, including preparing for the entry into service of the GTF later this year. "We offer a unique OEM value and the broadest coverage with 60 field offices to support our customers," Bromberg says. "We ship 100,000 parts a year and answer 100 AOG questions a year. With the geared turbofan entry into service, we will know more than anyone about this brand new architecture." Bromberg says they will strive to offer their customers unique OEM knowledge, an unbeatable cost, value, speed proposition and "huge economies of scale."

20

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about people

Gulfstream Names Tait VP of Quality



Tait

Gulfstream announced that it has appointed Lee Anne Tait vice president, Quality. In this position, Tait is responsible for overseeing the quality and continuous improvement efforts at all Gulfstream manufacturing and product support facilities. She reports to Mark Burns, president, Gulfstream Product Support, and Dennis Stulgross, senior vice president, Operations, Gulfstream.

Tait brings more than 30 years of experience to her new position, having begun her aerospace and defense career in 1983 as a member of the Quality group at McDonnell Douglas. Before joining Gulfstream, she served as the vice president of Quality and Mission Assurance at Aerojet Rocketdyne in Sacramento, California, where she managed more than 560 people across 14 operational sites. She previously served in similar roles at several other defense and aerospace companies, including Lockheed Martin and Bell Helicopter.

Moore Joins AAT as President



Moore

Advantage Aviation Technologies (AAT) announced that Dennis Moore will oversee AAT's business and production operations.

Moore joins AAT following a successful career in operations direction with 25 years of executive operations experience, including leadership roles at successful and high profile manufacturing organizations including Rubbermaid and Petmate.

"Dennis brings a wealth of manufacturing expertise and experience to our organization," states David MacDonald, CEO of AAT. "Dennis has a reputation of looking at business from a vantage point of proficiency, team results and a customer first approach."

MacDonald continued, "AAT has arrived at a growth stage where our reputation for providing exceptional manufacturing and repair services requires added company leadership and experience. Dennis brings the skills required to accomplish the next step in AAT's evolution and growth."

Working in tandem with AAT's engineering, production, sales, customer support and support departments, Moore will oversee all company operations.

RBR Maintenance Welcomes Carter, Lesniak

RBR Maintenance hired Scott Carter as service manager for the King Air and Citation line. Carter first joined RBR as a contract employee in October 2014 and was quickly hired full time. >>>

Duncan and Honeywell Lower the Price of VG14A Gyro SPEX Exchanges

Duncan Aviation and Honeywell Aerospace have worked together to develop efficiencies for Honeywell SPEX exchanges on the VG14A gyro that allow Honeywell to drop the exchange price of that unit by half.

"Operators prefer the value and quality of the Honeywell SPEX exchange for the VG14A gyro, but have provided feedback that they would like a lower exchange cost," says Kevin Miesbach, manager of Duncan Aviation's Avionics and Instrument Shop, which performs overhaul and recertification for all Honeywell SPEX VG14A exchanges. "Honeywell and Duncan Aviation collaborated and developed service efficiencies that allow for more value with the SPEX exchange on that unit."

Starting in April, operators will be able to receive the VG14A Honeywell SPEX exchange (part number PN7000622-901) for \$5,500, half off the former rate of \$11,000. However, customers who buy the exchange unit will still receive the same reliable, high-quality Honeywell unit backed by a full one-year unlimited warranty, Honeywell's liberal "no billback" guarantee and Duncan Aviation's excellent 24/7 customer service complete with same-day shipping and no AOG fees.

ARSA to Congress: You Can't Fly Without 300,000 American Aviation Workers

On Mar. 18, the Aeronautical Repair Station Association (ARSA) hosted a dual-premiere event on Capitol Hill to provide both visual and quantitative evidence for the importance of the aviation maintenance industry to American lives and livelihoods.

At a congressional briefing in the Rayburn House Office Building, Rep. Carlos Curbelo (R-Fla.) helped the association unveil You Can't Fly Without Us – The World of Aviation Maintenance. The seven-minute documentary was developed as part of a series of informational public-television features and is intended to provide a foundational introduction to the work of the men and women who keep the world safely in flight.

The video can be seen on AVMRO.arsa.org, the aviation maintenance industry's information portal.

After the screening, ARSA released the 2015 Global Fleet and MRO Economic Assessment, prepared by CAVOK, a division of Oliver Wyman. David Marcontell, CAVOK's vice president, presented an overview of the report's findings, noting that the total worldwide market for commercial aviation maintenance activity will surpass \$100 billion by 2025. On American soil, Marcontell noted that the industry employs nearly 300,000 men and women and generates more than \$43 billion in economic activity, while producing more than \$5 billion in federal corporate and individual income taxes.

The full report, as well as a fact sheet illustrating U.S. state-by-state employment figures, can be found in ARSA's economic data center at arsa.org/news-media/economic-data.

"Each year, [the Global Fleet and MRO Economic Assessment] continues to paint a clear picture of a complex, but vibrant industry," Marcontell said before the event. "People across the world are becoming more connected with each other and demanding even more from the aviation industry to carry them and their products safely and cost-effectively around the globe. As air carriers and other aviation businesses respond to this demand, the already-dynamic aviation maintenance market will march right along in step."

"The message here is pretty simple," said Christian A. Klein, ARSA's executive vice president. "Every single time you land safely, or pick a loved-one up at the airport, or have a package arrive on your doorstep, there's a maintenance provider somewhere for you to thank. These repair stations, maintenance facilities and component shops – the businesses that ARSA represents every day – are part of a complex global network of services that are vital to our national and global economy. We can tell those stories in many different ways, and this report and our documentary make key points in the overall discussion: You can't fly without us."





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about people

» With nearly 30 years in aviation, Carter has extensive experience in the field of aircraft maintenance management. He also has over eight years of service management experience in Part 91 and Part 135 Repair Station. Before starting his career, he served as an Air Force crew chief.

Carter earned a Bachelor's degree in Mechanical Engineering with an emphasis in Aviation Technology, a Master's degree in Engineering, as well as his A&P certificate at Western Michigan University. While working on his Master's Degree, he worked as an instructor on campus and designed the university's wind tunnel that is used in the engineering department.

Carter will be responsible for overseeing all maintenance projects, while also providing technical support to RBR King Air and Citation customers.

RBR also recently promoted Chris Lesniak to Sales and Marketing director. He has been with RBR since July 2013. In his new position, Lesniak will oversee the continuous development of the Sales and Marketing programs and employees at RBR. This includes increasing awareness in the regional aviation community of RBR's full service maintenance and repair capabilities as well as their parts department.

Lesniak will still be involved in all aspects of the parts department, including inventory procurement, working one-on-one with clients, providing value-added parts support as well as taking an active role in aiding the logistics team in procuring parts and services for the in-house maintenance customers.

Gulfstream Names Robinson Director, Product Support Asia Pacific

Gulfstream Aerospace recently appointed Nicolas Robinson as director of Product Support Sales for Asia Pacific. He reports to Mike West, vice president, Product Support Sales and New Business Development.

In his new role, Robinson oversees all Product Support Sales activities, including maintenance, refurbishment, avionics sales, provisioning and spare parts subscription sales in his territory, which stretches from China to New Zealand. He also establishes and grows customer relationships throughout the region and collaborates with and assists New Aircraft Sales team members.

Robinson is based in Singapore.

"Nic has a deep understanding of Gulfstream Product Support and how our products and services can benefit customers," said West. "He has the energy and enthusiasm to handle the demands of the position."

Hughes Appointed COO (Designate) at Rizon Jet UK



Hughes

Rizon Jet UK announced the appointment of Steve Hughes as COO. Reporting to the CEO Allan McGreal, Steve's responsibilities in addition to being the Part 145 Post Holder, will include the continuing alignment of the two main operating businesses within Rizon Jet, its MRO and FBO Operations. Additionally, all of the operational elements of the business will come under his supervision including Customer Services.

Cutter Appoints Elliott to New BD Position



Elliott

Cutter Aviation announced the appointment of Bryant Elliott to the new role of Regional Sales Manager for Cutter's Texas Piper South, based in San Antonio, Tex. Bryant Elliott grew up in north Texas and graduated from Carroll High School in Southlake. After graduation he enrolled in the »

CEVA/BAE Systems Logistics Team Wins Supplier Award

A team jointly staffed by personnel from CEVA Logistics and its customer BAE Systems has won the prestigious BAE Systems MAI (Military Air & Information) "2014 Supplier Relationship Award."

The winning F35 Transport Team comprises staff jointly drawn from BAE and CEVA. It is responsible for the delivery of raw materials from global suppliers, to support the manufacture of major components for the F35 Lightning II fighter aircraft program. In addition, it handles the components' subsequent delivery to aircraft final assembly lines in Fort Worth (USA) and Milan (Italy).

The award was made following nominations by the many different businesses within MAI, of global candidates they feel have delivered exceptional performance. A panel of BAE senior management assessed all submissions against set criteria, to decide the winner.

MAI, part of BAE Systems, traces its roots back to the earliest days of aviation, through well-known names including Avro and Vickers. MAI designs and manufactures fixed wing combat and training aircraft for customers around the world, and provides associated training solutions and support services. MAI also incorporates BAE's defense information arm.

Aerospace Center for Excellence Receives Funding

SUN 'n FUN has received \$225,000 in funding from the Emil Buehler Perpetual Trust to be used towards the completion of the Piedmont Aerospace Experience on the SUN 'n FUN Convention Campus.

The Emil Buehler Trust was established in 1984 to perpetuate the memory of Emil Buehler and his commitment to aviation science and technology. As an aviation visionary, architect and engineer, Emil Buehler considered the majesty and mystery of flight more than a private interest. He had a vision to be shared during his lifetime and beyond. It is this same vision that is perpetuated today through the continuing philanthropic involvement of the Buehler Trust.

The funding from the Emil Buehler Trust allows for the completion of a new learning center, meeting all public access building codes, on the SUN 'n FUN Central Florida Aerospace Academy (CFAA) high school campus. A fully functional Boeing 727, donated in 2012 to SUN 'n FUN from FED EX, will house the Bernie Little Classroom and is dedicated in memory to Piedmont Airlines founder Tom Davis and Buehler. Modern technology will allow students in the classroom to monitor the students in the cockpit as computer displays of all activity will be available. Students in aviation careers from CFAA, Polk State College and Traviss Career Center with programs on Aerospace Center for Excellence will be actively scheduled for related classes. The facility will be available for special education activities.

Air Madagascar Adds ATR 72-600s to Fleet

ATR and Air Madagascar announced the signing of a contract for the purchase of three ATR 72-600s for a total of approximately \$77 million. The first aircraft will be delivered as from 2017. At the same time, the airline has recently signed an agreement with the Irish leasing company Elix Aviation Capital to add two new ATR 72-600s, the first having been delivered today and the second being delivered next month. The arrival of all these five ATRs of the latest generation will enable Air Madagascar to renew its fleet of ATRs, which currently consists of one ATR 42-500 and two ATR 72-500s, significantly increasing seat capacity on the main domestic routes, while offering passengers the highest levels of comfort. Air Madagascar is a long-time customer of ATR. It introduced its first ATR, an ATR 42-300, in 1996 and has operated the ATR -500 series since 2005.

Titan Tool Supply Introduces New FreedomView LED Videoscope



Titan Tool Supply has introduced the new FreedomView LED Videoscope by Optim. Titan says it is designed to conduct and record inspections quickly and safely. The FreedomView features a patented, integrated LED light source with variable intensity control and a compact design to provide exceptional visibility and flexibility, according to the manufacturer. The unit can capture still images and streaming video (JPG and AVI file formats) with a date and time stamp, and can store more than 8,000 still images.

The company says that the most challenging inspections are reached within seconds, and that FreedomView is ideal for examining: aviation engines, military equipment, gas turbines, non-destructive testing, power generation, contraband searches, U. S. Customs and border protection, and interdiction as well as tactical law enforcement applications.

FreedomView has a field of view of 80° and depth of field from 5mm to infinity. The Tungsten braid probe has shaft diameter of 6mm (0.236") and flexible length of 2.0m (79"). The unit is powered by two rechargeable Li-Ion batteries that provide more than two hours operating time, Titan Tool states. Other features include a 3.7" touchscreen display, 110° up-down/left-right joystick control, and play/pause video controls.

The FreedomView can function in a wide range of operating temperatures, from -13°F to 158°F (-25°C to 70°C) ambient and 50°F to 86°F (10°C to 30°C) in liquid. The unit is packaged in a rugged carrying case that includes two batteries, a battery charger cradle with AC power supply, an 8GB SD memory card, and operator's manual.

Historic Retrofit Contract for Teledyne Controls

An entire fleet of Boeing 737-NG aircraft belonging to a North American airline is to be retrofitted with a sophisticated Digital Flight Data Acquisition Unit (DFDAU) from Teledyne Controls to significantly enhance the ACMS (Aircraft Condition Monitoring System) capability on each of its aircraft.

The contract, the largest of its kind in Teledyne Controls' history, will see new DFDAU technology installed on more than 400 aircraft over the next 18 months to add to the 85 Teledyne DFDAU-equipped aircraft already operated by the airline.

The technology, which is considerably more powerful and capable than the technology it is replacing, will enable the airline not only to have an advanced ACMS capability but also to take advantage of Boeing's proprietary Airplane Health Management (AHM) program.

Masood Hassan, president of Teledyne Controls, said that the combined monitoring and health management programs will lead to significantly advanced trouble shooting and data management capabilities. "It will allow our client to convert 'data' into meaningful, real-time information to further improve operational effectiveness and support enhanced flight safety," he said.

Teledyne Controls' Digital Flight Data Acquisition Unit (DFDAU) is an integrated system that combines the functions of Mandatory Data Acquisition and Recording with a sophisticated Aircraft Condition Monitoring System (ACMS). This comprehensive system provides aircraft operators with a standardized hardware and software solution for high-power data acquisition, management and recording.

Crane Aerospace & Electronics Launches NEW 8-Way Ku-Band Iso-D

Crane Aerospace & Electronics Microwave Solutions continues to expand the Ku-Band Iso-Divider product family with the introduction of an 8-way unit. Featuring similar outstanding performance as the previously introduced 4- and 2-way products, exceptional insertion loss and band flatness performance is continued in this product. Small size, low weight and high reliability are features that are crucial for the target space applications.

The Iso-Divider combines the functions of high performance power dividers with ferrite isolators to provide a high isolation power divider solution, making the external isolators redundant, for satellite receiver applications, without introducing complex switch-based solutions. Integration of the two functions into a single package provides enhanced product reliability due to fewer external components, interconnects and transitions. Additionally, marrying the power divider and isolators in the same package allows the performance of the integrated unit to be carefully matched and better overall performance can be obtained. Size and weight of the new product are considerably less than an equivalent discrete assembly.

"Our Chandler and West Caldwell operations continue to expand the Iso-Divider product line to provide our customers with a comprehensive integrated solution offering enhanced performance and smaller physical size and weight," said Mike Clark, Microwave Solutions Vice President. "Our Microwave team continues to demonstrate providing critical multi-function building blocks for advanced system architectures."

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about people

» Professional Pilot program at Oklahoma State University, where he graduated with his Commercial Multi and CFII. After earning his Bachelor's degree, he went on to graduate with his Master's in Aviation Management from OSU. While completing his course work to earn his Master's, he also taught flight lessons and accumulated over 1000 flight hours.

Bourquet Named CEO at Aircelle Affiliate, SLCA

Vincent Bourquet has been named the Chief Executive Officer of SLCA, the Aircelle (Safran) affiliate specialized in the design and manufacturing of complex aerostructures - with expertise in composites. Bourquet comes to SLCA from the Sagem company, where he was head of the Airborne Control Units' Center of Industrial Expertise in manufacturing and supply chain.

Previous positions held by Bourquet during his 26-year career within the Safran group were the President & CEO of Safran Electronics Canada, and the Quality Vice President of Messier-Bugatti. He initiated his professional activities with Messier-Bugatti beginning in 1988, where he was assigned responsibilities in the field of aircraft braking systems.

"Vincent has the experience that will be valuable in further developing SLCA, bringing knowledge that covers management, quality and systems," said Aircelle CEO Martin Sion. Import/Export Consultant Joins Duncan Aviation Dan Moody recently joined the Duncan Aviation Aircraft Sales and Acquisitions team to add expertise and consultant advice to the aircraft sales process. Duncan says Moody has decades of aviation experience and has spent the last three years as a Major Repair and Alteration (MRA) project coordinator with Duncan Aviation's inspections team. He will continue to assist that team in researching and conforming procedures to ensure the company's customers comply with everything they need to during a transaction.

"With the addition of Dan as a consultant to our team, our aircraft consignment and acquisition customers will be able to take full advantage of market opportunities around the world while keeping the process simple," says Duncan Aviation Marketing and New Business Development Vice President Steve Gade.

Aerospace Center for Excellence Receives Funding

SUN 'n FUN has received \$225,000 in funding from the Emil Buehler Perpetual Trust to be used towards the completion of the Piedmont Aerospace Experience on the SUN 'n FUN Convention Campus.

The Emil Buehler Trust was established in 1984 to perpetuate the memory of Emil Buehler and his commitment to aviation science and technology. As an aviation visionary, architect and engineer, Emil Buehler considered the majesty and mystery of flight more than a private interest. He had a vision to be shared during his lifetime and beyond. It is this same vision that is perpetuated today through the continuing philanthropic involvement of the Buehler Trust.

The funding from the Emil Buehler Trust allows for the completion of a new learning center, meeting all public access building codes, on the SUN 'n FUN Central Florida Aerospace Academy (CFAA) high school campus. A fully functional Boeing 727, donated in 2012 to SUN 'n FUN from FED EX, will house the Bernie Little Classroom and is dedicated in memory to Piedmont Airlines founder Tom Davis and Buehler. Modern technology will allow students in the classroom to monitor the students in the cockpit as computer displays of all activity will be available. Students in aviation careers from CFAA, Polk State College and Travis Career Center with programs on Aerospace Center for Excellence will be actively scheduled for related classes. The facility will be available for special education activities.

Avtrade's Growth Continues with the Appointment of Five New Regional Account Managers

Following the restructure of the sales department, Avtrade is pleased to announce the appointment of five new Regional Account Managers: Zaid Garnie, Cedric Fernandez, Marco Pozzato, Gavin Morris and Francois Rault. As part of their new roles, they will each be responsible for different regions in Europe.

Zaid boasts a successful career in aviation spanning over two decades. He has a wide range of experience developing and implementing key sales strategies and has extensively travelled to support customers globally providing high quality customer service. He will be responsible for applying his wealth of sales expertise to growing the company's customer portfolio and maximising business opportunities in Cyprus, Greece, Turkey and Israel.

Initially an engineer, Cedric joined Avtrade within the Support Contracts department, developing an in depth understanding of Power by the Hour. Cedric gained experience managing PBH contracts, negotiating with suppliers and delivering high quality customer service. With his wide range of PBH knowledge together with his technical expertise, Cedric will be responsible for Scandinavia; building strong relationships with new and existing customers and securing contracts.

Marco is responsible for providing dedicated account management to Italy, Spain and Portugal customers. His multilingual talents, extensive Sales expertise and aviation knowledge will ensure the delivery of the highest quality customer service and support for these regions.

Over 15 years' experience within aviation, Gavin joined Avtrade as an AOG Support Executive. Gavin's extensive range of knowledge and experience providing rapid response, on time delivery and exceptional communication skills allows him to exceed customers' expectations in providing high level customer service. Utilising these skills, Gavin will develop Avtrade's business with the sole focus of the UK and Ireland.

With Francois' extensive knowledge of aircraft components and sales ability, a great understanding of customer requirements and marketing skills from his previous role. Francois will be supporting customers in France, Belgium, Netherlands and in addition to his European customers, will also be responsible for North Africa. Francois will focus on maximising business opportunities, sales growth and high level customer service.



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FL Technics Jets Supports Grafair with Hawker Base Maintenance

FL Technics Jets announced that recently it has provided comprehensive Hawker aircraft base maintenance support to its latest customer Grafair, a Swedish business jet and FBO operator.

The agreement with the Swedish carrier was signed in the beginning of 2015. Since then, FL Technics Jets has already provided the first set of MRO works on the Grafair's Hawker 800XP business jet. The agreed upon

service package comprised such maintenance works as a 12-month check of engines, APUs and other aircraft systems as well as defect rectification. All services were provided in the FL Technics Jets own MRO center in Vilnius, Lithuania. Following the successful completion of the aforementioned works, the Grafair's aircraft has returned to its base at Stockholm-Bromma Airport in Sweden. Additional scheduled maintenance works on

the aircraft are to be conducted later this year.

"It's a real pleasure to support Grafair, one of the most prominent business aviation players in Europe, with our services. The fact that the Swedish carrier has placed its trust in our company and has since expressed full satisfaction with our services explicitly speak for the quality and reliability of our business aviation MRO solutions," comments Darius Saluga, the CEO of FL Technics Jets.



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Miyachi America Announces the Miyachi MDA-10000A Linear DC Weld Control



Miyachi America Corporation announced the availability of the Miyachi MDA-10000A ultra-fast, high current linear DC weld control, which can operate in constant current mode, constant voltage mode, or both. The company says it is particularly well suited to series welding applications and that the MDA-10000A is ideal for welding optical sensor parts, crystal oscillators, and projection welding of electronic components.

Connect multiple power supplies to achieve high power welding in a short time frame. Up to twelve MDA-10000A power supplies can be connected in a slave/master configuration to design just the right system for high power/short process welding. One master unit controls all connected units, eliminating the need to set separate weld schedules. The unit features controls to collectively stabilize current from all connected units.

MDA-10000A is equipped with three control modes: constant current, constant voltage or both. The constant current mode applies constant current to a work-piece regardless of the resistance, ensuring stable welding. Constant voltage mode stabilizes voltage from the beginning of the welding, reducing weld splash. And if both constant current and constant voltage are selected, constant voltage eliminates weld splash in the initial weld phase and constant current follows up to support stable welding. Control timing can be precisely set up to support specific application needs.



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Aviation Electronics Europe Yields Strong Restart

25th and 26th of March 2015 saw the successful reintroduction of an international avionics event, which took place in Munich, Germany.

Program highlights included opening keynote speeches by:

- ➔ **SES / EASA** Regulation update
Gzim Ocakoglu, DG MOVE,
European Commission
- ➔ Managing **transition between SES and EASA**
Maria Algar Ruiz,
EASA ATM/ANS – SESAR Coordinator
- ➔ Avionics **Perspectives for an Airlines with Growing Fleet and Network**
Ersan Yuksel, Senior Engineer,
Turkish Airlines Technic

The first day presentations included SESAR, standardization and certification and a panel discussion on the Impact of Performance Based Navigation from Alternate Perspectives. The second day included topics such as Connectivity and eEnabling, Situational Awareness and Open Architecture



Networking reception hosted by Ministry of Economic Affairs.



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Aviation Electronics Europe will take place again next year on 20/21st April again in Munich. For more information see www.ae-expo.eu or contact the show Director Adrian Broadbent via abroadbent@aerospace-media.com.



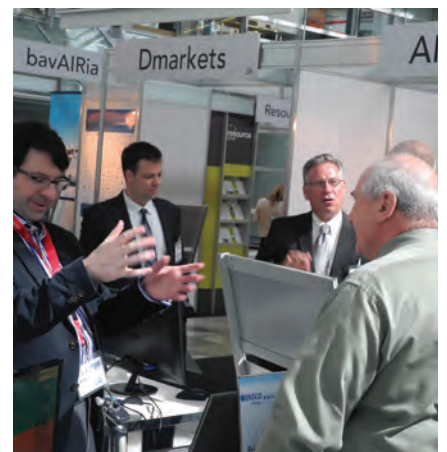
Conference delegates listen to great range of interesting and informative presentations during the two-day event.



Despite the event being a great success it is with great sadness that a valued member of the organizing team passed away during the show. James McAuley was a long-term supporter of the show and Avionics in general and will be sorely missed by all his colleagues and friends. Anyone wishing to pass on their condolences to his family should contact Adrian Broadbent at abroadbent@aerospace-media.com.



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Lufthansa Technik Chairman August Henningsen Retires

Interview and images by Joy Finnegan, Editor-in-Chief

After 14 years as chairman of the board for Lufthansa Technik, August Henningsen is retiring. The company is celebrating its 20th anniversary and Henningsen has been at the helm for the majority of those years.

In their first fiscal year, 65 percent of their revenues came from parent company business with Lufthansa. By 2014 this figure dropped to 38 percent and sales revenues have more than tripled to €4.3 billion. Henningsen oversaw worldwide expansion and acquisitions and now LHT has facilities in Shannon, Budapest, Sofia, Malta, Beijing and Tulsa. A new facility in Puerto Rico will open this year. In 1995 there were 10,337 employees and today there are more than 26,000 people worldwide. Described as a “typical pragmatic northern German,” Henningsen took the company on an upward trajectory, molding it into the world’s leading MRO provider. We sat down to talk with Henningsen one last time to get his thoughts about his tenure with the company and where it is headed.

AM: What is your education and work background? How did you come to be employed at Lufthansa Technik?

Henningsen: Well I am an aviation engineer. I studied aerodynamic flight, mechanical structures – all the basic stuff. Then I worked in the DLR, the German NASA so to speak for one year. Then there was a job availability for Lufthansa. It was a technical division and they were looking for someone with a background in aeronautics for incident analysis and support between flight operations and Technik. This is what I did. And at the same time flight system engineer for DC-10 and 747 flight controls. I was also in line main-

tenance and became the section manager in the flight controls group, which was very interesting. During the time of control loss for the A320 and so on and so on during the 80s. Then I took over the whole engineering department and was in base maintenance so when the wall came down, the former Interflug technical base, due to the bankruptcy of Interflug, they had technicians – good technicians - and they needed jobs so at that time the big German companies requested to do something on the other side for our new brothers and sisters so we decided to shift the 737 from Hamburg to Berlin. I was manager of that company and developed 737 base maintenance in East Berlin. Very exciting job and from the personal viewpoint it was rewarding. Then for two to three years I ran the component business, integrated the materials planning, materials management, purchasing, engineering and production side into one product, more or less. After that I was in Beijing, China for three years as general manager of AMECO. Then came back and became member of the board of Lufthansa Technik responsible for production and services and then half a year later became chairman of the board.

AM: After your retirement, will you continue to support LHT in some way? As a consultant or in any capacity?

Henningsen: Yes, in the supervisory board but not decided yet. But that is it. I am com-

pletely out of the operation. Our supervisory board is more distant from the operation. If you are out, you’re out. That’s the way it is here, which is good. The operational management has to have the decision power and should not be interfered with by people who are further away. Our business is so fast and changing so fast by demands you have from the market, from the production side, from the technology side you have to make them your experience. That is why we have the board. We have our top management and they are capable enough to make the right decision. I appreciate that system very much. These people are responsible and they have the responsibility – period. And not that somebody from outside from time to time looks in and comes with good advice. They have to question, is that still good advice?

AM: How long did you serve in your position as chairman of the board?

Henningsen: It’s a five-year term and I served three times. It is set up that way so that after five years there is an evaluation and if [business is] good they keep you and extend for another five year term. But they don’t have to.

AM: During your tenure, what do you view as the company’s greatest achievements?

Henningsen: Two things. Exacting market behavior. We were coming from a state

owned culture and then moving to a flexible, customer oriented organization. I think this was a challenge. The second was to make the organization flexible enough to change. What I mean is that it is that it can adapt to market needs, technological changes and any change. So this I think is the answer – customer orientation and adaptation. Adaptation to technology, new customer requirements, new products to innovation, to lean, to cost cutting overall to stay competitive. This doesn't happen only once. This is an ongoing process.

AM: As the leader of this large organization, how did you lead the company to make these adaptations to new thinking, innovation and technology?

Henningsen: Make people aware that the paychecks at the end of the month are coming from the customer. Not from the board. The other thing is we adapted our organization – adjusted the organization to the market demands. What I mean is there are different products in the market. So you have components, repairs, pooling, special products like wheels and brakes, composites, reversers, engine disassembly and repair, lease. We adjusted our organization in accordance to these needs from the market. SO the business units that we have are responsible for these different products and this means they have also all the RFPs from the market. They are the specialists. And they go head to head with their competitors in that market and to their OEMs. Although we are big and covering the whole variety we are very specific to the individual products and to the products that the market wants. I think this made it possible that the people were forced into the market segment. Then if you lose competition or the RFP then you don't have to tell much – next time we'll do better. What can we change? So adaptation of people but also the organization.

AM: Was there a certain initiative on customer needs or a time when you become more customer focused?

Henningsen: Yes, we had the big change in the organization in 2003-2004. And before that we were more classically oriented. Then we had purchased a number of companies that we had purchased. But they were not running integrated. And so we had internal competition for external customers. There were several needs to streamline the whole thing. That is what we did for the whole organization and it was a big move. Our customers at that time didn't understand what we were doing with those businesses. What is one

company doing? One company had different behavior than another company. We had to integrate it stronger and adapt it stronger to the needs of the marketplace.

AM: The technological change during the last 14 years you have been chairman has been dramatic. Talk about the technological changes and how it has impacted LHT in during your time as chairman.

Henningsen: I think this is the interesting part of our business. We are forced into new technology. With the new airplanes that are coming, you have to manage the new technology in them. Not when the aircraft arrives but in the years ahead. You have to prepare line maintenance, the shops, engineering, quality - everything. This keeps an organization young and responsive. I think it is one of the most interesting parts of our industry. We are not only going with [one manufacturer] Airbus or Boeing or Embraer. We go with all engines, all airframes, all systems. You have to have very, very broad knowledge in the organization. You have to manage it in a proper way to have it reliable, cost efficient. This is a big challenge for the whole organization. It's very exciting. With the A380 or the 787 or the A350 and with changes in the cabin, entertainment systems and things like carbon fiber, changes will continue.

AM: What one technology would you say has made the most positive impact?

Henningsen: Standardizing the airplane types. Today you have the A319, A320, A 321, A321neo with the same systems. This saves tremendous costs, in development for the manufacturer, in training for the pilots and in spares provisioning, tooling, repair facilities, docking, etc. This is tremendous. You have the same on the 767 side and 777. There will be a lot of commonality. So it's not one computer. The airplane didn't change so much. And it's not like going from low bypass to high bypass engines. We have some more fuel efficiencies and lower noise but traveling itself hasn't changed so much. I think the change is there.

AM: Tell us about your costing cutting and efficiencies initiative, the SCORE program, and where it is today?

Henningsen: We had in LHT a number of programs going in the same direction – higher productivity, cost cutting ideas, making things more efficient. We put all these programs under the SCORE program. It is an ongoing program because you always have to find ways to become more efficient, more productive.



Lufthansa Technik Increased Revenue in 2014

In fiscal year 2014, the Hamburg-based Lufthansa Technik Group says it achieved "a very good result" just under last year's record level, with increased revenue of EUR 4.3 billion. The annual accounts of the 22 consolidated Lufthansa Technik Group companies show an operating result of EUR 392 million.

"In spite of a good year for global aviation on the whole, price pressures on technical services providers have not let up. Against this backdrop, Lufthansa Technik has continued to develop well," said retiring Chairman of the Board August Wilhelm Henningsen on March 17 in Hamburg.

After fourteen years at the helm of the company, on April 1 Henningsen will turn over the leadership of Lufthansa Technik to his fellow Board member Dr. Johannes Bussmann, who has been responsible to date for Human Resources, Engine and VIP Services. "Through the continuation of our successful cost reductions and a positive order situation, we nearly reached last year's very good result. We have maintained our market position and remain the world's leader among independent providers of maintenance, repair and overhaul (MRO) services for aircraft," added Henningsen.

Currently, Lufthansa Technik says it has 800 customers and a total of 3,200 aircraft. In 2014, the group was able to win 30 new customers and conclude 325 new contracts, reaching a volume of 3.1 billion euros for 2014 and the years to come. The company says investments in innovation, research and development were boosted strongly in 2014. Plans call for EUR 200 million to be invested by the year 2018 - four times as high as during the previous five years.



Dr. Johannes Bussmann is new Chairman of the Executive Board, Lufthansa Technik

As of 1 April 2015, Dr. Johannes Bussmann (46) will become Chairman of the Executive Board of Lufthansa Technik AG, replacing August Henningsen (64), who is retiring after fourteen years at the helm of the company.

“August Wilhelm Henningsen led Lufthansa Technik to the top of the international maintenance, repair and overhaul (MRO) industry,” says Carsten Spohr, Chairman of the Supervisory Board of Lufthansa Technik AG and CEO of Deutsche Lufthansa AG. “I would like to thank him very much indeed for this outstanding achievement. His work will be continued by Dr. Bussmann, an experienced, successful Lufthansa Technik manager.”

Johannes Bussmann, who holds a doctorate in aerospace engineering, has been a member of the Executive Board since September 2012 with responsibility for Human Resources, Engine and VIP Services. He began his career at Lufthansa Technik in 1999 in Product Management and Development. Before being appointed to the Executive Board, he was senior vice president Component Services, and most recently, senior vice president Engine Services.

Antonio Schulthess is the new chief executive Human Resources. Schulthess, who is a military pilot, software engineer and management economist, has been head of Human Resources Division at Lufthansa AG in Frankfurt since July 2014.

As part of the changed allocation of Board responsibilities, the product division Original Equipment Innovation will be added to the responsibilities of the Chairman of the Executive Board alongside Strategy, Marketing and Sales. Antonio Schulthess' area of responsibility, Human Resources, Aircraft Systems & VIP Services, now covers not just personnel topics, but also VIP completion and maintenance as well as the Landing Gear and ARC business units.

The Engine Services division and “Design Organization and IP” have now been added to the Products, Services and IT responsibility of Dr. Thomas Stüger with Overhaul, Maintenance and Component Services.

You have to find possibilities to reduce cost and develop new products. It's not only downsizing it also upsizing. How can you make more business or offer more products? I think MRO is changing. How can you use new technologies not only from the airplane but also how can you use these technologies to manage your MRO.

AM: How is big data going impact MRO operations?

Henningsen: We are already managing big data for our fleet. We have designed tools to expand that to the customer's fleet. The question really is “What are you going to do with big data.” If you just collect big data and then make an analysis of what you can find from the data, that's one thing. But if you already have a clue and then use the additional data, as many as you can get, you can underline your direction or opinion and then it's even more specific or defined in finding out or solving problems. It's either big data blind or big data intelligent. You are either managing blindly or managing with operational knowledge. That is what we are doing today. We are investing more into this and it is part of our future. We have decided to invest heavily in innovation overall. So this goes in different directions – new products, new repairs but also in data management.

AM: What is the greatest challenge ahead for LHT?

Henningsen: Following our strategy is ambitious. But I think we have a good strategy and we are committed to growth. You can only survive if you can realize economies of scale on any product.

AM: Do you feel LHT is well-positioned for future growth? If so, why?

Henningsen: One hundred percent. If I am here or I am not here our strategy has been established. The organization is adjusted to the strategy already, so there will be no change.

AM: What advice will you give to Dr. Bussman as he takes over?

Henningsen: Stick to the strategy. We have developed it together so we both believe in it. Stick to it but not blindly. Our industry is changing so fast. There are different challenges so you always have to adapt.

AM: Can you give an example of a time in which you were extremely proud of your team?

Henningsen: Many. I think I am proud overall that in the different product divisions we have so much momentum and spirit. I am always proud to see that. You do not have to really guide them or tell them what they have to do — they know. There is always a correction here and there and overall guidance and strategy — where are we heading, what are the changes and challenges. But there is so much momentum in the company to become more competitive, to develop new products, to become better, leaner, administrative cost cutting. It's always impressive what the organization is delivering — this has impressed me very much.

AM: So is it your leadership that created that result?

Henningsen: Please, it's not about me. It's them. You can say Henningsen was there 14 years but then he's gone. Will Lufthansa Technik change? No. We have experts, engineers, mechanics, quality, change agents, lean managers, production managers and line maintenance technicians who are longer here than I am. And who are doing a fantastic job over 30 years. I had the privilege to lead this company and I enjoyed it very much. But if something is teamwork in keeping the airplanes reliable, safe, economical and in the air, from engines, components logistics, line maintenance, engineering, quality assurance, administration — this is teamwork. It's not like building a new airplane where you have new parts. Always you live with change. You heal systems to make them better to keep them reliable. Responsibility in our business is delegated to a lot of people. It's not like in a production company where you say OK today we turn the nuts left and not right... here it is different. People have to make decisions. Is this airworthy? Is the system good? How can we repair? What idea do we have to save costs? So for me, this is important and it is the Lufthansa Technik story — not the August Henningsen story. We are 20 years old now. We are successful. **AM**

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Protecting MRO Data Exchange

By Charlotte Adams

Maintenance organizations exchange information via paper, electronic messaging or some combination of the two. Electronic exchanges can be fully automated—often broadly designated as electronic data interchange (EDI)—or through other interfaces. Whatever the medium, it is necessary to protect the data, ensuring that only authorized employees are permitted to access and change it.

Some organizations prefer paper. They may be reluctant to switch to some electronic means of communicating documents because of the cost and difficulty of implementation or simply because of inertia—why change something that works?

Paper has drawbacks, to be sure. It deteriorates over time, so that at some point it is no longer useful as a work record. And written signatures are often illegible scrawls. What's more, paper records can be time-consuming and expensive to compile and track over long periods of time.

But shifting to an electronic system for keeping and transferring important compliance and logistics documents raises new concerns. Everyone thinks of hacking, but civilian MROs' security concerns are typically of a different order. MROs are repositories of aviation safety data and they must prove to their customers and the regulators that they have performed each repair, overhaul, and modification safely and correctly and that they have documented each task in the required manner. So their information security regime would stress the integrity and availability of the data through mechanisms such as passwords, biometrics, electronic signatures, or full digital signatures. They may also encrypt data for confidentiality. Since no particular method of electronic document exchange or security technology has been mandated, however, the choice is essentially a business decision.

Security Technologies

Full digital signatures can provide a robust method of message authentication that allows electronic documents to be "signed" by a known user and provides confidence that the information has not been tampered with. The FAA has endorsed the use of this technology and the Air Transport Association (ATA) e-Business organization—under the aegis of the trade group, Airlines for America (A4A), has developed standards for automated transactions that include the technology. Some providers of software and services also say they can support full digital signatures if their customers require it.

But because of the expense of implementing full digital signatures, a common alternative technology known as electronic signatures is more widely used in the aviation maintenance world. It might involve the use of a day/time stamp and the entry of an employee identification number to link an employee to a document. Maintenance organizations also can encrypt the data in transit. Many enterprise resource planning (ERP) systems provide encryption among their security options.

Adoption of full digital signature technology is lagging in the airline industry because there is no FAA mandate for such security, says Peter White, manager for supply chain technologies with consultant Capgemini and a former chairman of the ATA e-Business program. And the airframers have been more concerned about protecting the integrity of information in aircraft systems, he says, so there has been less of a focus on securing the exchange of maintenance data between ground-based systems. Companies also have been more concerned with securing data at rest in a database than with data in transit in many cases, he says.

Electronic Release-to-Service Forms: Digital Signatures or Not?

FAA Order 8130.21 addresses the use of electronic release-to-service forms. It recommends that organizations choosing the ATA Chapter 16 standards for automated exchange of return-to-service forms use full digital signature technology.

A4A/ATA says that while the use of the Chapter 16 standard for the automated exchange of return-to-service forms is voluntary and both parties have to agree in order to use it, the FAA Order 8130.21H, section 5, requires companies implementing Chapter 16 to use digital signature "in order for a transaction to be considered original." And Chapter 16, the group says, prescribes the use of digital signature/digital certificates. The FAA requires that companies that plan to implement electronic mechanisms for transferring 8130-3 tags must first notify the FAA, and in response the FAA may check the

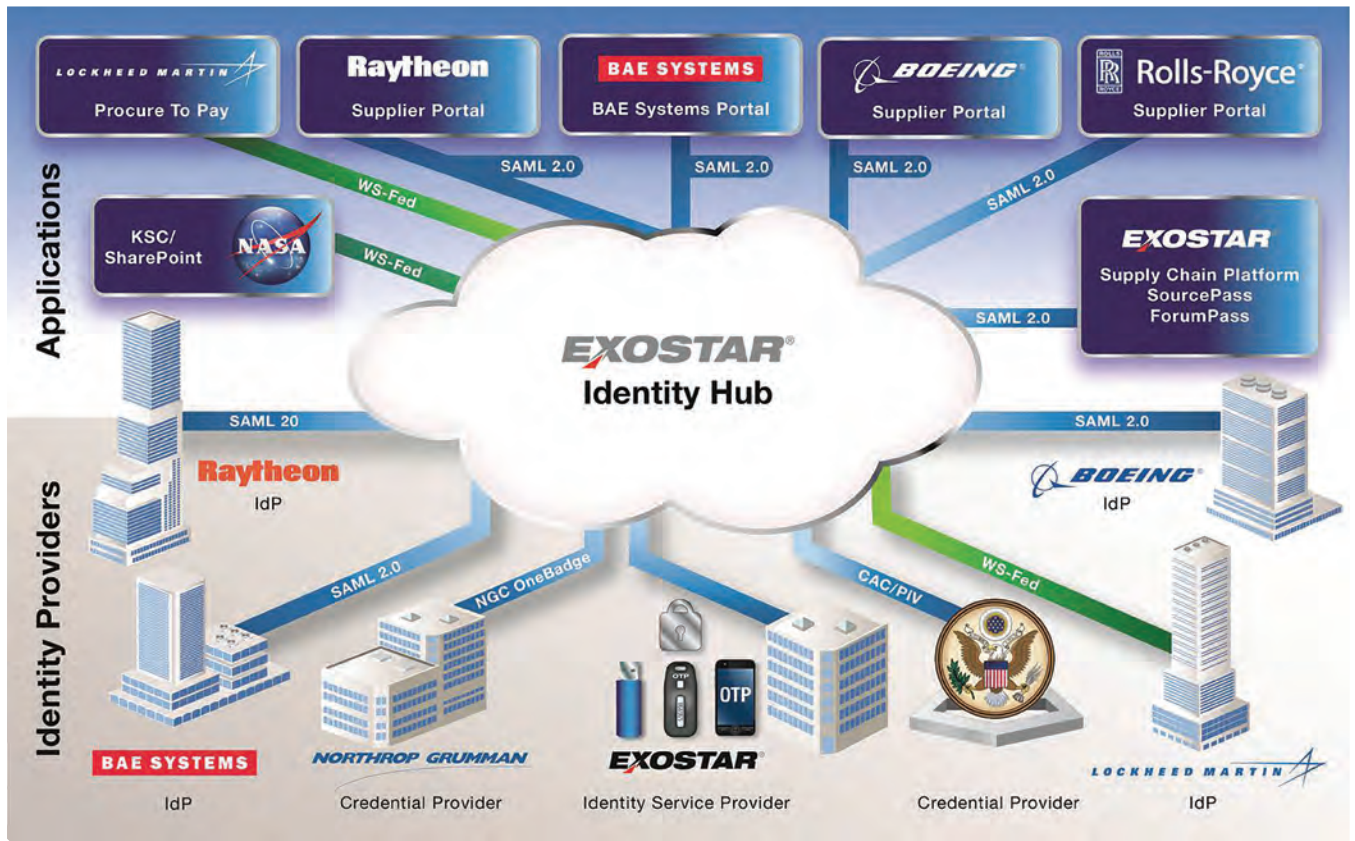
system for compliance, says Jason Dickstein, general counsel for the Aviation Suppliers Association. Few, if any, companies, to his knowledge, have been disapproved by the agency although some say they were discouraged, which may have been because local inspectors preferred to deal with a paper-based system, Dickstein says.

The ATA spec allows the e-form to be translated back into the paper document. At least one of the airlines that developed the standard originally envisioned a parts pipeline that combined electronically signed e-forms and manually signed paper forms. The idea was that the speedy electronic process would allow time to resolve discrepancies in documentation before the physical part arrived at the airline. The goal was to reduce the problem of quarantined parts.

Nobody was actively using Chapter 16, as this story was being written, although there were adoption plans, said an industry official familiar with the effort. One of the reasons for the low adoption rate is the need to harmonize FAA and EASA requirements. This was to be accomplished in a new version of the spec, a draft of which was expected in March of 2015.

But, under current law, the FAA cannot mandate what type of electronic method to use for document exchange, what type of format to use for an electronic form, and what means of security to use to protect the exchange. In fact, the E-Sign law of 2000 says that administrative agencies need to support e-commerce and not get in its way, Dickstein says. Specifically, E-Sign explains that a record like the 8130-3 tag may not be denied legal effect, validity, or enforceability solely because it is in electronic form. Nothing in the FAA's regulations (or any other regulations) forbids methods of on-line information exchange other than those standardized by ATA specs.

And even if two companies implement Chapter 16, adopt full digital signature technology, and obtain FAA approval, are their systems guaranteed to be interoperable? Trading partners have to integrate their systems thoroughly, including



Exostar enables structured and unstructured collaboration for the aerospace/aviation industry. Boeing Commercial Airplanes is its biggest participant. Exostar Image.

back-end systems such as digital rights management. So the issue ultimately comes down to questions of interoperability and affordability. Decisions to use paper or electronic record keeping, whether to use automated systems or email for document exchange, and what type of electronic security technology to employ are therefore business decisions based on the bottom line.

In fact, on the level of business concerns, some observers think that there are more important document exchange considerations than the choice of a security technology. For example, standardizing what records are required to be exchanged when aircraft are sold or returned to lessors may be a relatively more urgent business question. Compared with this issue, security management is “the least of our problems,” says Sarah MacLeod, executive director for the Aeronautical Repair Station Association (ARSA). A4A also has an active project related to this issue. (See sidebar, page 26.)

Business Issues

The trouble with full digital signature technology is that its effective use typically requires an electronic infrastructure, the services of a trusted third-party supplier of the digital certificates that guarantee the signatures, and complex administrative procedures to monitor and control these

processes. An airline would have to continue to manage the digital identities attached to compliance documents as long as it operates the aircraft. That could be 30 years—perhaps long after the employees who signed the documents have retired. Airlines lack the infrastructure and do not have the budgets to implement something that is not required.

Digital signature technology adds up to a large expense. It can cost up to \$500 per user for third-party certificate management—so its adoption has been slow. The integration of security protocols between the trading partners adds to the time and cost of implementation.

Subsets of the aviation maintenance workforce, such as line maintenance and hangar personnel, who have been using mobile devices for some time, frequently employ electronic signatures, which are much less expensive to administer, White says. This sort of filter has been available since the day of “green-screen systems,” he says. Electronic signature is essentially a business productivity tool that eliminates the need for physical signatures internally.

Electronic Marketplaces

Companies like Exostar and OneAeroMRO host arenas for exchanging information relating to subjects such as parts or repairs. They provide protections for applications, data/doc-

ument access, and on-line communications.

Founded in 2000, Exostar enables collaboration, both structured and unstructured, for the aerospace and aviation industry, including both product development and MRO. Some 25,000 supplier organizations and 8,000 to 10,000 individual buyers use the Exostar electronic marketplace, which last year enabled the spending of more than \$60 billion, according to Doug Russell, the company’s vice president of supply chain solutions. Although Exostar is known for its defense-related users, Boeing Commercial Airplanes is its biggest participant.

Various users of the Exostar network have deployed different security policies and technologies to protect their applications and data. In addition, supplier organizations have varying information technology (IT) capabilities and resources. Exostar accounts for these scenarios by allowing users to access the Exostar domain from the Web or through machine-to-machine connections, with information security policy enforcement largely transparent to the user.

Machine-to-machine links between a buyer’s or supplier’s ERP system and Exostar’s Supply Chain Platform solution for structured collaboration would involve a unique, “hard” integration. Systems would

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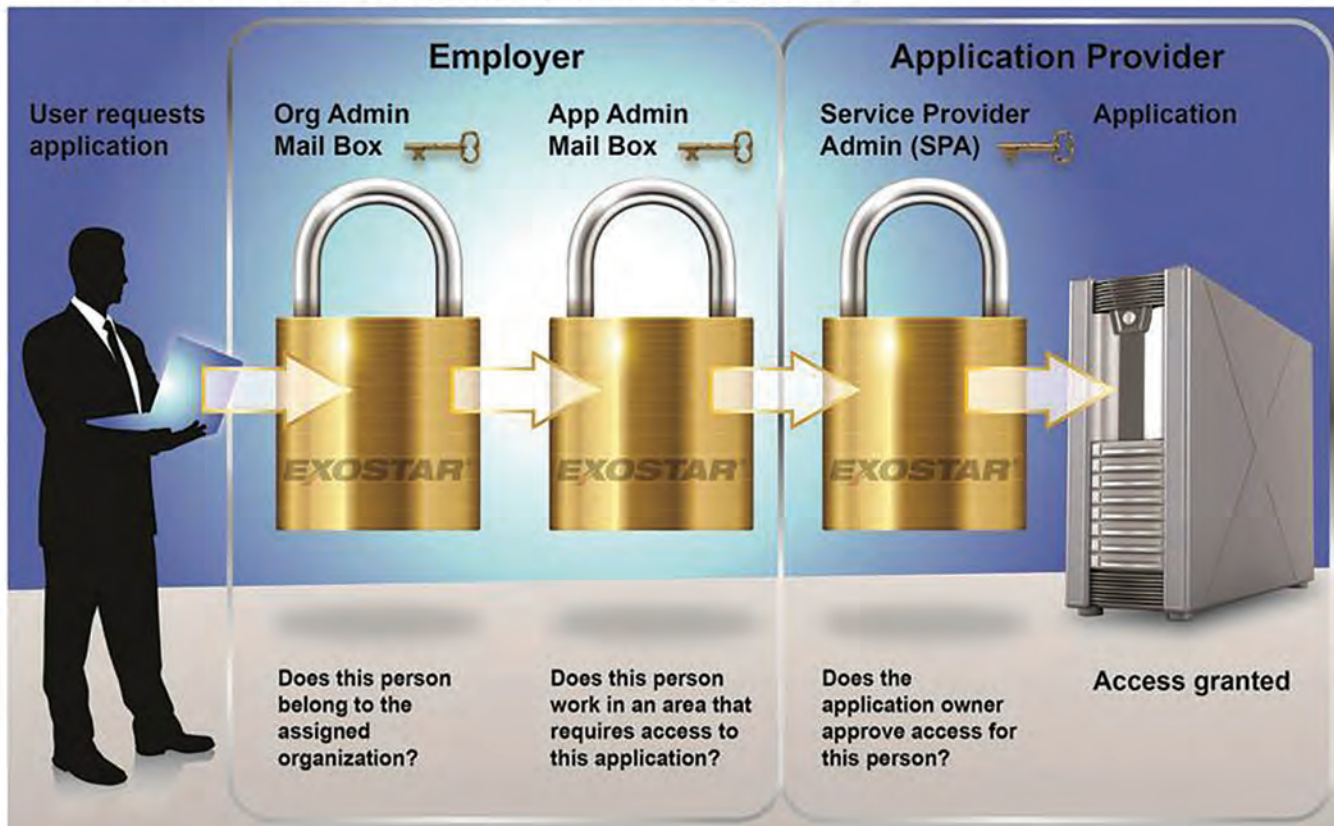
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Illustration of Access Approval Workflow



Exostar offers various levels of protection for application and document access and exchange. Exostar Image.

End of Life/Lease Document Exchange

Handling the transfer of documents at the end of an airplane's life or lease period is also fundamentally important to the aviation industry. Standards are needed to clarify and simplify the process.

End-of-lease activities historically have taken more than eight weeks just to validate that an aircraft is able to be returned under the terms of the lease, says James Elliott, product marketing manager for maintenance software provider, Mxi Technologies. And people are still making lease payments during that time, so it's a complicated, process-intensive problem. "If you're an operator and you're turning over a fleet of 50 or 100 aircraft, it doesn't make sense to spend a couple of months on every aircraft."

The Airlines for America (A4A) trade group's Aircraft Electronic Transfer Records project team has been developing fully electronic XML versions of several of the key documents that are exchanged when an aircraft is transferred. A draft specification for a few of the records is expected to be available after a May meeting, A4A says. The team also has developed "an electronic 'crate,' an XLM structure allowing the transfer of non-XML documents such as PDFs, JPGs, etc. in such a way to easily identify and categorize those additional documents," says A4A.

But the issue is actually far larger than that, says Sarah MacLeod, executive director for the Aeronautical Repair Station Association (ARSA). There is no definitive list of what documents are required to be provided, she says. "I think the business of aviation safety has to sit down with the regulators of aviation safety and fully understand what the minimal standards are for keeping and transferring records." And this needs to be on an international basis.

A lease may address the documents required by saying to follow the regulations. But there is no minimal, internationally acceptable list. If the sides can't agree, the matter goes to court, making for a more protracted and expensive transaction. But if the regulators would produce a standard list, then lease contracts could adopt it, removing a source of later litigation.

typically communicate with each other to share purchase orders or other procurement documents over an encrypted channel, Russell says.

Once the purchase order lands in the Exostar domain, suppliers who have logged into the Web site, or have a direct connection, and have the appropriate privileges, can see it and respond. Exostar applies multiple layers of security to these transactions, including mechanisms to authenticate a user's identity, via credentials such as a username/password, one-time password, public key infrastructure hardware or software credential, or common access card, the company says.

Exostar's Managed Access Gateway (MAG) performs the authentication function, controlling access by assessing credentials and enforcing the user's privileges and permissions assigned by asset owners. Once users are authenticated, they can access those applications and associated information to which they have been authorized by the asset owners, the company explains.

OneAeroMRO

Founded in 2000, OneAeroMRO enables the exchange of repair information, among other things, and features various security measures to protect client data. For example, all infor-

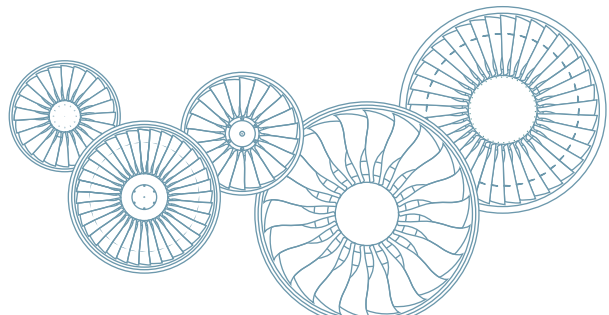


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maintenix Job Card Details : SB 32-30-00-35-050-JIC (Landing Gear Door Checkvalve Replacement) Barcode Search

Job Card Steps

Order	Description
1	Remove Panel 3103
2	Remove existing check valve assembly
3	Install new check valve assembly 65-44581-7
4	Inspect and test new valve assembly
5	Install Panel 3103

Part Requirements

Part Requirement			Install & Removal			Part Request				
Part Group	Position	Qty	INST	RMVL	Reason For Removal	Action	Req	Specific Part No	Request Priority	Part Provider
0R-0941 (O-RING)		1	EA	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>		NORMAL (Normal)	
32-30-00-35-050 (Valve Assembly)	1	1	EA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IMSCHO (Unscheduled Failure)	<input checked="" type="checkbox"/>	65-44581-7	NORMAL (Normal)	

Tool Requirements

Tool Description	Sched. Hours
1-6390-A (Sealant Removal Tool)	2.00
20-180 IN.LB (20-180 in.lb Torque Wrench)	2.00

Measurements

Order	Measurement Parm	Units	Possible Values
1	HYD LEAK (HYDRAULIC LEAK DROPS PER MINUTE)	COUNTS (Unitless Count)	

Conditions

Close

Mxi Technologies' Maintenix software uses a layered information security approach. Mxi Image.

mation is transmitted via Secure Socket Layer (SSL) technology "and then encrypted into our database to be only accessed by those authorized with special access rights and unique identification codes," says company president, Justin Spaulding.

The EDI service provider/data hub enables data exchanges between customer and supplier ERP systems. We ensure that the data exchange is encrypted and secure, Spaulding says.

But security is a very difficult topic, Spaulding says. Everyone has a different idea of what "security" is, what levels of risk are acceptable and what the standards should be. For OneAeroMRO "it is important to discuss all aspects of 'EDI security' with our customers in order to decide whether what we've proposed will conflict with their security policies and practices." Likewise, it's important for customers to understand what must be done to minimize their organizations' exposure to potential EDI security risks, he adds.

Maintenance Software

Vendors of modern on-line maintenance software systems such as Mxi Technologies and Ramco Systems support security as well.

Mxi Technologies' Maintenix software uses a layered information security approach. "The first thing we do is eliminate direct access to the database" at the core of the software,

explains James Elliott, the company's product marketing manager. Users have to go through an application server, which determines what data they can see. "There can't be a free-for-all access to the underlying data sets," he says.

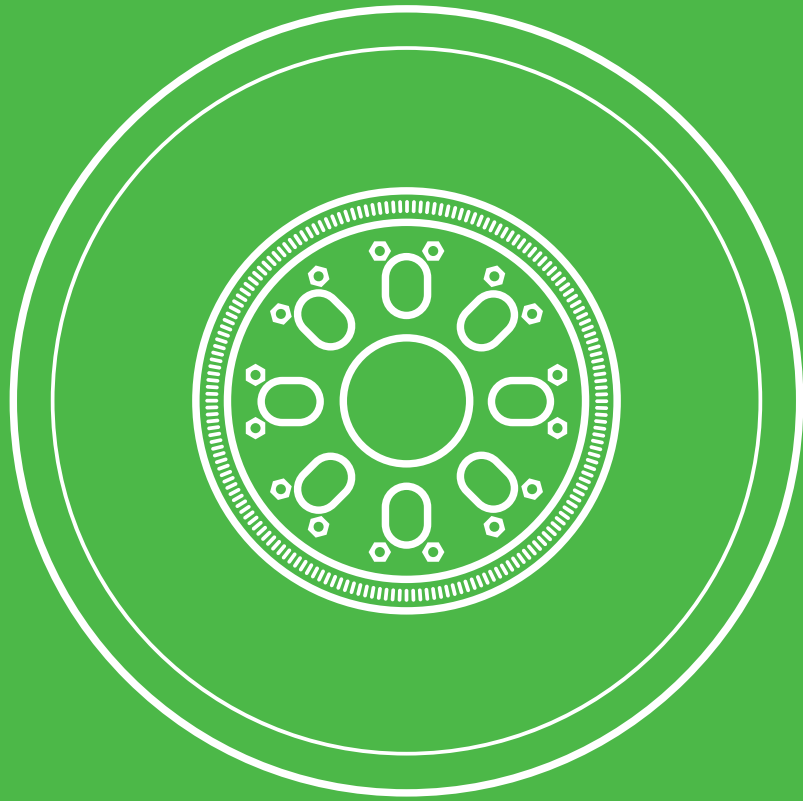
One means to control access is by defining the roles of different users. When users log on, they go through an authentication process mediated by the application server. This process grants users access based on who they are and what they do. "There are hard restrictions about who can look at what data," Elliott says. Changes to data are tracked and electronic records are kept about who did what at what time. There are "complete audit trails." Mxi integrates to the Lightweight Directory Access Protocol, a basic software protocol, but customers can overlay their own access control applications.

All applications that go against the database must go through the application server. No interfaces to external systems can interact directly with the database, Elliott says. So when you're sending or receiving data, it's a very controlled process.

Maintenix maintenance software also supports electronic signature technology to enable customers to record completed work on electronic versions of job cards and form 8130 release-to-service forms. Electronic signatures are supported via means such as swipe cards and USB keys.

Ramco's maintenance and engineering software complies with specifications such as FAA Advisory Circular 120-78, which describes minimum criteria for accepting digitally signed records, including uniqueness, significance, scope, security, nonrepudiation, and traceability, according to G.J. Narayana, the company's general manager for product development. He correlates each element with software features.

- Uniqueness. Each user is identified via unique user name, user-selected password, SSL security certificates, and access rights.
- Significance. Records are considered to be signed when a user clicks on "save" or a specified task button.
- Scope. There is clarity about what is being saved and which electronic signature is associated with what record.
- Security. This includes unique usernames and passwords, smart cards, SSL encryption, database-level encryption, data access logs, secure record amendment and deletion mechanisms, and data access policies, including mechanisms for disabling access to terminated employees and users.
- Nonrepudiation. This is enabled by features such as access logs.
- Traceability. This also is enabled through mechanisms such as access logs. **AM**



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By Dale Smith

Advancements in Turbine Engine MRO Capabilities

Leading turbine engine MRO providers are continually introducing new tools, technologies and processes to help operators keep engine reliability up and overall costs down.

When Charlie Taylor did the first “overhaul” on the 12-horsepower engine he helped create for the Wright Flyer, he used the tools that were readily available in every circa 1903 bicycle shop. Pliers, spanners, screwdrivers – maybe a ball peen hammer were the fledgling aviation technician’s tools. And that repair methodology pretty much remain unchanged for the next 100-plus-years. Piston engines haven’t changed much.

But turbine and turbojet engines required a whole new set of specialized tools, technologies and techniques for their ongoing inspections and repairs. While I know there have been many a time when you’d have liked to take a blow hammer to a turbine wheel, there are more subtle ways to coax a kerosene-burner back to life.

So as engine sophistication leaped forward, it wasn’t long before various electronic sensors and computers became irreplaceable parts of a turbine engine maintainer’s kit.

And even more recently, leading MRO providers have been introducing a steady stream of new equipment, processes and services to help operators further extend the lifespan and efficiency of today’s turbine engines.

Because so many of these recent advancements can be of such significant

help to MRO facilities around the world, Aviation Maintenance contacted three of the largest turbine engine MRO innovators to see what’s really new.

GE Aviation Services

Moore’s Law has nothing on the rapid growth of the information gathering capabilities of today’s large turbine engines. Practically every operational parameter of every second of every flight-hour is collected, tracked, locked and stored.

The problem was that much of this data was virtually unusable. Why? Because operators and maintainers couldn’t easily get to what they needed. They had the access, but not a simple way to filter through it all.

“If you have all this engine information and no one can find it, does any of it make any difference?” stated Gregory Coons, director of Customer Portals, GE Aviation, Services. “The answer was no.” Until now.

Providing a better solution was the goal of GE Aviation, Services’ new myGEAviation web portal.

“The idea behind myGEAviation is to get the critical information to the forefront and make it easier for our users to access what they need,” he said. “The more useable the data is, the more beneficial it is.”

Coons explained that the legacy site was

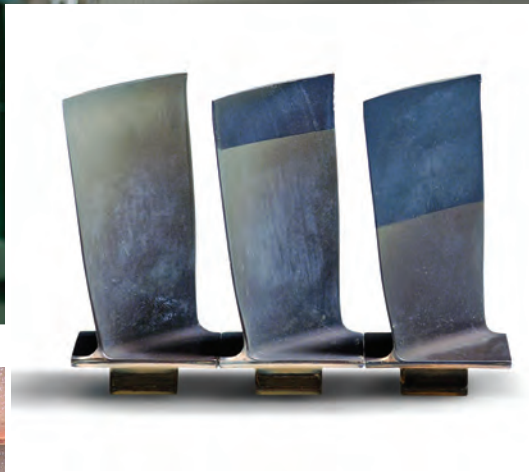
developed over 15-years ago and that it was admittedly very difficult to navigate. “Customers would get lost in all the drop downs and selections,” he said. “They’d get frustrated and click off.”

Being a very vocal bunch, GE’s engine customers weren’t shy about voicing their concerns with the old site. “The development of the new myGEAviation portal came directly from customer feedback. It took about two-years to create and the members of our Customer Advisory board have been part of it from day one,” Coons stated. “What we’ve created is a very modern, appealing, flexible and fast environment where customers can access all the information they need with 50 percent fewer clicks.”

That dramatic reduction in the number of user interactions was achieved through what Coons described as the site’s “asset based foundation.”

“We learned right off that our users wanted to be able to easily navigate and quickly find the specifics on a particular engine serial number or aircraft tail number,” he said. “So every customer has their engines listed, all they have to do is go and select that link and all the current information is presented to them.”

“It’s a totally customizable user experience like with a smartphone,” Coons said. “Each



Pratt & Whitney says it is realigning its business model to focus more on aftermarket service. Inset: Image of compressor blades from a CF6-80C2 engine, uncoated, conventionally coated and coated with MTU's high-tech erosion protective coating. Pratt & Whitney photo above and MTU photo inset, right.

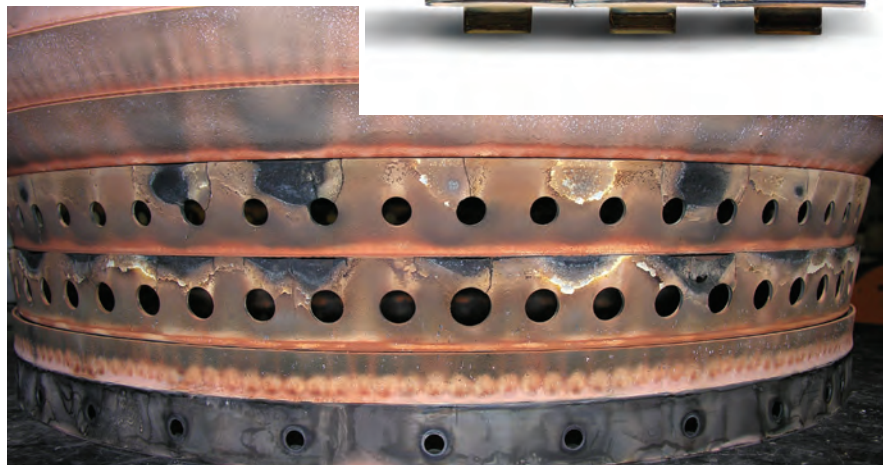
user can just select their own array of applications. Some users really want to see the documents that pertain to a particular engine—Service Bulletins and Engine Manuals. They don't need to focus on any other information."

"We have other users laser-focused on engine health and health monitoring data," he continued. "They don't want the document widgets. So they don't select them. There's just a lot of customization ability and that makes it easier and faster to get important data."

What's the Benefit to MROs?

"Once they have permission from the engine's owner they can look at, say, the ongoing trending or diagnostics of a particular engine and leverage their maintenance planning off of that," Coons said. "Again, it saves them a lot of search time. They can quickly see the engine's entire maintenance and operational history. How is it trending? How does it compare to the fleet?"

"There's years worth of information here and now readily available to MROs around the world," he said. "The site is extremely modular, so we'll be continually adding new



The inner liner damage of a combustor in a desert environment. MTU's CMAS coating was developed to combat this type of damage. MTU Photo.

widgets to the menu. Our data analytics will show us how customers use the site and what things to enhance. It's going to get better all the time."

MTU Aero Engines

MTU Aero Engine's MRO arm, MTU Maintenance recently celebrated its 35th anniversary and by the time you read this, is close to having fifteen thousand engines pass through its global facilities. Since the operation's inception, the company has developed a number of cost-efficient service packages and customized MRO solutions to its customers' varying needs.

One of MTU's core philosophies is that repairing damaged parts and returning them to service is much better than their wholesale replacement.

"It's an immense cost savings for the customer," stated Frank Haberkamp VP, Repair Services, MTU Maintenance. "A repair will always be cheaper compared to buying new parts, and that will ultimately lower the overall maintenance costs for the operator."

Haberkamp also explained that along with saving money, repairing components will also go a long way to saving the environment.

"Repairs have a positive effect on the environment as they need considerably less

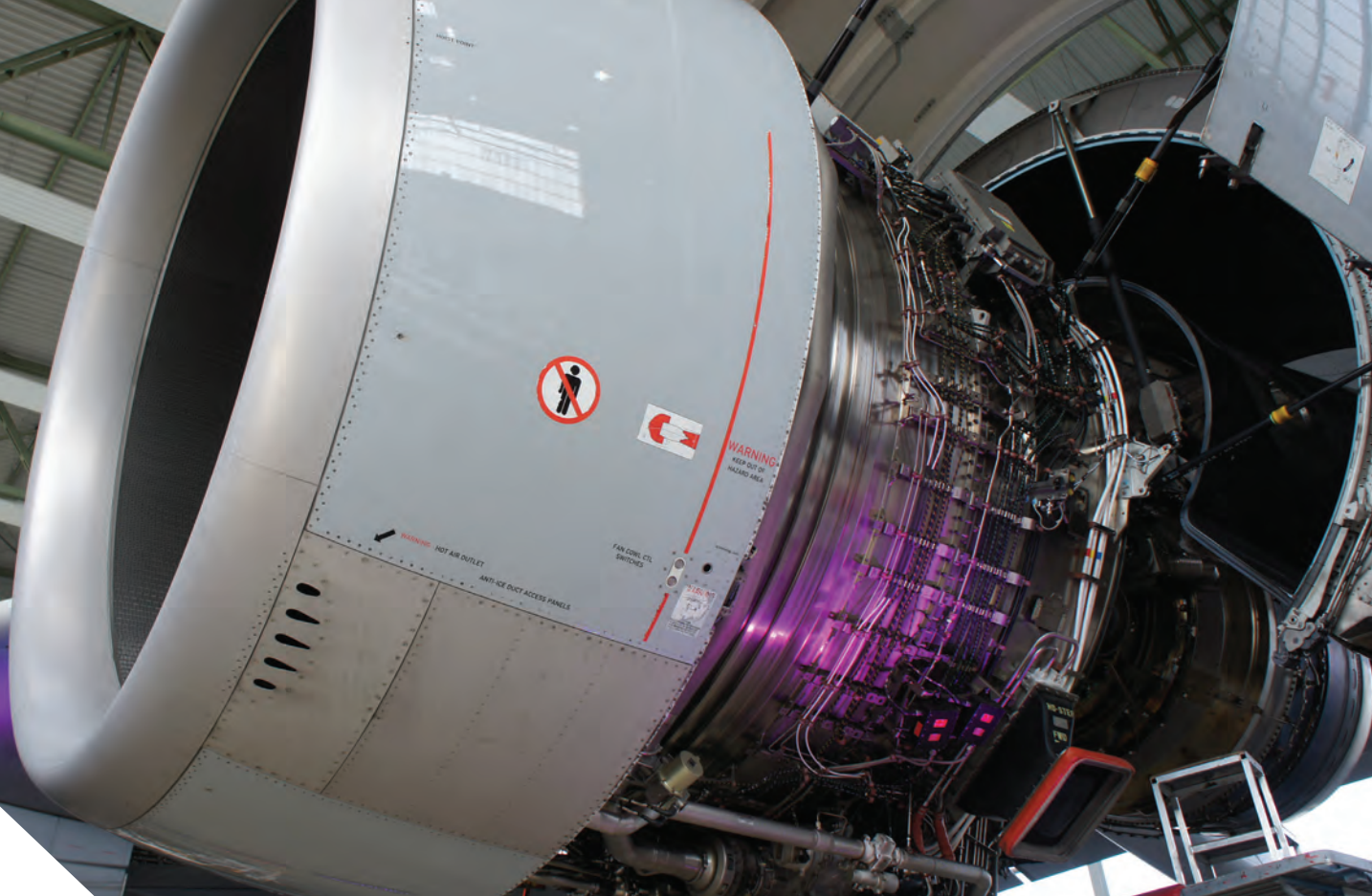


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Engine MRO spend in 2014 was \$22.1 billion according to consulting firm TeamSAI. Photo of A380 engine by Joy Finnegan.

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raw materials than new parts," he said. "In times of raw material scarcity, we can't say if, i.e. titanium or aluminum will be available in such quantities 30- or 40-years from now."

Of course that very same environment can be really hard on jet engines. Sand, dust, ash and moisture can play havoc on an engine's fine inner workings. One of MTU's newest repair offerings was specifically created for operators faced with flights in harsh environments is MTUPlus CMAS Resistant Thermal Barrier Coating process.

"Similar to the MTUPlus ER Coateco, this repair technique helps operators that fly in challenging environments, such as deserts. Airborne sand particles composed of Calcium-Magnesium-Aluminum-Silicates (CMAS) as well as sulfate containing industrial dust melt in the combustion chamber and leave deposit on the surface of the thermal barrier coating (TBC)," stated Guido Goetz, director, Product Management, MTU Aero Engines. "The durability of modern combustor components increasingly depends on the performance of TBCs and Yttria stabilized Zirconia (YSZ) is still the established standard material for TBCs in the hot section of gas turbines."

As Goetz explained it, molten CMAS infiltrates the open pores and micro-crack network of the YSZ thermal barrier coating, and a thermo mechanical and thermo chemical interaction between the molten CMAS and YSZ result in rapid coating damage. (If it sounds like rocket science, well, it pretty much is.)

"The affected combustor liners, especially in engines which are operated in deserts, cannot be repaired with regular weld or patch repairs but frequently have to be replaced due to excessive burning. This often leads to unscheduled shop visits," he said. "Additionally, CMAS attack results in a significantly decreased on-wing time compared to normal flight operation without environmental sand and dust pollution."

Goetz said that to minimize the use of expensive spare parts, MTU



“Quality is not an act, it is a habit.”

(Aristoteles, 384 BC – 322 BC)

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Pratt & Whitney's Columbus Engine Center is located 90 miles south of Atlanta in Columbus, Georgia. The Columbus Engine Center has performed more than 1,300 engine overhauls. Pratt & Whitney Photo.

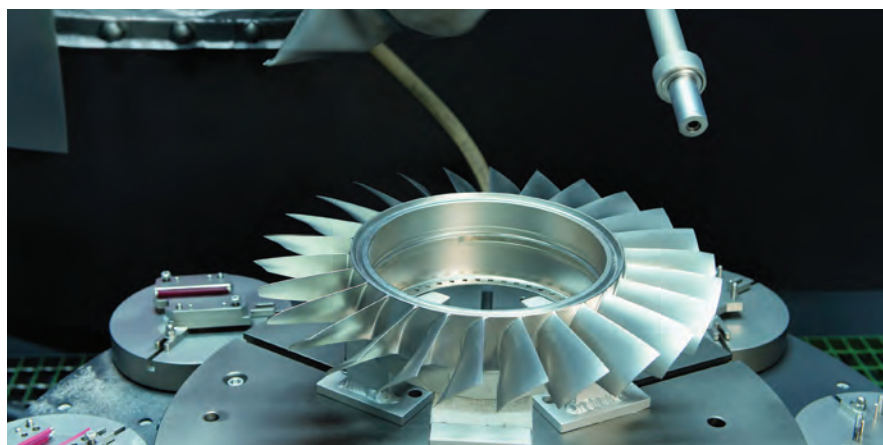
Maintenance developed advanced plasma-sprayed coatings for combustors tailored particularly to the needs of desert operators. For the new coating, MTU Maintenance applies an additional chemically optimized top coating, which reacts with molten sand and crystallizes the CMAS on top of the coating system.

"In a variety of isothermal and thermal cycle tests under simultaneous CMAS attack, our MTU coating showed a significant increase in CMAS resistance and lifetime durability compared to the current standard YSZ," he said. "In addition, the MTU coating shows a higher erosion resistance and at least equal lifetime durability in normal engine operation without CMAS attack. The new MTU coating does not affect other engine manual repairs and can be removed by engine manual stripping process."

Pratt & Whitney

When you've been designing, manufacturing and maintaining turbine engines as long as Pratt & Whitney, well, leaps in technological capabilities tend to be a bit shorter. But like everything, there's always room to improve the way the company supports its global customers.

To help make its support network even easier to deal with, Pratt & Whitney has transitioned its aftermarket business from



Shot peening with glass beads on a CF34-3 blisk, stage 7. MTU Photo.

a traditional MRO model—focused on transactional business—to a service model, created to support engine fleets on long-term maintenance agreements.

According to a company spokesperson, this approach serves Pratt & Whitney customers even better because it aligns the company's incentives directly with the customers' expectations: to keep engines in service and operating efficiently as long as possible.

For example, in 2003 the average time on wing for a Pratt & Whitney V2500 engine was around 12,000 hours. As the company entered into an increasing number of FPMs for the V2500 engine, the average time on wing has

grown to 18,000 hours, or approximately six more years. This is a 40-percent increase in effective usefulness for each of these engines.

The company also says that another added component to its fleet maintenance programs is the use of predictive analytics through a new collaboration with IBM (see *Aviation Maintenance* Dec14/Jan 15 issue for more on their use of Big Data). This new capability enhances Pratt & Whitney's engine health analytics offerings. These increased capabilities provide early warning or fault detection, as well as, improved visibility into the overall health of a customer's engines. **AM**



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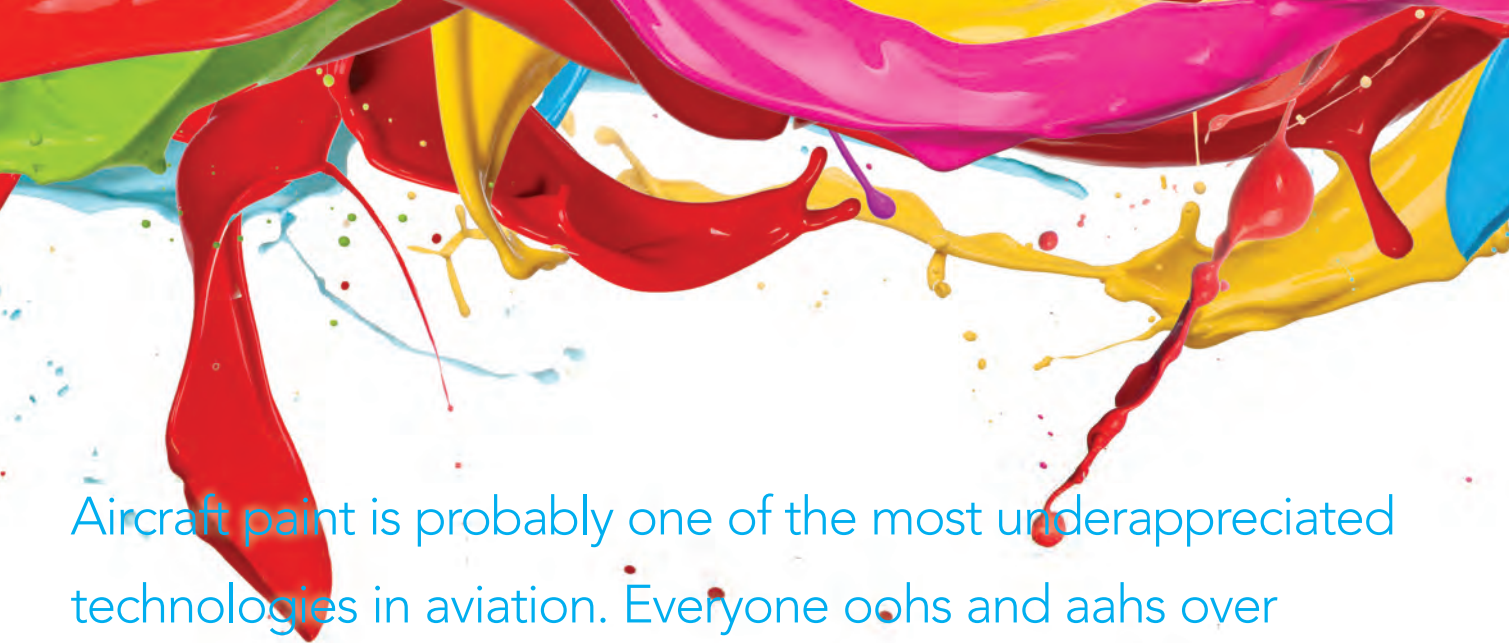


Aviation Paint: More Than a Pretty Face

By Charlotte Adams



King Aerospace, an all-round maintenance, modifications, avionics and paint operation in Ardmore, Okla., specializes in VIP and corporate aircraft and uses Sherwin-Williams paints.
King Aerospace Photo.



Aircraft paint is probably one of the most underappreciated technologies in aviation. Everyone oohs and aahs over today's jet engines and the electronics that dominate modern flight decks. But paint? Passengers think of it as a pretty face, not realizing its implications for safety, fuel efficiency and aerodynamics.

P



aint protects the exterior surfaces of an airplane from the elements. An aircraft hurtling through the air at 500 miles per hour or more is exposed to high levels of ultraviolet (UV) exposure, rapid and extreme temperature cycling, expansions and contractions of the outer skin, high wind velocities, and the effects of air, rain, and manmade chemicals. Aircraft paint has to stand up to this environment, be flexible, adhesive and durable, maintaining gloss and vibrancy for the five- to 10-year interval between refinishing. It must also be as eco-friendly as possible. And it has to look good.

Typical fuselage paint must be able to withstand temperature swings of well over 100 °F, says Mark Cancilla, PPG Industries global platform director, aerospace coatings. In a matter of minutes the temperature around the aircraft's exterior falls from ground levels to perhaps minus 60 °F at altitude. Temperature requirements

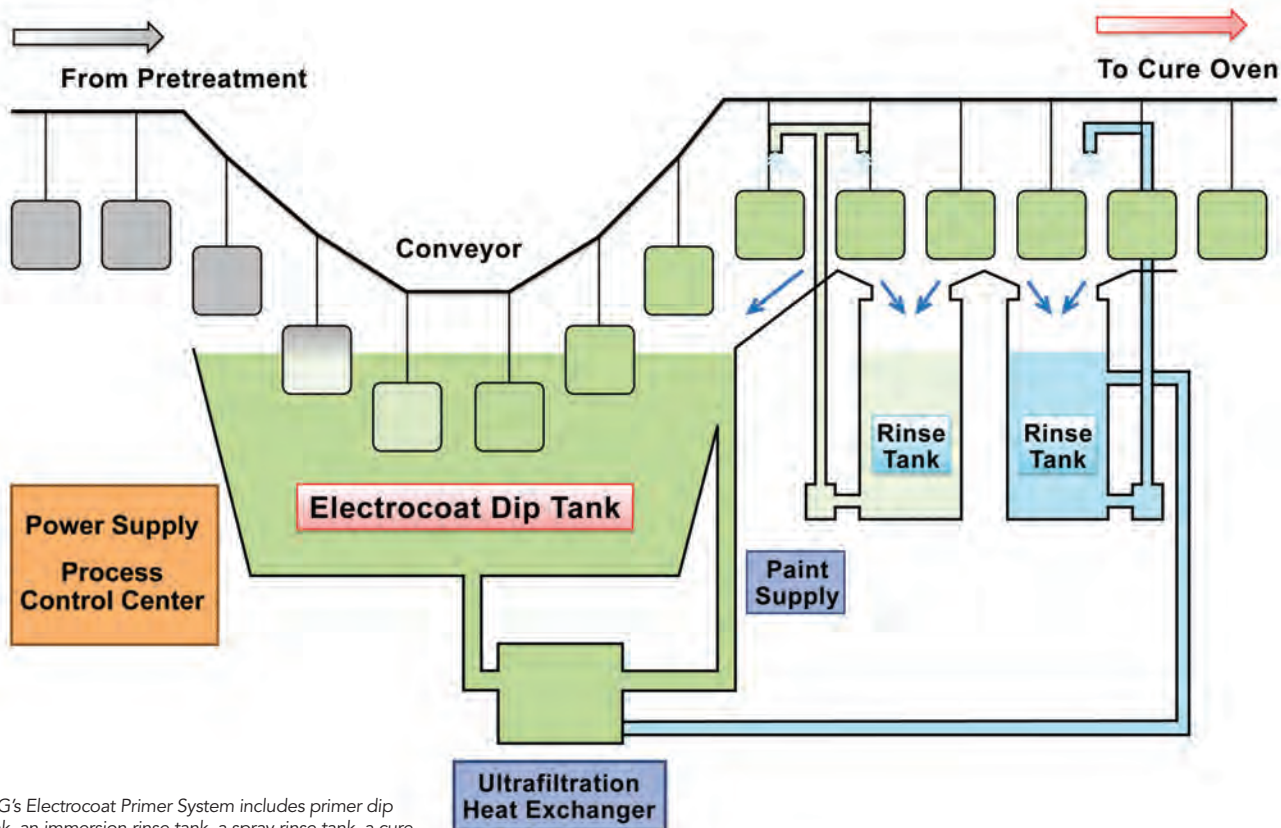
typically range from minus 60 °F to 160 °F, he says. There are also high air velocities and changes in humidity to deal with. "Of course, the effects of UV light are also much greater at 40,000 feet, and so the exterior topcoat must be able to survive this to maintain the integrity of the livery colors," he says. They also must resist chemicals such as deicing fluids, hydraulic fluids and industrial-strength cleaners.

Coatings for structural elements inside an airplane face a different set of challenges. These coatings must protect the aircraft from corrosion—in some cases for the duration—as some areas are difficult to reach for maintenance after the aircraft is assembled. Coatings for areas such as the insides of fuel tanks may need to last 25 or even 50 years, says Andreas Ossenkopf, director of aviation for Mankiewicz, a paint manufacturer headquartered in Germany. Structural components paints must resist chemicals such

as hydraulic fluids and prevent the corrosion of aluminum from contact with water electrolytes as well as aggressive media, he adds.

Interior cabin coatings also must meet strict standards for flammability, smoke and toxicity, Ossenkopf says. And cabin coatings must be functional, durable and pleasing to the eye. Mankiewicz has delivered exterior, cabin, and structural element coatings to the aviation industry for decades, the company says.

AkzoNobel, a paint manufacturer based in Amsterdam, points out that aerospace is a qualification-driven market. Coating systems must pass the stringent specification testing requirements set out by the aviation authorities and aircraft manufacturers before they can be used in the market. It often takes years for products to go from development through qualification to commercial application on aircraft, explains Maud Khelstovsky, the company's segment manager for OEM and MRO. AkzoNobel's Aerofine line



PPG's Electrocoat Primer System includes primer dip tank, an immersion rinse tank, a spray rinse tank, a cure oven and lab related equipment. PPG Image.

of cabin coatings, introduced in 2013, comply with strict cabin flammability requirements per FAR 25.853/JAR 25.853, she says.

It takes a lot of paint to cover an airplane even though each layer is exceedingly thin. A typical wide-body generally can require 80 or more gallons of top-coat in a single-stage system, which can weigh almost 500 pounds, Cancilla says. Of course, the exterior primer, interior primer and interior topcoat systems will add significantly to this amount, he says. So, it would not be unreasonable to have more than 1,000 pounds of paint on a typical wide-body, he adds. The three layers of paint on a superjumbo A380-800's exterior, by comparison, weigh about 1,102 pounds, according to the British Airways Web site.

It's Come a Long Way

Paint has come a long way in the last decade. The biggest change so far has been the introduction of BaseCoat/ClearCoat (BCCC) formulations by Mankiewicz in 2007, asserts Ossenkopf. Nor has the company's research stopped there. Mankiewicz is looking at futuristic concepts such as coatings with microstructures to reduce drag, also known as UV-Riblet technology, and on-demand functional coats, with anti-ice or easy-to-clean properties, that could replace clearcoat in areas where a specific function is needed.



The first PPG Electrocoat primer system in the U. S. is reducing application and process time at the U. S. Coast Guard Aviation Logistics Center in Elizabeth City, North Carolina. Robin Peffer, research associate (l) and Ed Mullins, sales and market development manager (r) worked with Coast Guard to design the system. PPG Photo.



BCCC involves the use of two types of coatings over the primer—the basecoat for colors and a protective clearcoat on top. In single-stage coating, on the other hand, everything necessary for the exterior is contained in a single formulation. But single-stage paints can take eight to 10 hours for the color to dry.

Because it dries faster, BCCC technologies such as SKYscapes can reduce

process times by as much as 30 percent, according to Sherwin-Williams Aerospace Coatings. BCCC formulations also can save customers up to 30 percent of the materials that would be used with standard single-stage topcoats, Mankiewicz’s Ossenkopf says. New pigments and resins, along with improved dispersing equipment and production methods, have allowed the “one-coat-to-hide” concept, he says.

BCCC basecoats use a higher level of pigmentation, PPG explains, so that a single coat of color typically does the job required by two coats of single-stage paint before. Some colors such as orange and yellow, however, can require more than one coat to achieve “desirable hiding properties,” Cancellia adds. Paint savings can translate to weight and fuel savings, as well as reduced application time and maintenance downtime, depending on

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factors such as livery design, painting process, and application techniques.

There are advantages to the new approach if a paint shop operates with multiple shifts around the clock. Time is money. It takes 14 to 21 days (or longer) to paint a wide-body 747 and seven to 10 days (or longer) to paint a narrow-body plane. The faster it can be returned to service, the greater the capacity for the MRO and the greater productivity for the airline.

If the paint shop is not a 24-7 operation, however, it may make sense to use single-stage coatings. California-based Global Jet Painting, a mobile paint operation, finds that Sherwin-Williams' Jet Glo Express top-of-the-line single-stage product meets its needs. Global Jet Painting transports its equipment to MRO sites and works around the maintenance activities, using a single shift of eight to 12 employees. Global Jet Painting works on a wide range of aircraft, including military, commercial, corporate, vintage, museum, and VIP platforms. It's even painted drone prototypes, says Guy Amico, Global Jet Painting owner and president.

Real-World Applications

But there are differences between the lab and the paint booth. King Aerospace, an all-around maintenance, modifications, avionics and paint operation in Ardmore, Okla., puts down at least two coats of basecoat and two coats of clearcoat when using BCCC paint products, says Randy Johnson, director of corporate aircraft services. That's four coats plus the primer, or a total of five coats. When he's using single-stage paint, he uses primer plus three coats of pigmented paint, which gives you better depth of luster than two coats, he says. King Aerospace specializes in VIP and corporate aircraft.

Single-stage and BCCC processes can be combined on the same airplane. The basic white fuselage can be painted in single-stage white, for example. Metallic stripes can be added in BCCC. A clearcoat also can be applied on top of a single-stage paint.

Some colors, on the other hand are available only in BCCC. If you have an all-pearl or all-metallic airplane, BCCC is the only way to go, Johnson says. Those colors aren't designed to be a top coat, he says. "They have to be top-coated with clear to have the shine and luster."

Painting also can involve complex designs on the aircraft fuselage. A recent project completed with Mankiewicz BCCC products involved the design of a new livery for Belgian flag carrier, Brussels Airlines, featuring the cartoon character, Tintin. Eirtech Aviation, an aircraft refinishing company headquartered in Ireland,

completed the special livery for the Brussels Airlines A320 in March of this year. The project took just 10 days, including the stripping and sanding away of the previous paintwork, says Steve Pickering, Eirtech vice president of aircraft refinishing. The Tintin detail, executed in paint rather than decal, took just three days, he says.

Paint operations work closely with manufacturers to ensure just the right look. Global Jet Painting repainted the exterior of designer Peter Nygard's 727, using custom-designed colors from Sherwin-Williams, Amico recalls. The company now is painting a 727 for

ZERO-G, an operator that gives people the experience of weightlessness. Amico stresses the product support the paint manufacturer provides in advising on adjustments such as changes to the component mixtures needed to compensate for temperature and humidity during painting or repairs.

Repairability

No matter how beautiful the paint job, there are frequently repairs to be made before the next repainting. There may be damage related to an incident that requires a new panel to be installed. Or the owner may



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need to change the registration number or want to add a stripe to the livery.

For white airplanes, for example, spot repairs can be a real challenge. That's why King Aerospace prefers to use single-stage paint for white color applications. Single-stage paint gives you reparability down the road, Johnson says. "Usually, if there's a clear coat on top, it's harder to match," he says. The clearcoat "has a tint to it." If the white has been clear-coated, you end up having to paint and clear a whole panel. On the other hand, deluxe products like pearl BCCC paints repair nicely, he says.

King Aerospace also looks for corrosion control performance and quality. The company uses Sherwin-Williams single-stage (Jet Glo Express) and BCCC (SkyScapes) formulations. King Aerospace handles everything from a Beechcraft King Air or Citation to a 757.

Eco-Friendly

Paint manufacturers also stress their effort to reduce or eliminate the use of hazardous, toxic, and otherwise undesirable chemicals. They have made "great strides," for example, in removing hexavalent chromium compounds such as chromate as the primary corrosion inhibitors, as these materials are being regulated out of the industry, Cancilla says. PPG has "an extensive line of chromate-free primers" for commercial, military and general aviation applications. And Sherwin-Williams Aerospace Coatings features a "complete line of chrome-free primers" for both aluminum and composite substrates, says Julie Voisin, global product manager for the unit.

AkzoNobel Aerospace Coatings recently celebrated the certification of new, 100 percent chrome-free paint systems under AMS 3095A, an SAE standard, the company says. Chrome-free systems help customers to reduce waste, save energy, cut maintenance costs, and enhance workplace safety, Khelstovsky says.

The new AkzoNobel systems include multiple topcoat options (both basecoat/clearcoat and single-stage topcoat) and the possibility to choose between water-based surface pretreatment or a unique direct-to-metal (DTM) system, she says.

The use of chemicals that release volatile organic compounds (VOCs) and other undesirable substances into the air is also on the decline in the industry. AkzoNobel, for example, has introduced a chrome-free, water-based pretreatment for paint systems that need a metal pretreatment. The Metaflex SP 1050 brand reduces emissions of VOCs by as much as 75 percent and simplifies the aircraft repainting process, Khelstovsky says.

Electrocoating also promises to reduce environmental impact and decrease waste. PPG has developed Aerocron, a corrosion-inhibiting electrocoat primer that is chromate-free and water-based, the company says. The process involves immersing metal aircraft parts in the primer bath and then applying an electrical charge. The primer is attracted to the charged part, resulting in uniform film thickness even in recessed and hidden areas, Cancilla says. The sequence involves the pretreatment of parts, primer dipping, rinsing, and thermal curing. The primer can be applied to any structural component of the aircraft, he says. "The determining factor is the size of the primer bath."

Weight savings could range from 30 to 70 percent, depending on the complexity of the part, Cancilla says. This results from the "nearly perfect film thickness across each coated component," when compared with spray-applied systems, he says. Moreover, the primer can achieve application efficiencies over 95 percent while spray-applied systems often achieve only 30 to 40 percent application rates, Cancilla asserts.

Manufacturers also are always trying to give paint a new look while making it easier to use. A new Sherwin-Williams Aerospace Coatings interior product, Jet-Flex Elite, for example, will impart "subtle glows" and vibrant effects from aircraft LED lighting, giving a special look to first class and business areas, Voisin says.



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Special-effect coatings by PPG Industries' aerospace coatings group add high reflectivity and vibrant color to the red tail and engines as well as aubergine lettering in Virgin Atlantic's new livery. Desothane topcoats with Andaro pigment by PPG are being used on new aircraft delivered to Virgin Atlantic Airways and for repainting its existing fleet with the new livery. PPG also supplies Desothane topcoats in high-sparkle silver mica for the fuselage. PPG Photo

Aftermarket Insights

Some coatings can be hard to get off, Amico says. His company is painting former American Airlines MD80s for a South American airline. Even the polish on the bare aluminum surface of the upper fuselage can be a challenge to remove, he says.

Finding a match to the existing color also can be a challenge, Amico says. He tries to find out who manufactured the paint and what

batch was used on the original job. Sometimes paint can be matched via a panel from the existing aircraft. If the plane has been flying for a while, colors may have faded or been discolored. White, the most popular color, is also very hard to match, he says. It also discolors over time. "I think white is so popular because it is like a canvas," he says. "It makes colors and logos pop." Cabin temperature could also be a factor, he says, as white reflects rather than absorbs the light.

You also have to be careful to put on just the right amount of paint—not too little, but not too much. "You have to be really careful on the layer thickness," Amico says. The one time that thickness wasn't a challenge was when Global Jet Painting repainted the first 747 for the Museum of Flight at Boeing Field in Seattle, Amico says. "We sanded all areas, did some spot priming on all the exposed areas, and then painted it over with a couple of coats, he says. With an airplane that was going back on the flight line, Global Jet would have paid closer attention to paint thickness, he says.

Composite Challenge

Composites are another challenge, Amico says. Coating composite surfaces is more labor-intensive because these substrates have little pinholes, he says. You have to "heavy sand" and use a high-build primer to fill any cracks and pinholes and then sand most of that off.

The processes required to coat composites on corporate jets, for example, are somewhat different from those used to cover aluminum, Johnson says. Typically, additional priming and sanding steps are involved in order to work out all the composite texture flaws before you paint.

Removing the paint from a composite airplane is all manual labor, he says. Painters can't use chemical strippers because these would break down the polymers. So it's a matter of labor-intensive sanding with 180-grit and 240-grit sandpaper until they get down to the composite surface. Manufacturers are designing a composite stripper that's supposed to be available in a year or so, Johnson says, but it's not out yet.

Repainting an entire composite aircraft like the 787 will be an interesting challenge, Amico says. Composites are made up of resins and fibers. Global Jet Painting has handled interior composites, and "we would never consider [chemically] stripping paint off a composite in an interior," Amico says. Global Jet Painting just sands and repaints these components, maybe using a primer filler when needed. **AM**

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Export/Import Documentation for PMA Parts

I get a lot of interesting emails. Recently, one email from an Asian air carrier asked whether they could accept PMA parts without 8130-3 tags, and also whether they could accept PMA parts without a “criticality statement” in block 12 of the 8130-3 tag.

This raises a lot of interesting questions — so many that I will be examining the question in two articles (so look for the next issue on your newsstands, soon) — but let’s start by examining a question that was not asked. If an aircraft part is produced in the United States (under FAA production approval), then when is it considered to be exported (from the U. S.) or imported (into another jurisdiction)?

This is a tricky question because there can be at least two different answers based upon which government agency is asking the question.

For purposes of most import and export laws, when the part crosses the international border it is imported/exported. Import duties may be owed on the part at this point — however many countries allow the tariff-free import of aircraft parts, so the part may be imported on a duty-free basis into those nations. As an importer, you should always read the fine print on your own laws. I have encountered at least one country where the import laws stated that aircraft parts entered from the United States must be accompanied by an 8130-3 tag in order to be considered for duty-free entry. So that is one example of a situation where the 8130-3 tag has some value in the regulatory system of the tax collectors (not just the airworthiness authority)!

While import and export laws may look at an aircraft at the point of a border crossing, airworthiness authorities take a different view. The part is considered imported into a new system when it is identified for installation on an aircraft of the new country’s registration. This is a totally different standard and it frequently causes confusion.

Imagine that you have an aircraft part that is made

in the United States under a FAA production approval (like a PMA). The part is shipped to Japan with the intent that it be installed on a U. S.-registered aircraft currently at Narita Airport in Japan. For purposes of export law, the part is exported (but it is probably imported on a duty-free basis). An export license might be required and licensing exceptions might apply. But for the purposes of the relevant aviation authorities (FAA in the United States and JCAB in Japan), the part is not imported into the Japanese system because it is never installed on a Japanese-registered aircraft. Instead the part continues to fall within the regulatory jurisdiction of the FAA. This also means that the installer of the part must meet the requirements of 14 CFR 43.3 and 43.7 to perform the work and sign-it-off.

From a documentation perspective, this aircraft part does not require an export 8130-3 tag because it remains within the US regulatory system.

Let’s change the fact pattern a little. Assume that you have an aircraft part that is made in the United States under a FAA production approval (like a PMA), but the part is shipped to Japan with the intent that it be installed on a Japanese-registered aircraft. Once again, for purposes of export law, the part is exported. An export license might still be required and the U. S. licensing exceptions that might apply become a little more limited. But the big change is that for the purposes of the relevant aviation authorities, the part is imported into the Japanese system because it is installed on a Japanese-registered aircraft.

The reason that we started our answer with this examination of the export standards is because in the United States, when dealing with installations on U. S.-registered aircraft, the 8130-3 tag is generally NOT required by U. S. law. Commercial aviation’s reliance on the 8130-3 tag as a receiving expectation is a commercial norm — not a regulatory

requirement. Thus, our inquiry should start with the notion that the 8130-3 tag is NOT required for domestic U. S. transactions (except as commercial terms may require it).

The 8130-3 tag is considered to be a facilitator of exports, but under U. S. law there is no obligation to obtain an 8130-3 tag to accompany your export. This will come as a shock to some people because many people believe that U. S. law requires the 8130-3 tag (it does not).

But some of the U. S.'s trading partners require the 8130-3 tag as a condition of import. And when they do, that means that the 8130-3 must be a condition of the transaction, because otherwise the importing nation may reject the part.

Let's turn our attention to the European Union (EU). The U. S. and EU have entered into a bilateral airworthiness safety agreement (BASA). Under the BASA Technical Implementation Procedures (TIP), the EU accepts properly documented parts from the United States. Proper documentation for most aircraft parts from the United States will be the 8130-3 tag. For PMA parts from the United States, EU member states will accept the PMA parts if they have the 8130-3 tag and if that tag also includes special language in block 12. Most PMA parts are non-critical and thus block 12 should say, "This PMA part is not a critical component." Critical components (those that the FAA has determined to be critical) will have alternative language either identifying a licensing agreement between the TC/STC holder and the PMA producer, or identifying an EASA STC that is associated with the critical part. But this is almost a non-issue

because so few of the PMA parts exported from the U. S. to Europe are critical in nature.

It is important to recognize that this "criticality" language is required in Europe but is generally not required in most other accepting states (and the U. S. regulations do not require it for FAA-PMA parts that are produced in the U. S. and then used on U. S.-registered aircraft). So the answer to whether it is necessary to have the criticality language on the 8130-3 depends in large part on the requirements of the importing nation.

In the next issue, we will examine the relationship between bilateral safety agreements, regulations, and PMA parts as we continue to examine when an 8130-3 tag is required and when it is not required. **AM**

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