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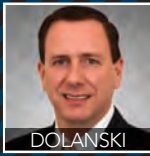
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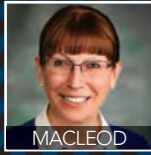
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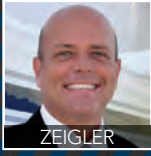
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# STATE OF THE INDUSTRY

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### TEACHING TROUBLESHOOTING

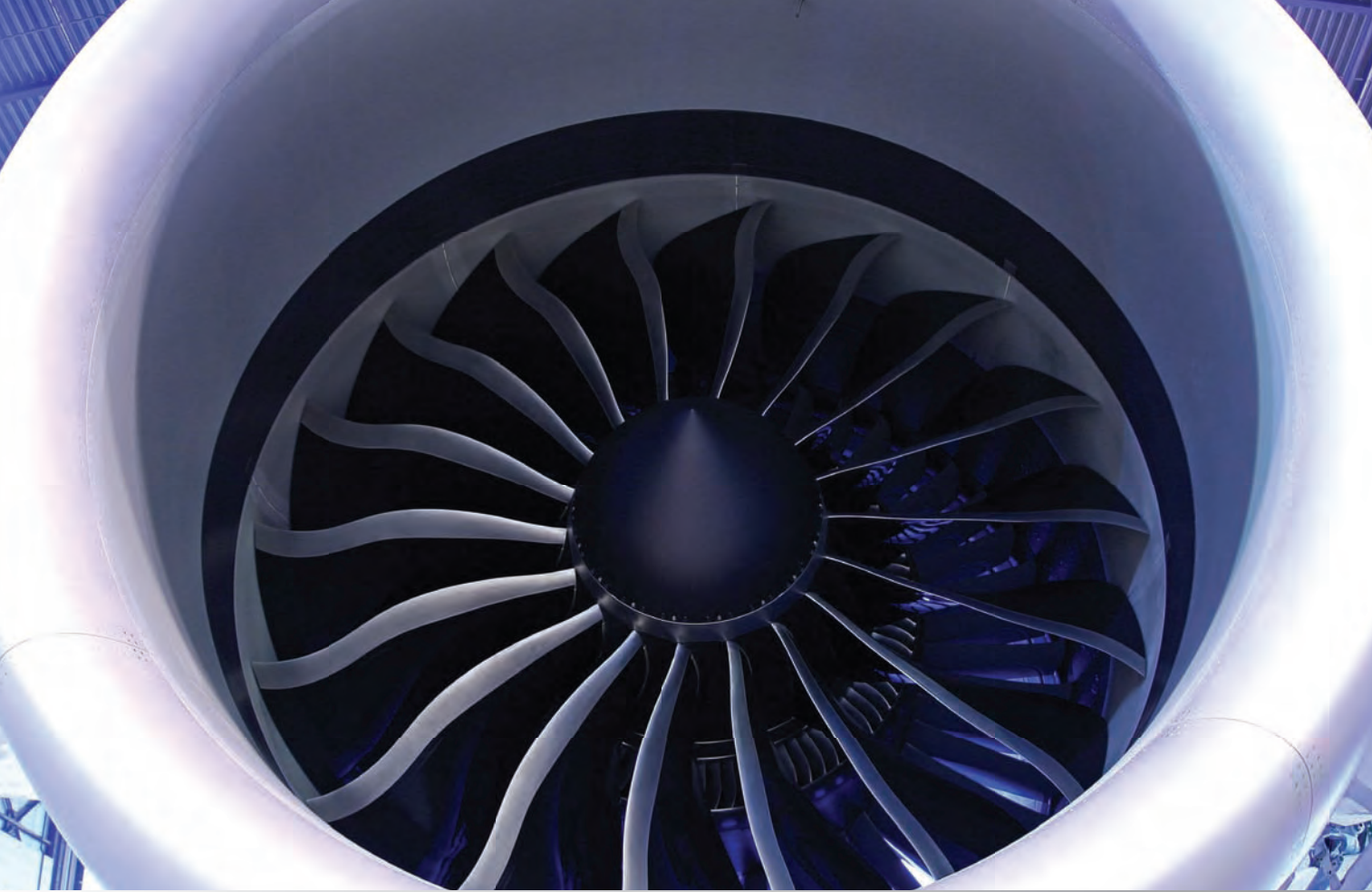
CAN THIS CRUCIAL SKILL BE TAUGHT OR IS IT  
SOMETHING YOU'RE JUST BORN WITH?



### VIP AIRCRAFT PAINT SCHEMES

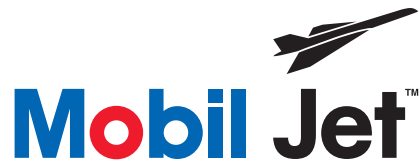
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**State of the Industry**  
Each year we ask top executives in the aviation maintenance business, from the largest MROs in the world to family-owned shops, to give us their insights on how our business is faring. Here are their amazing answers.

Industry leaders.  
Cover image designed by Cavich Creative.



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Troubleshooting is a crucial skill for maintainers. But how does the education system go about teaching A&Ps how to do this? Can it be taught or is it something you're just born with?

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Painting an aircraft is challenging enough. But how do you best deal with clients that have their own, very particular vision of how their aircraft should look? We talked to aircraft paint scheme designers and paint manufacturer Sherwin-Williams to get some advice.



### CATEGORIES

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

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# Crystal Ball Time

BY JOY FINNEGAN  
EDITOR-IN-CHIEF

With healthy growth projected in air travel, the FAA has a tremendous opportunity to make a major difference in the industry," FAA Administrator Michael P. Huerta said recently in conjunction with the release of their annual forecast. "As the system becomes more complex, we'll look to new technologies to meet the growing demand for safe and efficient air travel here at home and around the world."

The FAA Forecast warns, per usual, that shocks can impact the accuracy of the forecast. These shocks include things such as the terror attacks of September 11, skyrocketing fuel prices, and global recession. It says these recent shocks have caused air carriers to manage this period of extreme volatility by fine-tuning their business models by lowering operating costs, eliminating unprofitable routes and grounding older, less fuel efficient aircraft.

The report says passenger demand shows minimal growth in 2014, but projects an upturn in growth for the 2015-19 period. Over the same time period, the report says, system capacity growth averages of 3.3 percent per year. "For the overall forecast period (2014-34), system capacity is projected to increase an average of 2.7 percent a year. Supported by a growing U.S. and world economy, system RPMs are projected to increase 2.8 percent a year, with regional carriers (up 2.3 percent a year) growing slower than mainline carriers (up 2.8 percent a year)." By 2034 the report says U.S. commercial air carriers are projected to fly 1.75 trillion ASMs and transport 1.15 billion enplaned passengers a total of 1.47 trillion passenger miles.

One bright spot noted is growth in air cargo with air cargo traffic, as measured by Revenue Ton Miles (RTMs – one ton of cargo flown one mile) expected to more than double by 2034 at an average growth rate 4.1 percent.

The 2014 FAA forecast says as "the economy recovers from the most serious economic downturn and slow recovery in recent history, aviation will continue to grow over the long run." The FAA Aerospace Forecasts FY 2014-2034 can be found here:

[http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/aviation\\_forecasts/aerospace\\_forecasts/2014-2034/](http://www.faa.gov/about/office_org/headquarters_offices/apl/aviation_forecasts/aerospace_forecasts/2014-2034/)

VZM Management Services has released their VZM Market Outlook 2014 for commercial aviation and maintenance. The group's report "looks back at how the aerospace market evolved through the Great Recession and provide our thoughts regarding future developments."

Marcel Versteeg, owner of the consultancy says, "Increasing OEM dominance in both airframe and engine aftermarkets is forcing the independents to review their business strategies, putting pressure on MRO management to identify and implement cost effective initiatives throughout the aftermarket supply chain. The VZM Management Services report can be found here: <http://www.vzm.net/Infopercent20Center/VZMpercent20Publications>

Focusing more intently on MRO, comes the ARSA/Team SAI 2014 Global MRO Market Economic Assessment, released last month as well. The Aeronautical Repair Station Association (ARSA) is a Virginia-based trade association that represents aviation maintenance and manufacturing companies and Team SAI is an aviation consulting services firm.

Their report says the aviation maintenance business is a vibrant \$57.7 billion global industry that is expected to grow to \$86.8 billion in the next decade. The study also stresses that the commercial and business aviation MRO and parts manufacturing/distribution industries combined generate \$44.4 billion in economic activity in the United States and employ 244,000 workers across the country.

Other issues addressed in the report include the flow of trade between various regions and market conditions in specific maintenance sub-sectors such as airframe, engine, component and line maintenance. Some highlights from the report:

- Airframe MRO is forecast at \$11.5B for 2014. Nearly 30 percent of this spend is for aircraft based in North America.
- Engine MRO is expected to be \$22.1B in 2014. More than 30 percent of this value is tied to North American operators.
- Component MRO is forecast to be \$12.2B in 2014. Upwards of 35 percent of this spend is for North American aircraft.
- Line MRO is pegged at \$11.9B in 2014. North America represents 27 percent of the market.

You can download the entire report at <http://arsa.org/wp-content/uploads/2014/03/ARSA-TeamSAI-EconomicReport-20140307.pdf>

Additionally, in this issue, we have leaders from around the globe giving their input in our annual "State of the Industry" feature starting on page 22. We hope these insights help give you the information you need to understand our unique, dynamic and challenging industry. **AMM**

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## Lufthansa Technik Touts Higher Revenues



August Henningsen, Chairman of the Executive Board of Lufthansa Technik



Dr. Peter Jansen, CFO, Lufthansa Technik

"In spite of the generally satisfying development of global aviation, the difficult situation of many airlines, particularly in Europe, and the increasing availability of MRO services around the world continue to challenge our industry and increase price pressures," said August Wilhelm Henningsen, chairman of the Executive Board of Lufthansa Technik, on March 18 in Hamburg. "Against this backdrop, the Lufthansa Technik Group has developed very well. Our good order situation and our successful cost reductions have enabled us to boost our operating result significantly."

Currently Lufthansa Technik says it has 770 customers and a total of 2,800 aircraft. In 2013, the company won 47 new customers and concluded more than 450 new contracts, as reported at their annual press conference to release company data.

LHT said 2013 was also marked by the expansion of their service portfolio, particularly for the Boeing 787, as well as significantly extended partnerships with original equipment manufacturers (OEMs), and preparations for the new Boeing 777-9X and Airbus A350 aircraft types and their engines and components.

"In addition to the good order situation, it was above all the significant cost reductions resulting from the SCORE (the company's stringent restructuring efforts) program's measures that made our excellent result in 2013 possible," said Dr. Peter Jansen, Lufthansa Technik CFO, at the press conference. He emphasized that a restrictive approach to new appointments and offers of early retirement for special groups of employees as well as the closure and sale of companies led to a reduction in the average number of employees to 19,927, down 2.2 percent.

As the most important package of measures in the future, Jansen mentioned the remaining SCORE projects, which will be implemented in 2014 and 2015 and are expected to contribute an additional 350 million euros. "We're now halfway through the program and have achieved almost 50 percent of the planned impact on earnings, but sustaining improvements in efficiency in the long term is more difficult than achieving initial successes."

The company closed Lufthansa Technik Switzerland due to a collapse in demand, and the closing of Lufthansa Technik Airmotive Ireland in Dublin was initiated at the end of the year due to strongly declining revenues and inadequate market opportunities.

In contrast, Lufthansa Technik Budapest expanded its capacities and Lufthansa Technik Malta extended its capacity for parallel work on several long-haul aircraft through a hangar enlargement. In Asia, Lufthansa Technik Philippines is expanding its portfolio of services for the A380 and Lufthansa Technik Shenzhen has opened two new hangars in order to be able to offer new component, engine and logistics services. And in

Hamburg, the newest Lufthansa Technik network company, Lumics, a joint venture with McKinsey, has begun its consulting activities, which are not limited to the aviation sector.

### New home for Central Materials Technology

During the second quarter of 2014, Lufthansa Technik will commission a new complex of buildings in Hamburg representing a construction investment of approximately €20 million. In addition to offices and workshops, the Central Materials Technology department will be sited at the new complex, and will include a completely new chemistry lab.

Central Materials Technology at Lufthansa Technik is responsible for component and system assessment, production resource monitoring, the testing of all fluids used in aircraft, from hydraulic oil to cleaning agents, materials verification, and the evaluation of new technologies, among other things. The team of about 20 employees is composed of highly qualified engineers and laboratory staff, whose extensive expertise is used well beyond the bounds of Lufthansa Technik.

"We're bundling all the know-how of our team in Hamburg at one place," says Dr. Christian Siry, who heads up Central Materials Technology for Lufthansa Technik. "With the new materials lab and the chemistry lab, we have fulfilled the requirements for being able to provide answers to any question in conjunction with the material combinations of the future, usage scenarios and customer demands."

### Lufthansa Technik Steps Up Innovation Investment

Henningsen also announced LHT would strengthen its commitment to innovations. "We have set up centralized innovation management and markedly increased our investments in this area, from €50 million during the past five years to €200 million over the coming four years. We rely on developing product innovations to open up new markets and customers. Lufthansa Technik is always focused on preparing for new aircraft types and technologies," said Henningsen. "New materials and technologies offer great opportunities to make our services more eco-efficient, less expensive and more attractive for our customers. In this way, innovations are the main driver for our growth."

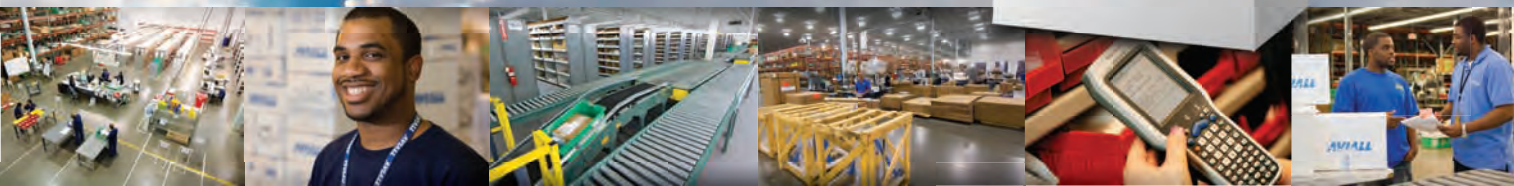
Several projects are geared towards the use of fiber composite materials. Involving partners from academia and industry, these projects are developing procedures for diagnosing faults directly on the aircraft fuselage and for damage rectification by a mobile repair robot. Another research activity has been to examine using modern materials, designs and production procedures, various OEM components can be replaced by self-developed, maintainable, lighter and more economical parts.

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**New President and Sales for Sierra**



Miller

SkyWay Group founder and CEO Mark Huffstutler announced that aviation veteran Jason Miller has joined Sierra Industries as president. Miller assumed the newly created position on January 20, 2014. Miller will lead Sierra Industries' growing aircraft MRO organization.



Carter

A graduate of the U. S. Naval Academy in Annapolis, Miller spent a decade in the U. S. Marine Corps. Following his USMC service, Miller was employed by StandardAero as finance manager. He has an M.B.A. from Rice University in Houston, Texas. In 2009, Miller became VP/GM of StandardAero's Houston business unit, supervising a workforce of 100 employees.

Sierra also added aviation veteran Patrick Carter. Most recently employed with Rocket Engineering, an aftermarket turboprop conversion firm, Carter brings experience in certifying and marketing high-value aircraft performance modifications.

In 2001, he became chief operations manager for American Aviation. After acquiring valuable experience in Part 135 charter/cargo operations, aircraft sales and FBO management, he moved to Rocket Engineering Corporation in 2003.

**LHT Personnel Changes in Manila and Hamburg**



Andrich

On February 1, 2014 Dr. Burkhard Andrich (52), who had been senior vice president Aircraft Component Services at Lufthansa Technik in Hamburg, took over as president and CEO of the Manila-based Lufthansa Technik Philippines (LTP).



Harald

This joint venture with Philippine aviation service provider MacroAsia Corporation has a staff of 2,700 and offers aircraft MRO services focusing on base maintenance checks for Airbus aircraft.

Andrich studied mechanical engineering and completed his education with a doctoral degree. He has been at Lufthansa Technik since 1992. He was senior vice president Line Maintenance, and then served as senior vice president Engine Services from 2005 to 2011. Since then he has been senior vice president Aircraft Component Services in Hamburg.

Succeeding Andrich as senior vice president Aircraft Component Services is Harald Gloy (41). Gloy holds a degree in engineering and management. He came to Lufthansa Technik in Hamburg in 2003. Following a tenure as director Production Aircraft Base Maintenance he took over Component Maintenance Services as VP

**Boeing Commercial Airplanes Customer Support and Services Leader to Retire**



Deal



Mancini

Lou Mancini, who has served as the leader for Boeing's commercial airplane customer support and after-market products and services, will retire from the company after 12 years of service. Stan Deal has been appointed to succeed him.

Commercial Aviation Services (CAS) provides customer support for more than 12,000 Boeing airplanes and consists of five services businesses. More than 11,000 worldwide employees provide a wide range of services, including material management solutions, airplane conversions, upgrades and repairs, flight navigation and operational systems and training solutions. These capabilities are part of a comprehensive portfolio of services, support and solutions collectively known as the Boeing Edge.

"Lou Mancini's leadership has been instrumental in helping us evolve a services business for the 21st century, from digital aviation to the Boeing Edge," said Boeing Commercial Airplanes President and CEO Ray Conner. "The insights he gained from his years of management experience at United Airlines as a Boeing customer were invaluable in helping us better serve the marketplace. His drive to inspire the team and meet customers' expectations is unmatched, and in this industry, there's no higher praise."

Mancini will transition his assignment to Deal, who is named senior vice president of CAS, effective immediately. Mancini will retire on June 1.

Deal, who joined the company in 1986, most recently has served as vice president and general manager of Supply Chain Management and Operations for Boeing Commercial Airplanes, with responsibility for the overall leadership of Supplier Management, Fabrication, Propulsion Systems and Quality.

"Stan has a well-rounded background in sales, engineering, supplier management and operations that makes him a strong fit to lead our customer support team and grow our services business," said Conner. The Supplier Management, Fabrication, Propulsion Systems and Quality organizations will report directly to Conner.

**NPRM Seeks Comments on Drug and Alcohol Testing of Maintenance Employees Located Outside U. S.**

The Federal Aviation Administration (FAA) announced it is seeking comments on an Advance Notice of Proposed Rulemaking (ANPRM) that would require drug and alcohol testing of maintenance personnel who work on aircraft operated by U.S. air carriers (Part 121) in facilities outside the U. S.

In the Federal Register notice, the FAA noted that it is considering developing a rulemaking that would require employees of FAA-certified foreign repair stations and certain other maintenance providers who perform safety-sensitive work on U.S. air carrier aircraft to be subject to a drug and alcohol testing program. Consistent with the Congressional mandate for the rulemaking, the testing program would have to meet FAA standards and be consistent with the applicable laws of the country where the repair station is located. Currently, the FAA's drug and alcohol testing regulations do not extend to companies or individuals who perform safety-sensitive functions, including aircraft and preventive maintenance, outside the United States.

The public comment period, closing May 16, 2014, will help the FAA develop a proposed rule and to assess its economic impact. The notice invites comments on issues related to proposing drug and alcohol testing for the relevant employees of covered maintenance providers, including:

- Which drugs are most misused in a particular country? If testing programs exist, are they administered by a national regulatory authority? Are industry participants required to establish such programs under the country's laws and regulations, or does industry do that voluntarily
- Should a program require testing for the same drugs the FAA requires tests for in the U. S.?
- Does a country allow/require random drug and/or alcohol testing? What is the process?
- If a country does not allow or require random drug and/or alcohol testing, are there laws that prohibit random testing? What other methods might successfully deter employees from misusing drugs or alcohol while performing safety-sensitive duties, or within a certain period of time before performing such duties? What are the standards that employees who have violated drug and alcohol regulations should meet before they are allowed to return to performing safety-sensitive maintenance work?

The FAA's action responds to a mandate in the FAA Modernization and Reform Act of 2012. 60 days after publication in the Federal Register.



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» and thereafter Gloy became VP Engine Overhaul in November 2012.

Gerald Frielinghaus (58) joined Lufthansa Technik in 1985 and has held the post of President and CEO of Lufthansa Technik Philippines since 2011. He will return to Germany to manage the Paperless Maintenance project in Frankfurt, a migration from paper-based to electronic aircraft maintenance documentation.

**DAC Int'l Names Davis Director**

DAC International named Steve Davis as director of Technical Support and Business Development. Davis formerly served as DAC's director of Airline and Government Sales.

"Steve is a seasoned aviation professional who brings a great deal of knowledge to our team," said GM of DAC International Francisco Hernandez. "Moving him into this role should increase our ability to identify new potential partners."

Davis' new role will consist of assisting all sales staff with technical issues, proposals and research as well as assisting in the identification of potential new business partners for the company. Davis has been with the company since 1996.

**Summit Aviation Adds Regional Sales Manager**

Summit Aviation announced the hiring of Ken Pike as a regional sales manager. Pike will be responsible for the development and execution of sales strategies for Summit's aircraft sales and aftermarket services for both fixed wing and rotorcraft.

Previously, Pike held the position of regional support manager for North America, Europe and Africa for Sikorsky Aerospace Services and Helicopter Support Inc. In addition to his responsibilities, Pike will also serve as facilitator between Summit's S76 Customer Support Center for legacy helicopters and Sikorsky.

**Gulfstream Names Herring Director**



Herring

Gulfstream has named Susan Herring director, Initial Phase Operations Finance. She reports to Kevin Dutton, vice president, Operations Finance, Gulfstream.

In her new role, Herring will direct financial strategies for Initial Phase Operations for all large-cabin programs. In addition, she will work closely with the Material and Procurement team on supplier negotiations for Initial Phase Manufacturing.

"Over the past 14 years, Susan has been the backbone of Initial Phase Manufacturing and Material Finance," said Dutton. "She has a deep knowledge of the large-cabin product »

**Bombardier Opens Regional Support Office in Toluca, Mexico**



Bombardier Aerospace continues to enhance its aftermarket support worldwide by opening a new Regional Support Office (RSO) in Toluca, Mexico. The office will anchor regional support capabilities for Bombardier business aircraft customers throughout Mexico, and surrounding areas.

The new RSO is located alongside Bombardier's new business aircraft sales team within the modern Assertec fixed based operation (FBO) at the Toluca airport. The office will be home to three field service representatives (FSR), one sales director, one RSO administrative assistant and one RSO Manager. This local presence provides customers with an additional level of support in conjunction with Bombardier's extensive parts and maintenance network of wholly owned service centres and authorized service facilities (ASF), as well as its expert in-service engineering teams and 24/7 Customer Response Centres.

"Latin America is an important region for Bombardier with a large number of existing Bombardier business aircraft operators," said Michel Ouellette, president, Bombardier Customer Services and Specialized and Amphibious Aircraft. "By opening our second RSO within Latin America, we will strengthen the support presence on the ground. It is a true example of our commitment to building lasting relationships with existing and potential customers, as well as establishing local roots in the markets where our aircraft operate."

Bombardier's latest market forecast for the aviation industry predicts a total delivery of 2,300 business jet deliveries destined for Latin America over the next 20 years. To date, Bombardier has a total of 470 business aircraft jets based in the region. The Toluca RSO will provide expertise and support to local business aircraft customers, as well as customers flying into the region.

**Flybe Aviation Services Achieves Certification as Practical Training Provider**

Exeter UK-based Flybe Aviation Services' technical training team, as an approved EASA Part 147 organization for the delivery of theoretical and practical training to support Embraer and Bombardier regional aircraft types, has achieved compliance with the latest standards defined in Commission Regulation (EU) 1149/2011, as recognised by the UK Civil Aviation Authority (CAA).

This allows the Flybe technical team to deliver to the latest standards as defined in Commission Regulation (EU) 1149/2011. theoretical and practical training programs worldwide on Embraer 190/170 and 135/145, and the Bombardier Q400 and CRJ 100/200 and 700/900/1000 types of aircraft.

Head of Technical Training, Graham Noon, states: "Flybe is one of the few training suppliers in the UK to have obtained the CAAs latest approval standard for our practical training. This is fantastic news for us as a business and for customers wanting a fully approved training certification. It is testament to the team here, which has worked incredibly hard to successfully obtain the certification and proves our commitment to continually deliver high quality practical training to our customers in the UK, Europe and beyond."

The Flybe Technical Training team has a full array of theoretical and practical programmes being delivered on Embraer 190/170, 145, Bombardier Q400 and CRJ 100/200 and 700/900/1000, BAe 146 and ATR 42-400/500/72-212A series. EASA approved courses available include the B1, B2 and B1/B2 combined theoretical and practical programmes.

ensuring smooth operations of both governmental and civil helicopter operators worldwide," says Anatolij Legenzov, the CEO of Helisota.



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» lines and Initial Phase business areas, which, along with her financial expertise and excellent leadership, will serve Gulfstream well.”

Herring joined Gulfstream in 2000 as a budget analyst and has held a number of positions, including finance manager of Gulfstream G450 and G550 product lines and senior finance manager of Initial Phase Operations and Advanced Aircraft Programs. She earned her bachelor’s degree in business administration, with an emphasis in accounting, from Georgia Southern University in Statesboro.

Essex Welcomes Mitchell as EVP

Essex Aviation Group recently announced Tom Mitchell has joined their team as executive vice president. Mitchell will be based at their L.G. Hanscom Field, Bedford, Mass., location and will begin his new position immediately.

He brings 35 years of experience to Essex, specifically in flight operations, technical support, and aircraft management. “Tom is the perfect addition to our group at Essex,” says Lee Rohde, president and CEO, Essex Aviation. “His extensive experience in a »

ExxonMobil Aviation Secures Rolls-Royce Approvals

ExxonMobil Aviation’s Mobil Jet Oil 387, a synthetic High Performance Capability (HPC) turbine engine oil, has secured Rolls-Royce’s approval for use in Rolls-Royce’s Trent 1000, Trent 900 and Trent XWB engines.

These Rolls-Royce aircraft engine technologies are used to power some of today’s most advanced aircraft including Boeing’s 787 Dreamliner and Airbus’ A380 and A350.

“As a company that helped pioneer synthetic lubrication technology, we have a long legacy of working side-by-side with Rolls-Royce to deliver lubricants that enable operators to enhance fleet performance for the long haul,” said Frans Horjus, global aviation lubricants sales manager, ExxonMobil Fuels & Lubricants. “Since these Rolls-Royce engine technologies are used to power some of the most advanced aircraft ever built, it is only fitting that Mobil Jet Oil 387, the most advanced synthetic turbine oil we have ever developed, is approved for use in these engines.”

AFI Wins TAROM ATR Component Support Contract

Romanian airline TAROM has designated AFI to provide component support services for its nine ATR42 and ATR72 aircraft. “We chose AFI because they were the group that provided the best response to our operational requirements and made us a most competitive offer,” said TAROM vice president maintenance and engineering, Eugen Nicolescu. Anne Brachet, EVP Air France Industries, said she was delighted by the trust shown by TAROM, a Sky Team member airline since 2010, adding: “We are very happy to support TAROM’s growth in this way. The contract will also allow us to make our commercial comeback in the Balkans, strengthening our positioning with airlines based in Southern and Eastern Europe.”

Vice President AFI, Product, Strategy and Development for Materials and Services, Franck Becker added: “This is a further sign of the competitiveness of the AFI offering for ATRs, and for regional fleets in general. Turboprops are a growing sector, with a rising number of aircraft in service worldwide, but a few alternative support offers to OEMs. Airline MROs like AFI have a lot to offer when it comes to attracting a regional client base.”



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about people

» wide range of areas will bring significant value to our current and future clients, I am confident he will be an integral part of Essex's continued growth in the industry."

Before joining Essex, he held the position of senior vice president at Aviation Management Systems Inc. (2010- 2014). Tom also held a flight department manager position with Liberty Mutual, as well as nearly 20 years as a member of the senior management team for Jet Aviation. In addition, Mitchell is an FAA certificated mechanic for both airframes and engines and holds a current FAA Inspection Authorization.



**West Star Appoints Pompa Interior/Paint Project Manager**

West Star Aviation has appointed Joan Pompa as interior/paint project manager at their East Alton, Ill. location. Joan joined West Star in 2013 as interior/paint sales manager at their Grand Junction, Colo. location. Joan will continue to support Grand Junction interior and paint sales while she »

**AAR Signs LOI with Mesa Airlines to Support New E175s**

AAR has signed a letter of intent (LOI) to provide support for 30 new Embraer 175 aircraft operated by Mesa Airlines. The 12-year agreement will include rotatable inventory power by the hour (PBH) support, heavy maintenance, and wheel and brake services. AAR will utilize its broad service offerings to provide this comprehensive fleet support under a single program.



To support the inventory PBH element of the program, AAR will own and manage a rotatable inventory pool in five of Mesa's locations to meet guaranteed service levels. The heavy maintenance will be performed in AAR's Oklahoma City MRO facility and the wheel and brake services will be performed in AAR's Miami location. The estimated total value of the contract is more than \$200 million.

"We are excited to build on our history of quality and reliable service for Mesa Airlines," said Ken Hein, vice president of Operations for AAR's Aviation Supply Chain Group. "Our total support solution simplifies the supply chain and life-cycle support for their new E175 fleet."

Mesa will begin revenue operation of the new fleet of E175s this summer for United Express service. "The total support services package offered by AAR as the primary supplier will allow us to focus on our core business—providing outstanding regional service for United Express and its customers," said Gary Appling, Sr. vice president of Maintenance and Engineering for Mesa Airlines. "We look forward to putting these new planes in operation this summer."



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**American and MassPort Open Newly Renovated Hangar at Boston's Logan**

American Airlines and the Massachusetts Port Authority celebrated the grand opening of the newly renovated aircraft line maintenance center at Hangar 9 at Boston Logan International Airport recently. The hangar will house up to three narrow body aircraft and includes administrative space. The hangar also has a state-of-the-art ground service equipment facility with four bays. The facility was updated to support maintenance operations for legacy American Airlines and legacy US Airways aircraft and equipment.

"As Logan enters its 91st year, investment in maintenance is important to keep good paying blue collar jobs as a cornerstone of the airport," said Massport CEO Thomas P. Glynn. "American Airlines predecessor Colonial Air Transport started flying from Boston in 1926 and the airline has been here ever since. This renovated facility will continue that long relationship for years to come."

American's new line maintenance facility covers 73,000 square feet and is located at the north end of Logan Airport. The project was also completed under Massport Sustainable Design Standards and Guidelines to ensure the construction made proper use of recycled, energy-efficient and regionally produced materials, as well as successfully met other environmental criteria.

Hangar 9 was originally used by Trans World Airlines, which began major service out of Boston in 1963. The hangar has been reconstructed

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## about people

» transitions into her new role.

In addition to her experience at West Star, Joan has 13 years of sales experience in interior, paint and refurbishment projects.

"We continue to see an increase in demand for our interior refurbishment and paint services," says Eric Kujawa, GM of the East Alton location of West Star Aviation. "This demand has created a need to have a single point of contact working in operations at ALN to manage all of the incoming projects."

In her new role, Ms. Pompa will work directly with the sales team and manage the overall project from pre-arrival planning and material selection to post-departure follow up.



Chatten

### Superior Names Chatten EVP/Hurless Joins Superior Aviation Group

CEO Tim Archer announced that Keith Chatten has been appointed executive vice president and general manager at Superior Air Parts, Inc.



Hurless

"Over the past three and a half years, Superior has continued to make significant strides in growing its position as a leader in the FAA-approved PMA (Parts Manufacturer Approval) business, as well as its other business areas including piston engines for certificated and experimental aircraft," Archer stated. "I am very happy to be able to announce Keith's appointment as Superior's executive vice president and general manager and am confident that his passion and leadership will be instrumental in continuing our success and growth."

Later Keith Chatten, VP Engineering and Quality for Superior Air Parts announced that Wes Hurless had joined the company as its quality assurance manager.

"Wes has an extensive background and invaluable experience in quality assurance practices for the aerospace and aviation industries," Chatten said. "His skill sets include not only mechanical applications and practices, he has also been highly successful in directing the implementation of several quality systems programs for a variety of aviation specific applications."

"I believe in taking a proactive approach to the entire quality assurance process," Hurless said. "Find and eliminate problems before they leave the building or better yet, identify them before they find their way into the manufacturing process."

Along with his successes in quality assurance, Hurless also brings a strong background in process improvement, »

and rebuilt, and offices have been added. Larger and higher hangar doors have also been installed, enabling safer and easier movement of aircraft in and out of the building.

"We are excited to open this new facility here at Logan," said Paul Wroble, vice president, Line Maintenance for American Airlines. "As we continue to restore American to the greatest airline in the industry, and move forward with the integration with US Airways, Hangar 9 will offer everything we need to support existing flight operations from the great city of Boston to markets across the globe."

At Hangar 9, technicians will be able to perform a wide-range of line maintenance tasks, ranging from routine servicing to engine changes, phase checks and more. The team will also handle the shipping and receiving of aircraft parts. American Airlines' Tech Ops crewmembers routinely service up to 27 aircraft per night at Logan Airport alone, according to the company.

Opening of the hangar was celebrated in conjunction with Employee Appreciation Day for the American Airlines Line Maintenance team. The event included a special presentation, facility tours and a ribbon-cutting ceremony with George Monahan, an American Airlines aircraft maintenance technician who recently celebrated 54 years of service with the company.

"George started his career with TWA at Hangar 9 and was present for the original grand opening of the facility," said Mike Trochalakis, managing director, Northeast, Europe, Middle East and Asia Line Maintenance for American Airlines. "He has come full circle 51 years later."

## Quick Turn HSI on P&WC Engines Offered at Duncan

Duncan Aviation recently announced that its Battle Creek, Michigan, facility can now provide operators with a QuickTurn Hot Section Inspection (HSI) program for Pratt & Whitney Canada (P&WC) engines.

"We are excited to be able to offer aggressive turntimes on P&WC hot sections," says Dan Arrick, Duncan Aviation's Pratt & Whitney engine service sales specialist. "Many operators will want to take advantage of this over a weekend so the maintenance impact to their flying schedule is at a minimum."

In addition to the engine support, Duncan Aviation has airframe service capabilities on the main airframes that fly P&WC engines models, allowing operators to have airframe work performed while their engine maintenance is being completed.

Duncan Aviation has provided overhaul management and Hot Section Inspection services for P&WC engines through their relationship with P&WC and a network of authorized service providers for more than 30 years. More than a year ago, though, P&WC opened an HSI back shop located within Duncan Aviation's hangar in Battle Creek. The 3,700-square-foot of work and office space is fully staffed by a team of Pratt & Whitney Canada engine technicians.

"Our customers can really benefit from the shop being located here on-site," Arrick says. "Shortening downtime and controlling expenses are on the forefront of every operator's mind. Having a P&WC HSI repair facility located in Battle Creek cuts the time and expense necessary to send out parts for factory inspection. Now all we have to do is walk them down the ramp to the shop. Not only do Duncan Aviation technicians have unprecedented access to OEM technicians and engines are delivered out of maintenance quicker, but parts shipping costs are also nearly non-existent."

Duncan Aviation has performed HSI services on-wing for PT6, JT15D and PW500 series engines for years. We have also provided customers with line maintenance for PT6, JT15D, PW300, PW500 and PW600 series engines at our full-service aircraft maintenance facilities in Battle Creek, Michigan, and Lincoln, Nebraska, and we have eight strategically based U.S. Engine Rapid Response teams on-call and equipped to travel to a customer's location to perform engine R&Rs and HSIs and technical support at a moment's notice. Duncan Aviation also provides overhaul management services for PT6, JT15D, PW300 and PW500 engines and works with ESP, JSSI and Power Advantage maintenance plans.

## Rockwell Collins Unveils Tablet Mount for Venue Cabin

Rockwell Collins has unveiled a new personal tablet mount for its market-leading Venue HD cabin management and entertainment system. The optional solution, available now, allows passengers to securely mount, charge and more easily operate Apple iPads and Samsung Galaxy Tabs.

The new mount serves as a closely matched alternative to traditional side-ledge-mounted cabin displays and gives passengers a more ergonomic way to use their personal tablets. Rockwell Collins offers a number of apps for tablets that integrate with Venue, including its Cabin Remote for controlling the cabin environment and Airshow Moving Map for interacting with real-time flight information.





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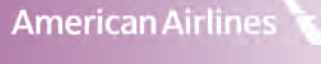
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## about people

►► project management and team leadership to the Superior Air Parts team. "During the past several years I have driven many high performance, cross functional teams to successfully resolve deep-rooted systemic process issues that were eroding quality and productivity within the company's value streams," he stated.

### AAR Hires Communications Director

AAR has hired communications and government strategist Kathleen Cantillon as global director of communications and reputation. Cantillon has more than 20 years of experience in corporate communications and government relations, with expertise in transportation.

Cantillon will develop communications strategies for all of AAR's business segments domestically and abroad, including the Company's operations in Europe, the Middle East, Africa, and Asia Pacific. She will report directly to Cheryle R. Jackson, AAR's Vice President, Government Affairs and Corporate Development.

"Kathleen's experience in strategically using communications to enhance a company's reputation and support its business goals will be a tremendous asset to AAR," said Jackson. "We are especially excited to have someone on board with a mix of transportation and government affairs expertise, which will be critical as AAR expands its global footprint."

Before joining AAR, Cantillon was Managing Director at ASGK Public Strategies where her transportation clients included Navistar, RTA and CDM Smith. Prior to ASGK, Cantillon served as Director of Communications for Exelon, and ran communications at the Illinois Tollway and Amtrak. She also was a communications executive at Edelman Public Relations. Cantillon is a graduate of the Medill School of Journalism at Northwestern University and the John F. Kennedy School of Government at Harvard University.

### Turner & Townsend Appoints Millan VP/Head of Aviation

Turner & Townsend, a global construction and project management consultancy, has appointed Tina Millan as vice president, head of Aviation USA. In this role, Millan is charged with driving the strategic direction of the department, growing the business and managing the team that is responsible for serving clients in the aviation sector. She reports directly to Turner & Townsend's CEO Bruce McAra and is based out of the firm's New York office.

Millan brings 15 years of project management experience in transportation, ►►

For cabins with Venue's wireless AVOD (audio video on-demand) or Skybox, passengers with tablets can access digital content already onboard.

"With Venue, we're creating a cabin experience that's tailored to best suit its passengers," said Greg Irmen, vice president and general manager, Flight Controls and Information Systems for Rockwell Collins. "Our new mount enables passengers to seamlessly integrate their personal tablets into the cabin setting and more comfortably enjoy their own content."

Rockwell Collins new personal tablet arm mount is compatible with current- and previous-generation Apple iPads (including iPad Air) and Samsung Galaxy Tabs 1 and 2.

## Johan Bank Appointed VP Engineering at KLM E&M

Johan Bank, director MRO, KLM Engine Services since 2007, has been appointed vice president Engineering, KLM E&M. With a Bachelor's degree in Mechanical engineering from the HTS engineering school in Haarlem and a Master's degree in Energy Production, Johan Bank began his professional career at KLM Flight Operations as a flight engineer on Douglas DC10s. Subsequently, from 1993 to 2003, he became a flight engineer on Boeing 747s. In 2003, he moved to KLM's Engineering and Maintenance Division to oversee implementation of Lean Six Sigma projects. For four years he worked as a Lean Six Sigma "Black Belt" in all areas of aircraft maintenance, from components, to engines, and airframes.

From 2007 he was Director MRO at KLM Engineering & Maintenance's Engines Division, tasked with overseeing all production processes and steering the implementation of Six Sigma methodology. Under his leadership, the Division cut CFM56 engine overhaul shop time from 85 to 60 days. "I am honored to be given these new responsibilities within KLM. I shall strive to place at its disposal all the Engineering and Six Sigma skills and knowledge I have acquired over a period of 30 years working with KLM E&M," Bank said.

## Etihad Regional Leases Four ATR 72-500s



Etihad Regional recently announced a multi-million dollar agreement to lease four ATR 72-500 aircraft, which will see the carrier boost its regional fleet to 12 and support its rapidly expanding network.

All four aircraft are scheduled for delivery between April and June 2014, with the first touching down at Geneva International Airport on 1 April. The airline currently operates a fleet of eight 50-seat Saab 2000 turboprop aircraft.

Etihad Regional will configure each aircraft with 68 seats. The lease of the aircraft was arranged by Nordic Aviation Capital (NAC), the world's largest turboprop leasing company headquartered in Billund, Denmark.

"[This] announcement marks the beginning of our new fleet expansion program. It is part of our strategy of matching our growing network and frequency requirements with the right aircraft," Maurizio Merlo, CEO of Etihad Regional said. "Choosing ATR for this transaction is a logical step. The ATR aircraft have the lowest seat-mile costs in their class, are ideally suited for regional operations, can operate in all-weather types, and have relatively low engine and airframe maintenance costs."

## DAC Intl. Gains Additional PMA

DAC Intl. announced the Federal Aviation Administration has provided Parts Manufacturer Approval (PMA) for the company's Electronic Flight Bag system including the RPU, Display and Tray assemblies.

The PMA was issued as a result of the Supplemental Type Certificate obtained earlier in the year for DAC's Gen-X EFB e-Enabling program that is installed in the cockpit and cabin to support a wide range of applications including system interfaces to the aircraft navigation systems, EFB functionality for charts and aircraft documentation, communication system interfaces for text messaging, maintenance support, e-Commerce applications as well as cabin applications for customer support.

The PMA approval was accomplished by DAC Intl.'s Engineering and Certification Division (ECD) and supports the Boeing 777-200/300/300ER series aircraft.

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## about people

►►► urban redevelopment and infrastructure to the company. For the last seven years she has specialized in all aspects of the management of capital projects in the aviation sector. Most recently, she served as a consultant to senior management at Los Angeles World Airports (LAX) to develop strategies for the successful procurement and implementation of a \$4B capital program.



### Morgan Joins Duncan Aviation Avionics

Duncan Aviation has welcomed Mike Morgan to their avionics installations sales team, where

Morgan

he will provide technical sales and quote support for avionics installation projects.

Morgan joined Duncan Aviation's Battle Creek, Michigan, facility in 1996 as an avionics installation technician and, for the last five years, has been a team leader in the engineering department.

"Mike's knowledge of the latest in avionics systems and mandates is an asset that will benefit customers and prospects as they seek information about aircraft upgrades and certification. His avionics knowledge and engineering experience will help customers identify the best avionics solutions for them and their aircraft," says Phil Suglia, sales manager for Duncan Aviation-Battle Creek.

## Hartzell's Bantam 3-Blade Propeller Approved for Diesel Skyhawks

The Federal Aviation Administration has awarded Hartzell Propeller a Supplemental Type Certificate to install the company's recently type certified high performance Bantam series three-blade propeller on diesel-powered Cessna Skyhawk aircraft.

The Hartzell Bantam propeller series are small, lightweight two and three blade propellers with a thin, wide chord and swept high performance airfoils. The recent approval covers installation of Hartzell's three-blade Bantam propellers, featuring carbon fiber structural composite blades and composite spinners, on Cessna C-172s with Centurion diesel engines.



"Geared diesel engines, like the Centurion and the Austro Engine AE-300, require an ultra lightweight, slow turning propeller with a higher blade count because the airframes they power are extremely weight-sensitive," said Gary Chafin, Hartzell Propeller vice president of OEM Sales and Product Support. "The combination of Hartzell's Bantam propellers and the Centurion engines in Cessna Skyhawks will prove to be an unbeatable combination for all operators, including flight schools."

The lightweight Bantam three-blade propeller weighs 35.3 pounds, including spinner, and replaces the previously supplied wood-core propellers. The superior strength of the carbon fiber structural composite material enables the Hartzell Propeller engineering team to design blades with wider chords and thinner airfoils, ultimately leading to higher performance and durability.

With a new Bantam propeller the aircraft cruises approximately three knots faster from 75 percent up to max power, has 15 percent faster acceleration time to 45 KIAS and shows a 50-75 fpm increase in max power rate of climb. The Bantam series propellers utilize Hartzell's proven durable carbon fiber monocoque construction, including field replaceable electroformed hard nickel erosion shields, allowing for maximum damage tolerance and field reparability, important in flight school environments and on unimproved runways.

The three-blade Bantam propellers for Centurion powered Skyhawks have a 2,400 hour recommended Time Between Overhaul as well as a warranty that covers the propeller and spinner for three years or 1,000 hours, whichever occurs first. The new propellers are available through Hartzell's Top Prop performance conversion program.

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by Joy Finnegan



# STATE OF THE INDUSTRY

## THE TOP MRO LEADERS SHARE THEIR WISDOM

Adolfo Gordo Head of Commercial, Iberia Maintenance



**In your opinion, what is the state of the aviation maintenance industry?** It is going through an on-going process of continuous readjustment to match operator's demands. Aftermarket competence is getting more and more mixed among different players from independent MROs, airline owned MRO's and OEM's. These three basic types of service providers are looking for agreements among each other to comply with customer requirements and this is creating a new setup that will probably change the way to address customer needs.

**What were the biggest developments for your company in the last year?** 2013 has been a busy year for us. We were concentrated in the development of our capability to service and overhaul a new engine model, the IAE V2500 as part of our future positioning in the Engine Shop services. This has become a major milestone already accomplished in the first quarter of 2014.

In 2013, we also started the retrofit of our A340-600 fleet. As you know, Iberia launched new long haul cabins on board of its new A330-300 last year. Both, the new Business and Tourist classes will also be installed in the 17 A340-600s. The retrofit of these aircraft include new seats, but also optical fiber and new IFE, as every seat of the Tourist Class has an individual screen for IFE. All passengers will also be able to use WiFi Internet access and GSM capability through its own electronic devices. The mood lighting system will be available in the Business Class cabin. The project started last year and it will go on until 2015, when all the 17 A340-600 aircraft in our fleet will be ready.

The third big project started in 2012 and finished in 2013: the automation of the cleaning process of engine parts in our engine shop. And finally, but not less important, it was the process of diversifying our business. In 2013 we started offering maintenance and overhaul of GG8 turbines used in electrical power generation.

**MRO growth is coming from Asia. What is your company doing to capture market share there?** When looking at the trend for next decade, it is clear that Asia region growth will pass any other and our sales department is quite conscious of it, we have recently gained some contracts in the region that are serving as a base to project our presence in Asia, as well as in the Middle East.

**In last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** We definitely believe so, as said before, customers tendency to follow a one-stop-shop regarding their maintenance needs will drive more consolidations not only among MRO's but also with mixed joint ventures with OEM's and even airframe manufacturers.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?** In our opinion, investments in technology are made in those areas where it makes sense. This does not necessarily mean that there is a lag, but the difficulty to get access to some advanced technology, mainly for proprietary rights issues, plays a major role in the equation.

## August Henningsen Chairman of the Executive Board, Lufthansa Technik



***In your opinion, what is the state of the aviation maintenance industry?*** 2013 was a good year for the aviation industry. For the very first time, more than three billion people traveled by plane, and air transport safety reached the highest level in the history of aviation. The world fleet continues to grow. Consequently, the MRO market was characterized by stable development. However, the persisting financial strain felt by many airlines, as well as the further increase MRO services offered worldwide, continue to pose challenges and increase price pressure.

***What did your company do last year to adapt to changes in the market? MRO growth is coming from Asia. What is your company doing to capture market share there?***

By accommodating new aircraft types and extending the product portfolio, Lufthansa Technik has been able to expand its good market presence even further. Technical services for the new Airbus A350, the Boeing 777-9x or the Bombardier C-Series are in preparation and will be offered as soon as these aircraft types are introduced into a scheduled service. Another key-point in our corporate strategy is to intensify our presence in growth markets. For example, in 2013 Lufthansa Technik Shenzhen, Lufthansa Technik's composite materials specialist in Asia, has started construction work to double its workshop and warehouse capacity from 7,000 to nearly 15,000 square meters. Another example is Lufthansa Technik Philippines, Lufthansa Technik's center of excellence for Airbus base maintenance in Asia.

***In last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?*** The technical and structural preparation of MRO suppliers for the arrival of the new aircraft generations is very cost-intensive, due to investments in tooling, spare parts, technical training, licenses etc. Seeing this, we think there is still more to come and the consolidation process is not finalized.

***What is the current regulatory environment like for MRO?*** Within EASA, as we are hearing, the Rulemaking Directorate shall be dissolved and rulemaking be integrated with other tasks into new product safety and oversight oriented functions. This perspective—if it leads to better/fewer rules in the long run—is appreciated by the MRO industry. In respect of international regulations, demonstrating compliance with the recently issued US-TSA Security Rule for repair stations will be a new challenge.

***A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?***

It is true that with the arrival of the new a/c generations like the A380, the 747-8, the 787 in the past years and the A320neo, the A350 or the 737 MAX and 777-9X in the future, MRO suppliers have had to re-structure their approach to the business. The new technologies are more reliable, but also more complex than older systems. This means, that business models have to be adapted and large investments in the organization and technology have to be made to prepare for these challenges.

## Sarah Macleod Executive Director, Aeronautical Repair Station Association



***In your opinion, what is the state of the aviation maintenance industry?*** Good and stable; the aviation maintenance industry attracts investors when the business is specialized or has customers from military, civil or industrial sources. While heavy aircraft maintenance providers will always be economically challenged with slim margins, currently, hangars are full. The economic indicators are positive. As evidenced by the association's 2014 economic assessment, we expect global growth of better than four percent a year over the next decade; that represents an \$87 billion market by 2024. This forecast is consistent with what ARSA members are telling us: 64 percent of the respondents to our recent member survey said they expect their markets to expand in 2014 and 60 percent plan to add workers. That sounds to me like a healthy, growing industry.

***What were the biggest developments for ARSA in the last year?*** Creation of a long term strategic plan—ARSA 20/20—we are working hard to ensure the stability of the trade association so it can continue and expand its reach. The need for "good government" is universal; ARSA needs a deeper and broader presence in the United States, Europe, Canada, South America and in the Asian nations. Upgrading the association's annual economic report with TeamSAI; our new partners will be enhancing the ability to dig into the economic nitty-gritty of individual part numbers and systems. Detailed knowledge of the industry's evaluation and pricing structure will be used to standardize safety requirements and measures.

***What is the current regulatory environment like for repair stations and MRO?*** The regulatory environment is a field full of land mines; no business can be 100 percent compliant 100 percent of the time. It has always amazed me that companies have internal OSHA or EPA offices that are responsible for ensuring compliance with occupational and environmental standards, but leave it up to "chief inspectors" or quality managers to convince the national aviation authorities of a company's adherence to aviation safety regulations. The inconsistent application of such regulations costs businesses hundreds of thousands of dollars, all apparently deemed inevitable!

***A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?*** I am not sure what the person meant. Maintenance companies must return articles to their original condition, if the original product is based upon old technology, for the most part, the maintenance will be as well. On the other hand, the aviation industry is slow to change because of the potential for disaster if things go awry. Our assessment indicates that more than 84 percent of U. S. repair stations have fewer than 50 employees. That's more than 3,300 businesses that need rapid returns on investments; technological upgrades are not so easy to verify or justify. Labor is also a key impact area, especially considering the specialized and aggressively regulated nature of the business. Further, 86 percent of respondents to ARSA's member survey indicated that they have trouble finding skilled workers. All this is to say that before upgrading technology, companies need to look at capital and human investment requirements carefully.

## André Wall Chief Executive Officer, SR Technics



**In your opinion, what is the state of the aviation maintenance industry?** The aviation industry is at a turning point between the mature and new aircraft platforms, which will ultimately change the industry landscape. New technology and IT requirements require the aviation maintenance industry to adapt at a certain cost tag, which will further foster the ongoing consolidation that is underway.

**What were the biggest developments for your company in the last year?** By successfully opening up our component maintenance facility in Malaysia SR Technics has demonstrated that we understand the requirements of our customers especially in growing markets like Asia. This facility enables us to not only repair components at much lower rates but also ensures that we are closer to our future customer base. In parallel, our ICS fleet size is sky-rocketing, with double digit growth rates and in 2013 we hit a significant milestone as we signed our 1,000th aircraft under contract, emphasizing SR Technics' position as a leading independent global MRO. Another area of increasing focus is developing partnerships with airlines.

**What did your company do last year to adapt to changes in the market? MRO growth is coming from Asia. What is your company doing to capture market share there?** Opening up Malaysia was definitely the right strategic decision to continue to capture the significant growth in Asia. Customer proximity is, from our perspective, a key requirement in this region. The next steps will be to establish Regional Customer Service and Distribution Centers in the region, which should be in Q2 and Q3 of 2014 respectively.

**In the last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** Absolutely. Consolidation is in an early phase where lots of players are just testing the market. We expect more significant moves to be announced in 2014/2015 with potential to change the overall MRO landscape.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?**

**What is your company doing to advance technologically?** The state of the MRO industry today is very much linked to the product lifecycle of the aircraft. As many aircraft flying today were designed and built in the 1980s, the MRO industry has a tendency to accommodate to this fact. With new platforms such as the Boeing 787 and Airbus A350 coming onto the market, we expect a technology impact on the MRO side. We are in the process of completely refining our IT & data infrastructure to become even more efficient on these new platforms. Hot topics for us center on predictive maintenance, e-enabling and big data.

With increasing IT trends towards the use of applications on iPads and handheld devices we are also looking to implement our own applications as part of our logistics approach, which give Technicians and customers real time access to data. Over the much longer term we are also looking at opportunities for introducing the use of robotics and / or greater automation in the airframe business.

## Dany Kleiman Group Vice President, Repair and Engineering, Technology, AAR



**In your opinion, what is the state of the aviation maintenance industry?** It's robust and will continue to be robust going forward. The airlines are making money and investing in their fleets. They are particularly focused on the customer experience and are making interior and passenger comfort upgrades in coach as well as in business and first class. There are airplanes that will be getting interior upgrades that will be in service for another 10 or 15 years. In addition, there are record orders for new planes worldwide. The older fleet types will continue to be taken out of service as the newer fleets come in. In general, though, the U.S. carriers didn't place the large orders as quickly or as early as airlines in the Middle East and Asia.

**What were the biggest developments for your company in the last year?** In the past year, AAR has ramped up its MRO operation in Duluth, Minn., and will be at full capacity by this fall. Secondly, we acquired an MRO facility in Lake Charles, Louisiana, that has increased our capacity to perform wide-body work, including A380 aircraft. While the Lake Charles MRO was once an Airbus-only facility, we plan to serve other platforms as well.

**What did your company do last year to adapt to changes in the market? MRO growth is coming from Asia. What is your company doing to capture market share there?** There has been increased interest in the industry for smaller airplanes, such as the Embraer series. Large orders have been placed for that airframe in North America, and AAR is well positioned to serve that market. In fact, we recently signed an LOI with Mesa Airlines to support 30 new E175s going into service this summer for United Express. If you look at AAR from more than airframe standpoint, we have a respectable presence in Asia right now through our supply chain and inventory management businesses. We're continuing to cultivate relationships with the Asian carriers.

**In the last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** I believe there will be more consolidation in the short and the medium term. HAECO's purchase of TIMCO, for instance, was a major acquisition.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur? What is your company doing to advance technologically?** Technology in the industry isn't that far behind but it requires investment.

AAR has invested heavily in technology in our business systems over the years. We develop systems in-house to support our MRO businesses, and they've served us very well. Our APRiSe safety and quality management reporting technology gives us a closed loop system to manage quality and safety in our business. Our STAAR system helps us to manage our businesses, contracts and invoicing. And our Inventory Management and Order Processing System (IMOPS) tracks revenues from procurement to repair to invoicing. We manage customer inventory through that system and we think it's one of the best in the industry.



## Franck Terner Executive Vice President, Air France KLM Engineering & Maintenance



**In your opinion, what is the state of the aviation maintenance industry?** The MRO market is generally expected to grow by four percent, which is quite reasonable. It is still consolidating. The shift towards more asset management is confirmed, as the growing competition of OEMs. On airframe mainly, we are seeing the first moves towards an increased regionalization.

**What were the biggest developments for your company in the last year?** In 2013, there were major new steps for AFI KLM E&M. In line with our strategy, we expanded our global footprint. In the Americas, we set up our Bonus JV, based in Miami, specializing in engine tear down and in PW4000-94 and JT8D maintenance. In China, we opened a new component workshop end of 2013. We've also built a comprehensive network for narrowbodies airframe maintenance serving Europe, Middle East and Africa, through our maintenance centers in Norwich (UK), Amsterdam (NL), Paris (F), Toulouse (F) and Casablanca (Morocco). In 2013, we've also strengthened our positions on the GE90 maintenance market, with 340 engines in support, and on the 787 component support with several new contracts. We also plan to open in 2015 a 20000 m<sup>2</sup> unit devoted to aerostructures and composites in Paris CDG.

**What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?** In 2013 we implemented major measures in the frame of the Air France KLM Group "Transform" plan. This plan targets process improvement, cost savings, which benefit to our competitiveness, and development. In this perspective, we've set up win/win partnerships with several airframe MROs to who we send airframe work, while they send us component and engine work. Regarding our development in China, our component workshop is a 100 percent subsidiary based in Shanghai. It is at the doorstep of the Chinese airlines while being backed by our powerful logistic network. At the beginning, the repair solutions provided by the shop focus on Airbus A320 and Boeing 737 avionics systems.

**In last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** Indeed, in order to meet their customers expectations, MROs will seek for more scale effects, more base load and more investment capability, while coping with the OEM licensing challenge. On top of that, the Airline consolidation calls for larger providers. Our recent acquisition of Barfield is a perfect illustration of this trend: this will help us to better serve the airlines all across the Americas.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?** In terms of innovation, which is in our DNA, we have a three-pronged strategy: "green maintenance", with environmental initiatives around energy and resources savings or recycling and cradle-to-cradle concepts. Stimulation of innovation at the workshop level is another strong orientation, with more than 4000 ideas suggested every year by our employees.

## Leo Koppers Senior Vice President Marketing and Sales, MTU Maintenance



**In your opinion, what is the state of the aviation maintenance industry?** First of all, on the positive side, we think that the engine MRO market is a growing and a booming market. According to our own forecast, we estimate that shop visits for commercial jets above 100 seats will grow at just above 2 percent p.a. over the next ten years. Engine MRO revenues should grow even further at a rate of 7.4 percent when taking price escalation into account. However, we are currently in the middle of a period of transition where older equipment is increasingly being replaced by newer aircraft with longer on-wing times as well as less shop visits throughout the life cycle. What this concretely means in terms of shop visits is that more MRO-intensive engines are being replaced by brand new ones with very little need for maintenance over the next couple of years, so that shop visits overall should remain relatively flat over the next three years. At the same time we are seeing an over-proportional growth in demand for engines such as the V2500, CFM56-5/-7, GE90 Growth or the Trent engines. Luckily, we have entered into these growth platforms years ago and are now hoping to reap the benefits of our investments. We estimate that the market we are serving is growing at least double as fast as the average, at a 4.4 percent CAGR over the next ten years.

**What were the biggest developments for your company in the last year?** Our biggest development has been our decision to grow our engine lease business. For that purpose we have entered two joint ventures with Sumitomo Corporation, a leading Japanese trading house. Whereas MTU Maintenance Lease Services B.V. (MTU stake 80 percent) focuses on short-term leasing, MTU also took a 10 percent participation into Sumisho Aero Engine Lease.

**What is your company doing to capture market share in Asia?** We are already well-established in that market which we entered in 2001 by establishing local engine MRO capabilities in China, Asia's largest and fastest growing engine MRO market. MTU Maintenance Zhuhai is the second-largest location in our network. With our joint-venture partner China Southern, we have secured an exclusive volume for the next thirty years. Further, the company has been very successful in acquiring 3rd party work and has become China's largest engine MRO provider. In order to cater for further growth, in 2012 MTU Maintenance Zhuhai completed the extension of its facility to add another 50% capacity, thus increasing its capability from 200 to 300 shop visits. Also, we have partnered with Lufthansa Technik in Malaysia where we operate Airfoil Services Sdn. Bhd. (ASSB) which focusses on labor-intensive parts repair.

**In the last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** Yes, we do expect some more consolidation in the engine MRO sector, and feel some of it is actually overdue. In a market where over-capacity exists and some shops are being either under-utilized or not being operated in a profitable way, consolidation is inevitable.

## Ed Dolanski President and CEO, Aviall



**In your opinion, what is the state of the aviation maintenance industry?** Since the global economy faltered in late 2008, most industries have struggled, aviation among them. Business and General Aviation is one of the market segments affected by the economic environment. When times are tough, private pilots and corporate operators fly less frequently and maintenance activity declines accordingly. The airline market is also affected by the economy, but in different ways. For instance, airlines have been transitioning to new aircraft in recent years and carefully managing their overall seat capacity. New aircraft also require less maintenance initially and are often subject to lower maintenance levels over their lifespan. Careful management of seat capacity also means fewer aircraft carrying fuller loads, which is good for utilization, but not so good for the overall volume of maintenance.

**What were the biggest developments for your company in the last year?** Prior to last year, Aviall focused heavily on adding products to our market basket and expanding our services to best meet the needs of our customers. With an expansive list of parts offered, we're now looking at other ways to build on our business model and sustain our growth as a world-class distributor. We're currently embarking on a journey to add new competencies and bring additional customer value. We have identified significant opportunities.

**What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?** Aviall recognized that the weakness in the economy, changes in aircraft fleets and other macro factors could cause serious disruptions to the supply chain in such a way that critical parts might not be available. We took aggressive action to significantly increase our stocking levels across thousands of key products, well beyond what our forecasting system indicated, to ensure that customer needs could be met. We also worked closely with our OEM suppliers to closely monitor the market so we could continue to adapt as necessary. Aviall has been committed to the Asian market since the 1940s, when we opened our office and warehouse in Hong Kong. In the 1980s, we opened a similar location in Singapore. We continue to operate our Hong Kong and Singapore locations, and have sales offices in Shanghai and Beijing. We actively support airlines and MROs throughout the region, and we continue to explore opportunities to additionally support the Asian market.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur? What is your company doing to advance technologically?** Aerospace MRO technology has lagged other industries for a number of reasons. To start, profit margins are relatively thin in aerospace. There are many unique requirements that make use of new technology challenging, particularly for smaller companies. The industry is straddling a major shift in aircraft technology with radically new aircraft being put into service while 30-to- 40-year-old aircraft continue to operate. MROs are investing heavily in equipment and training to support new maintenance activities, such as composite repair, so they are challenged to find capital to invest in other new systems and technologies.

## Mário Lobato de Faria Executive Vice President, TAP Maintenance and Engineering



**In your opinion, what is the state of the aviation maintenance industry?** The maintenance industry is continuously facing challenges. On one hand, the pressure on cost reduction continues so efficiency gains are required constantly without jeopardizing safety and quality. On the other hand, the aftermarket is being more and more controlled by the OEM's demanding effective strategies of partnerships with the OEM's, other MRO's and customers. As a constant, is the difficulty in having enough engineers and mechanics for the MRO activity. This constitutes a global problem which requires a careful attention and measures that go beyond the MROs themselves. MRO activity is definitely becoming an integration of services providing solutions to mitigate the customers risk provide customized solutions.

**What were the biggest developments for your company in the last year?** We have invested in two main areas: developing IT support and improving business processes. TAPME as always invested in IT to support MRO operation. Last year we began developing a system for management of tools and GSE's, using top of the art RFID solutions. This development is aligned with the experience gained from our first project (MEERA - Mobile Enabled Engine Repair Application) which resulted in the first fully integrated RFID application in the world to support Engine Workshop processes. In aircraft maintenance, mobility is fundamental and we have developed applications for line maintenance operations, based on the usage of smartphones for mechanics, which will be strategically integrated with our MIS (Maintenance Information Systems).

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?** Couldn't disagree more. There was a tremendous evolution in technology and IT to support MRO operations. Big investments are needed to modernize technology and innovate. As OEMs capture and control the complete value chain and, accordingly, control a big part of the aftermarket, the dedicated technology is becoming more captive of OEM, and affordable by them only through the control of intellectual property. Thirty years ago there was no MRO MIS and, in this time gap, MRO's have developed their own integrated MIS, implemented CRM and ECM platforms, helped define data standards in the industry, ATA SPEC, ASD, ISO, etc., created, with vendors, electronic maintenance manuals accessible on any tablet and network independent, developed systems to collect real time data from the aircraft, etc. Furthermore, there was a huge investment in data security and data connectivity. Nowadays, using trend and predictive analysis tools that process aircraft and engines/components real time data into intelligence, one can, in fact, predict faults and make the MRO process more lean, safe, economic and on time. MRO's must have top of the breed technology to support new generation aircraft such as B787 and A350. Technology has become a differentiator in the MRO business.

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**Jeff Bartlett** Director of Aftermarket Services, Commercial Aircraft Solutions, BAE Systems



**In your opinion, what is the state of the aviation maintenance industry?** It's such an exciting time to be in this industry. Airlines are asserting themselves more, new OEMs are entering the aftermarket, and MROs and component OEMs are vying for market share. The challenge to improve industry-wide profitability is driving competition, innovation, efficiencies, and new business practices.

**What were the biggest developments for your company in the last year?** BAE Systems introduced our cabin system, IntelliCabin, for line fit and retrofit, which leverages our digital backbone in the cabin to integrate in-seat power, IFE, lighting, and crew interfaces.

**What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?** BAE Systems offers a broad range of MRO, aftermarket, and overhaul services to more than 300 airlines, many of which are in the Asia Pacific region. In addition to our Beijing office, we opened an office in Shanghai in 2013. Performance underpins our relationships, and our Singapore Service Center is consistently recognized as best-in-class by our customers. We will continue to focus on delivering the best performance and support while letting our customers tell us what they need.

**In last several years, consolidation was heralded as necessary and inevitable within the MRO industry. We have seen some but, in your opinion, is there still more to come?** Yes. Airlines are demanding more from OEMs and MROs than in the past. Further consolidation in the industry is a natural by-product when existing organizations cannot meet new price or performance expectations.

**What is the current regulatory environment like for MRO?** With the new TSA regulations for foreign repair stations, I anticipate greater global competition on the basis of cost and responsiveness. More repairs will be done in low cost countries and in-region closer to customers, and economies of scale may drive partnerships for smaller players.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?** I disagree. Our customers are asking for innovative solutions to improve reliability and reduce costs. We have developed proprietary solutions that can predict and prevent future failures before they can affect reliability, and by extending life we are reducing our customers' asset management costs. Our FADEC overhaul solution is one example.

**Christopher Whitehead** President, AJ Walter Group



**In your opinion, what is the state of the aviation maintenance industry?** Firstly, dominance of the engine arena by the OEMs is continuing. Currently around 50 percent of all engines sold are wrapped up in 'total care' maintenance packages and this number is only going to increase with the newer generation of aircraft emerging. I see this creating an uneven playing field, stifling competition within the industry, which is not in the interests of customers. Secondly, safety and cost are still the main drivers of movement in this industry. The problem is that while cost of maintenance is soaring up, some airworthiness authorities seem to have lack of appreciation of the current economic climate, which leads to a significant imbalance.

**What were the biggest developments for your company in the last year?** Right across the AJW Group, we saw significant development: AJW Engines extensively increased the engine leasing portfolio; developed a fan blade exchange program; and released our new engine management product offering to the market. In Canada, AJW Technique welcomed 120 staff members; achieved numerous regional certifications (from Indonesia, Thailand, Brazil, Europe and North America); were granted Design Approval Organization Status, broadening technical ability; and overall, solidified our place in the industry with strong business agreements with many OEMs. In addition to this, we saw a successful new product introduction adding significant 737NG capabilities to the facility. With regards to AJW Aviation, we adapted to market requirement and moved into the position of 'total solution' provider, adding significant technical capability to our current portfolio.

**What did your company do last year to adapt to changes in the market?** As always, we continue to listen to our customers and produce innovative solutions, like the AJW Engine's Fan Blade program. Unlike most of our competitors, AJW recognized a long time ago that one size does not fit all. It is this innovation that is the key to our core success. Across the Group, complete focus on quality of product and service gives customers the best possible experience. For example, at AJW Technique, we have technicians with thirty years of knowledge—we employ only the best people in the industry. Our commercial flexibility allows fully customizable end-to-end component solutions to be tailored for customers based on their unique requirements, even as markets change.

**What is the current regulatory environment like for MRO?** OEM's are creating a false environment by developing a True engine concept. This is a commercial push against repair services and PMA/DER repairs and nothing to do with the technical aspect of the engines. From an MRO perspective, current progressive alignment between the likes of EASA and the FAA have started to ease the ability for MROs to function more internationally. However, these two regions are only two of many others that still govern by their own regulations, therefore complicating access to these emerging market places. A move towards a global common standard should be the focus of these civil aviation authorities. The variance in auditing criteria varies dramatically across all bodies. When there is, in theory, one CMM for components, is it really necessary for individual authorities to go through weird and wonderful auditing processes? Why does every country have to approve MRO with their own certification? I feel the regulatory authorities have taken a commercial view rather than supporting a superior standard of safety.

**A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?** MRO technology lags behind other industries because the aircraft technology it is designed to support is also in that same time bracket: twenty year-old A320 components can still be tested and repaired on the test equipment designed for it when the aircraft first entered service, because that is the demand. Because we are looking to the future, AJW have ensured that most of our major test and repair stations have been built with next generation aircraft in mind.

## Zilvanas Lipinkas CEO, FL Technics



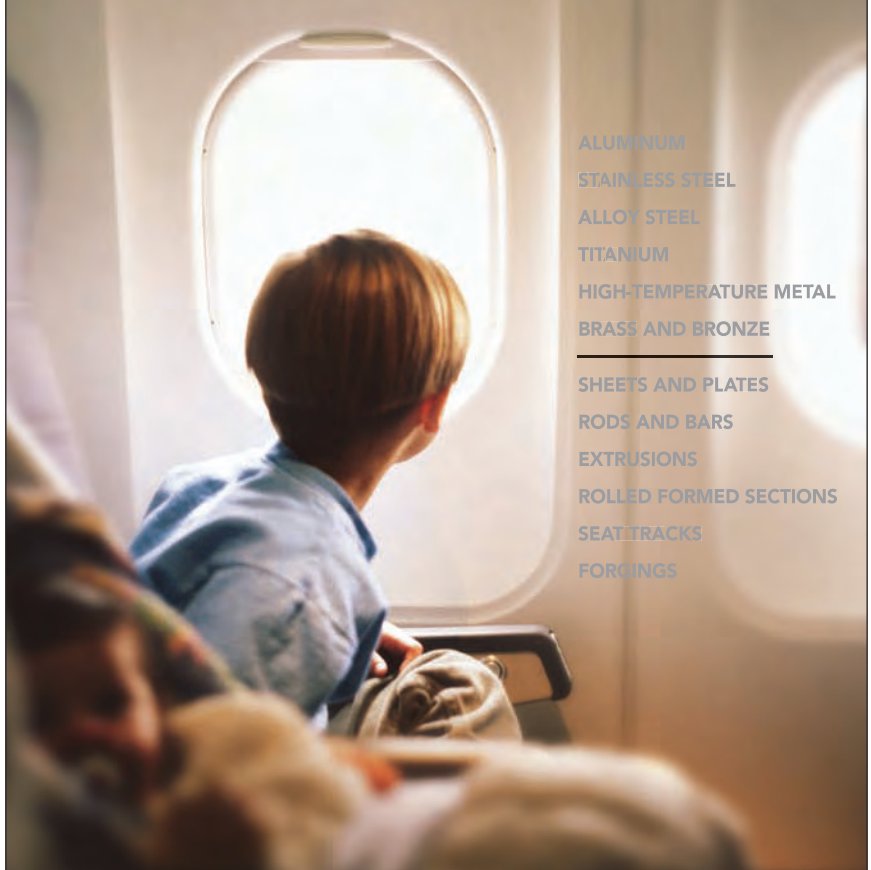
**In your opinion, what is the state of the aviation maintenance industry?** One of the major trends is that OEMs are gaining more and more presence in the MRO segment, seeking to compensate for some of their investments into new products. Under these circumstances the industry has become subject to a brand new dynamics, which presupposes searching for new business strategies for those providers who want to survive. On the one hand, it spells the need to be extra flexible and render truly tailored solutions while remaining financially attractive to customers struggling to cut down on their own expenses. On the other hand, it means having to find a mutually beneficial solution for co-existing with the manufacturers. All in all, the industry is definitely on the rise, and it's really exciting to see what comes next.

**What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?** We are definitely following the market trends and adapting to the changes. Our investment program is very conservative and based on detailed market research. We have already introduced new aircraft types and licenses in almost every service we provide. In 2012 we achieved the Boeing GoldCare partner status, which we consider as an important factor and stimulus, which helps us to adapt to the ever-developing global MRO market. Our main goal is to stay focused on effective means of doing business, high level of services and customer support, as well as prompt logistic solutions and non-expensive man power rate. All of these factors are an integral part of FL Technics achievements and success. As concerns Asia, it is one of our target markets. Two years ago FL Technics set up an office in Malaysia while last year the company opened another one in Indonesia. Having already started to sign our first contracts within the region, our long-term plan involves the construction of a local hangar and shops.

**What is the current regulatory environment like for MRO?**

Being an EASA Part-145 and EASA Part-147 certified company, FL Technics offers its services in the rapidly growing markets thus contributing to raising the safety standards in many served countries. Operating and serving customers in more than 50 countries globally means having to acquire all of the necessary certificates and approvals from the local aviation authorities. Nevertheless, while the process can be lengthy, safety is the only thing that matters and assisting local markets in improving the level of MRO services by bringing them to the European practices as well as safety and quality standards is a responsibility that one simply has to take on.

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## Jim Ziegler President and CEO, Greenwich AeroGroup



***In your opinion, what is the state of the aviation maintenance industry?*** Overall, the aviation maintenance industry recovery has been positive, however, it still lags behind where we were prior to the U.S. recession. Going forward we will continue to see a trend of consolidation. We are seeing more and more mergers and acquisitions in hopes of improving revenue and profit. This is being driven by numerous factors that have dampened progress including the U. S. Government sequestration, restructuring of the airline industry and long costly certification cycles unfit for fast paced technology advancements. I think these issues will continue impacting maintenance for a few years, but will be outpaced by growing components in several market segments. Most concerning will be the availability of qualified technicians to support growth, especially in the Pacific Rim.

***What were the biggest developments for your company in the last year?***

Last year proved to be our best financial and most progressive year since the inception of the company in 2007 and we can attribute that to several things. Our acquisition of Aero Precision in Livermore, Calif. significantly improved our government/military and international footprint while providing us with a more balanced business portfolio. We implemented new MRO, parts distribution and component repair and overhaul ERP and CRM software systems that provide us with the ability to better manage our resources, improve our efficiencies and to be more competitive. We continued to invest in Helivia Aero Taxi in Rio de Janeiro our offshore helicopter company in Brazil. We have now received our approvals to allow us to begin supporting companies like Petrobras. We continue to be very bullish on this market and see tremendous upside potential for our company. We embarked upon a 26,000 square feet expansion at Western Aircraft in Boise, Idaho to accommodate the growth we have been seeing in our parts and MRO services; we made additional investments in our manufacturing businesses with new modern machines.

***What is the current regulatory environment like for MRO?***

The current regulatory environment still proves to be a challenge in today's setting. Fast growing markets and fierce competition involving dozens of regulatory bodies is costly and keeps many current market players from expanding. Key emerging markets such as China and India lack structure to support general aviation, making entry in these markets tedious and time consuming. New regulated navigational requirements on the other hand will yield significant opportunities across all segments of aviation over the next five years due to the influx of new markets and new players. Additionally, there is a rapid rise of high tech products in the marketplace. While this is a positive note, unfortunately most businesses are paying the price as after-market modifications and upgrade certification costs and cycle times are escalating, while product life cycles are shrinking in light of these advancements. And despite the FAA's good intentions, they can't keep up with the high tech advances in time to certify most of the products.

## Todd Duncan Chairman, Duncan Aviation



***In your opinion, what is the state of the aviation maintenance industry?*** As we all know, the need for aircraft maintenance and the health of the MRO industry is tied to the number of hours the fleet of business aircraft spends in the air. Flight hours plummeted in 2009 and have just not come back to pre-recession levels. After some slow growth, flight hours in 2013 stayed steady, like they were treading water. However, from talking with customers and looking at industry reports, it looks like flight hours have been up some over the last 60 days. It is hard to tell whether that is a long-term change or just a blip, but it is encouraging to see those numbers going up. For several years now, we have seen customers migrate to larger business aircraft. This large and ultra large jet market seems to be healthier than the smaller aircraft market, where hull values have decreased and are not recovering. On the bright side, though, we are seeing strong demand for avionics installations and upgrades. There are some great technologies available and operators are seeing the value of adding them to their flightdecks. I recently saw first-hand how RNP approaches will work and am encouraged by the fuel and time savings they will offer operators.

***What were the biggest developments for your company in the last year?***

This summer, we will complete a new 175,000-square-foot maintenance facility that includes two 40,000-square-foot maintenance hangars and additional office and shop space. We also continue to look forward to developing more services and larger spaces for our services at our Provo, Utah, location, which we anticipate becoming a full-service location in the next few years. But anyone can build new hangars. It's who we put in the hangars that make the difference for our customers. So we invest in our people. Not only do we invest in their pay, benefits and company culture, but in their training. We have budgeted more than \$4 million for various training classes, both technical and soft skills training, for 2014. We recently began performing interior service road trips for customers whose aircraft interiors need attention but who may not be able to make it to our Lincoln or Battle Creek, Michigan, facilities.

***What is the current regulatory environment like for MRO?*** Over the last several years, we have seen lots of changes in regard to regulations and requirements from the FAA and EASA. Our customers look to us to be experts, so we have committed additional resources and time to understand the impact these changes will have on their aircraft and operations.

***What is your company doing to advance technologically?*** Several years ago, we introduced myDuncan, a web-based and app-based project management tool that helps customers track their project, communicate with their project manager and approve changes to workscope as needed, all in real-time. We have also developed a complete electronic sign-off system for technicians. For convenience, we have mobile apps available to help customers. Our AOG app helps operators get immediate support by locating the nearest Duncan Aviation facility and providing contact information for technical representatives. Our mobile parts site, which can be installed as an app, provides technical support for parts issues and parts and repair capabilities searches.

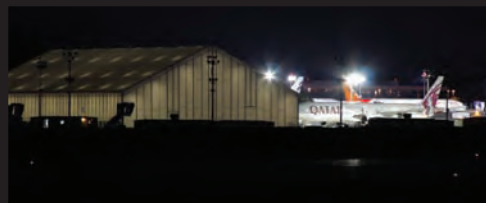


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## Stan Younger Vice President, Aircraft Service Centers, Bombardier Aerospace



***In your opinion, what is the state of the aviation maintenance industry?*** The maintenance industry is following the path of aviation. More and more aircraft are being delivered around the world and the need for local MRO solutions is growing in new markets for both commercial and business aviation. In well-established markets such as the U.S., we are challenging ourselves to not only continue to improve, but ensure that cross-training is relevant not only to those in immediate surroundings, but across the globe. Our products are pushing new limits, and committing our resources to training, development and new technology will help us follow new aircraft at each step.

***What were the biggest developments for your company (in regards to MRO, maintenance, etc.) in the last year?*** Deploying our Customer Response Teams across the field, by land and by air, has profoundly changed how we support our business aircraft operators. We're able to not only support them in times of urgent need, but are able to perform scheduled maintenance tasks in their own hangars. We've also taken giant leaps internationally by continuing to drive quality and speed of service at our Amsterdam facility, opened a brand-new hangar in Singapore and signed a landmark agreement to establish a maintenance joint venture facility in Tianjin, China.

***What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?*** Our plan is to serve our customers where they fly. Our facility opening in Singapore and first steps to a Bombardier presence in China speak to our commitment to establishing local roots. We are also committed to the communities in which we operate. Need for local service also translates to a need for local talented professionals. We are honored and excited to help develop the next generation of maintenance professionals through the scholarship programs we support as well as internship opportunities such as our most recent agreement with Singapore Polytechnic.

***What is the current regulatory environment like for MRO?*** We are seeing more and more consistency from one area of the globe to another. This helps drive quality and turn times in delivery of maintenance, which makes for happy operators and healthy MRO companies or branches. We have to remain extremely vigilant and fully trained with regards to local regulations across the globe, best practices and, in-turn, standards are being increasingly shared creating a cohesive community.

***A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?***

Technology and materials on aircraft are evolving at exponential paces. Taking the CSeries jetliner as an example, we've been working hand-in-hand with the development and flight test teams to ensure the maintenance offering, and trouble-shooting tools, match the next-generation systems of the plane itself. Getting involved from day one on development program is how we ensure the MRO tools and processes will stay ahead of the curve.

## Neil Book President and CEO, Jet Support Services, Inc.



***In your opinion, what is the state of the aviation maintenance industry?*** Although in economic recovery mode, the industry has not reached the heights we saw in 2008. Capacity remains high and the maintenance facilities, large and small are all competing for the same business. As a result, we expect to see continued consolidation among providers. The positive side to this story is that the strongest providers will prevail, and the consumer will benefit from a highly competitive landscape.

***What were the biggest developments for your company in the last year?*** JSSI has very strong market share in both the US and Europe. Over the last few years, we have been highly focused on building our business in Asia, the Middle East, Africa and South America. As a result, we are building new affiliations with MROs in these regions as well as growing our existing relationships with our suppliers that have a global reach. In addition, we continue to expand our airframe and Tip-to-Tail coverage because of the high adoption rate of these programs in emerging markets.

***What did your company do last year to adapt to changes in the market? MRO growth is coming from Asia. What is your company doing to capture market share there?*** We have invested in a seasoned, Asian based technical team that is headquartered in Hong Kong. We have a regional sales office in Indonesia and a business development alliance with the China Business Aviation Group, based in mainland China. In recent years, we have hosted several events throughout Asia for the business aviation community, with the objective of educating these players on the benefit of hourly cost maintenance programs.

***What is the current regulatory environment like for MRO?*** MRO facilities worldwide are very much aligned with necessary approvals, be it with the FAA, EASA or local authority. We see a drive in mainland China that is encouraging MRO expansion. Previously, very few maintenance vendors had CAAC approval capability but this is changing. There are still some issues for operators, such as CAAC tagged parts on mainland B registered aircraft and regional variations in regulations, but mainland China is encouraging MRO growth.

***A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur? What is your company doing to advance technologically?*** Having joined JSSI directly from the cyber security industry, I would say that not only is the MRO industry lagging, but the entire aviation industry is behind from a technological perspective. I was surprised by this, because clearly the ability to fly is one of the most profound technological breakthroughs in modern history. As a company, we have been migrating our services to the cloud, to ensure our people have greater access and connectivity to the data and systems we need, and to provide our clients with the best possible service. Also, by leveraging predictive analytics, we have made significant strides towards making our programs and services even more effective.



## Declan O'Shea President and CEO, Vector Aerospace



***In your opinion, what is the state of the aviation maintenance industry?*** Overall the aviation maintenance industry is relatively stable and will experience considerable growth in the next decade. The market for civil helicopter MRO remains strong and growing. Actually, experts suggest 50 percent growth in rotary wing MRO over the next decade. In the fixed-wing MRO market, we are expecting rapidly increasing long term (20 year) outlook for regional aircraft. The shorter term (10 year) MRO outlook remains flat due to the timing of fleet renewals.

***What were the biggest developments for your company in the last year?***

We plan for significant development in three major ways (1) increase in services (2) expansion in geographic regions and (3) increase in engine MRO. In the area of services, we have introduced Vector Financial Services, which is focused initially on the leasing of Super Puma helicopters. We provide operators with the ability to operate AS332L Super Puma helicopters without the large capital investment associated with the outright purchase of either a second hand aircraft or the associated typical aircraft financial lease type obligations. As such our offering is of interest both to operators with short-term contracts, whether in support of civil oil and gas operations or governmental peacekeeping operations, as well as to those customers needing a stop-gap solution pending the delivery of a new heavylift helicopter, whether an S-92, EC225 or the recently introduced AS332 C1e. In addition we have launched an Engine Trading Division which will be managing the extensive inventory of engines we have in order to maximize our return on investments. This year, we have established new facilities in Latin America and South East Asia. In Latin America, we have established a facility near Sao Paulo, Brazil.

***What did your company do last year to adapt to changes in the market? What is your company doing to capture market share in Asia?*** We have adjusted our business operations within our 21 facilities globally in response to the changing MRO market. We see maturity within the North American market and certain areas of Europe, with significant growth in many emerging markets. Recognizing the rapid growth in the Asian market, we elected to establish our first South East Asia MRO facility in Singapore. Strategically situated within the expanding SE Asia market, Singapore offers many advantages including, proximity to other aerospace companies, including sister company Airbus Helicopters Southeast Asia Ltd in Seletar Park, easily accessible transportation routes and excellent infrastructure. Our ground breaking event for the Singapore facility was held in October of last year and we are slated for opening later this year.

***What is the current regulatory environment like for MRO?***

Regulators have taken on a more holistic approach to auditing MROs, using tools such as Process Validation Inspections (PVI's). They evaluate the companies' processes with a wider lens whereas audits in years past may have focused more heavily on technical aspects of the operations. Regulators around the globe have raised the expectations on MROs. Some have opted to mandate programs such as Safety Management System (SMS), Risk Management (RM), and Anti Drug and Alcohol programs.

## Jim Swehla Co-Founder, Executive Vice President, West Star Aviation



***In your opinion, what is the state of the aviation maintenance industry?*** The state of the aviation maintenance industry continues to strengthen. 2009 and 2010 were very challenging years. Many companies in the corporate aviation MRO business had to make some very difficult decisions, and in most cases, downsize their businesses. Since that time, throughout 2011, 2012 and 2013, these same businesses have had to cautiously begin growing back to levels prior to 2009, with a strong emphasis on "cautiously." While 2013 was strong for West Star Aviation, we had to work very hard to make it a success. As I said, most MROs were still progressing cautiously with the thought in mind that "every project counts," therefore we believe it was a buyer's market for aircraft owner/operators requiring MRO services last year. Furthermore, we would argue it is still a buyer's market as we go into second quarter of 2014. However, we are starting to see our customers scheduling service farther into the future, meaning they are starting to become concerned about getting a slot that fits their requirements.

***What were the biggest developments for your company in the last year?*** We are working on a few key developments in our hangars. We are 30 days away from finishing a new 48,000 ft<sup>2</sup> maintenance hangar at our West Star location in East Alton, Illinois (ALN). The new hangar space is in addition to the 15,000 ft<sup>2</sup> accessory overhaul shop we are also adding at ALN. At our Grand Junction, Colorado (GJT) location we are close to breaking ground on an ultra-modern paint facility, which will handle stripping, prepping and painting of aircraft. Finally, we have also secured an additional 20,000 ft<sup>2</sup> maintenance hangar in Columbia, South Carolina (CAE).

***What is the current regulatory environment like for MRO?***

This is an ever-changing topic of discussion. With OSA, EPA, FAA, the Federal Government, State and City Governments (the list goes on) the MRO business is strapped with an ever-changing list of regulatory issues. Our two most valuable assets when working within the current regulatory environment are West Star employees and the West Star customer. We are very sensitive to the safety of both groups. We are equally sensitive to the costs associated with regulatory issues that affect our employees and customers. This can be a real balancing act. One issue that surfaces repeatedly is the regulation surrounding the stripping and painting of aircraft. West Star is regulatory-mandated to use high-solids paint, which is more expensive, and as a result, obviously drives up our cost.

***A leading MRO executive said last year that technology in the MRO industry is lagging by 30 years. Do you concur?*** I don't agree with a claim of a 30-year lag. At West Star we are constantly upgrading with new test and repair equipment along with the training of technicians and support staffing. Avionics, engines and airframe are far more sophisticated today than 30 years ago and henceforth our people, hangar facilities, test equipment, repair equipment, etc., are more sophisticated as well. MROs have to keep up with the times in order to design, install and certify new, and more sophisticated digital equipment that major OEMs are developing.



# Teaching Troubleshooting



Shown in both images this page are students attending Tarrant County College in Fort Worth, Texas. Instructor David Hill likes to challenge students by inserting faults into the engines they've been assigned to work with in his reciprocating engine overhaul course. Tarrant County College Photo.



By Charlotte Adams

**Troubleshooting or diagnosing problems in complex electrical, airframe and propulsion systems is perhaps the most important skill a maintainer can have. It requires not only a thorough knowledge of a system's normal operation but also an understanding of the system's component parts and the interactions between them. It also requires a certain aptitude or gift in addition to training.**

In the days when the schools saw a lot of military veterans, the schools' task was easier because veterans often had a considerable base of experience before entering the maintenance training programs. But schools are seeing a lot fewer veterans these days, and entering students often have little mechanical experience. Many, according to one professor, haven't even repaired a lawnmower.



The Pennsylvania College of Technology (PCT), a unit of the Pennsylvania State University (PSU) system in Williamsport, Pa., embeds aviation troubleshooting in many of its courses, according to Thomas Inman, associate professor, Avionics. Embry-Riddle introduces students to the troubleshooting process in the first semester according to Chuck Horning, chairman of the Aviation Maintenance Science Department at Embry-Riddle Aeronautical University, Daytona Beach, Fla. PCT Photo.



Troubleshooting is a very important skill for a mechanic to have, considering that the “reason for a mechanic is usually to fix something or service something,” says William Kamm, a bizav executive. In a sense the schools “narrow the herd down,” he says. The students who make it through the airframe and powerplant (A&P) programs have the basic skills and understanding to work in the industry. So the schools take a person with little or no knowledge of aviation and give them the basics, including troubleshooting. “I think they do a good job for a government-mandated program,” he says.

The Federal Aviation Administration (FAA) recognizes the importance of troubleshooting. Part 147 of the Code of Federal Regulations—dealing with aviation maintenance technician schools—cites the word more than 30 times in connection with school facilities as well as the airframe and powerplant curriculums. While this skill is not always required to Level 3, the highest level of proficiency outlined in Part 147, troubleshooting is clearly a critical ability in aviation

maintenance. Thus every aviation maintenance school tries to incorporate the process throughout its curriculum.

### Important Skill

Schools that train future A&P mechanics include troubleshooting in many of their classes. Troubleshooting is “probably built into the vast majority of courses here,” says Chuck Horning, chairman of the Aviation Maintenance Science Department at Embry-Riddle Aeronautical University, Daytona Beach, Fla. One reason it’s so important is that ineffective troubleshooting, resulting in “no fault founds,” wastes a lot of time and money, he says.

“We incorporate troubleshooting in as many places as we can,” Horning says, “and not necessarily at the end.” Students tend to enjoy troubleshooting, he says, especially when they are working with real equipment. The logical process is very important in all areas of aviation maintenance since it is “a large part of what technicians do.”

“Troubleshooting is a mandatory part of the curriculum,” says Charles Hilton,



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Having real world equipment like PCT's 727, pictured above, is always helpful when teaching troubleshooting. PCT Photo.

Aviation Department head at Connecticut Aero Tech, a Part 147 school in Hartford. Also, per Part 147, "for any type of theory lesson, you have to have a corresponding shop or hands-on portion," he says. But troubleshooting is a little difficult to teach, Hilton says. "The key thing is to have a really good understanding of how the system is supposed to work...so that [the students] know what's abnormal and what the cause must be," he says.

The Pennsylvania College of Technology (PCT), a unit of the Pennsylvania State University (PSU) system in Williamsport, Pa., likewise embeds aviation troubleshooting in many of its courses. In one of the early electricity classes, students look at logic gates. Canned software programs, along with lectures on theory and practice in the lab, are used to help students determine whether the logic diagrams depict systems that are working correctly. From a

starting point that they know is good, the students use a process of elimination to identify where the problem lies, explains Thomas Inman, an associate professor of avionics technology at the Pennsylvania College of Technology.

Connecticut Aero Tech also uses computer-based training to supplement lectures and hands-on training. After the software sets up a scenario, the student decides what the most likely problem is



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and the program says whether the answer is right or wrong, Hilton explains. "But that can't duplicate a hands-on [exercise] with a meter in your hand," he adds.

### Trainers

Commercially produced maintenance trainers often are used to supplement lectures. PCT, for example, uses a unit that simulates the entire electrical system of a King Air aircraft, Inman says. Texas-based Tarrant County College uses an electrical trainer that simulates an aircraft fire extinguishing system. The fire extinguishing simulator is basically a flat board with a wire harness attached to it. The harness connects various real fire extinguishing components such as spray nozzles and actuators, explains David Hill, an instructor in the Tarrant County College aviation maintenance program.

Connecticut Aero Tech uses an antiskid trainer in its airframe section. Instructors can induce faults such as shorts in the electrical circuits, while students use wiring schematics and system descriptions to figure out what the problem is and where it is located, Hilton says.

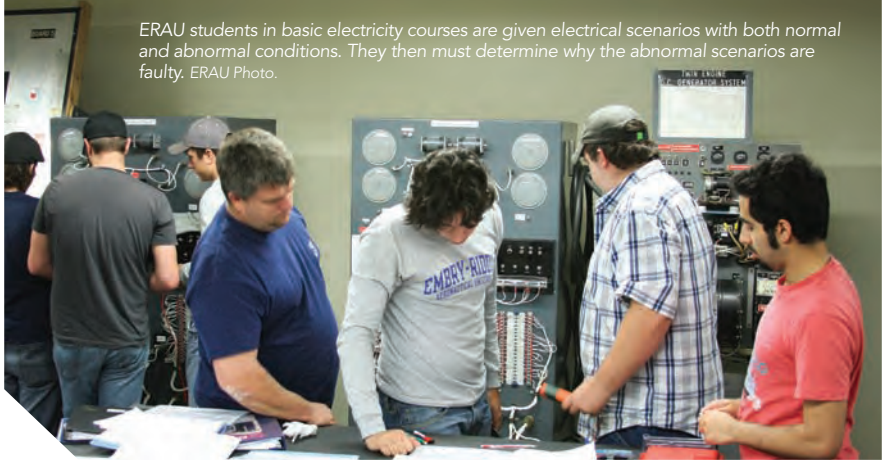
Embry-Riddle introduces students to the troubleshooting process in the first semester, Horning says. In the "basic electricity" segment of the general curriculum, for example, brand-new students are assigned a number of projects in which they can practice the process. They are given electrical scenarios, and the first thing they have to do is to determine what the normal condition of a system is. The students then are given a number of readings from instruments such as volt, amp and ohm meters. Some of the readings are consistent with normal conditions but others aren't, he explains.

Where a reading is inconsistent with normal operation, the students have to figure out why—what are the possible faults that would give the abnormal readings? Then they have to come up with scenarios and test those scenarios, identifying, for example, the individual component at fault. This is basically done by looking at schematic drawings of logic gates on a piece of paper. In lab projects students actually build circuits, Horning says. Trying to make the circuits work is basically another form of troubleshooting.

As students progress into airframe and powerplant courses, they will apply the process introduced in basic electricity to more complex systems, Horning explains, and take the troubleshooting concept much further.

Like other schools, Embry-Riddle emphasizes working with real equipment. A lot of the training aids are real engines, mounted on stands. Instructors then insert faults, such as leaks, Horning says. In electrical courses, by

ERAU students in basic electricity courses are given electrical scenarios with both normal and abnormal conditions. They then must determine why the abnormal scenarios are faulty. ERAU Photo.



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FAA Part 147 of the Code of Federal Regulations—dealing with aviation maintenance technician schools—cites the word troubleshooting more than 30 times in connection with school facilities as well as the airframe and powerplant curriculums.  
Tarrant County College Photo.

the same token, instructors can insert faulty components into circuits, he says. The circuitry looks fine from the outside, but there's something wrong inside a component.

After going through a logical thought process to diagnose a problem, the student should be able, not only to identify the fault, but also to explain to the instructor how the conclusion was arrived at, Horning says.

### Engine Troubleshooting

Powerplant classes offer a lot of scope for exercises in troubleshooting. Hill likes to challenge students at Tarrant County College by inserting faults into the engines they've been assigned to work with in his reciprocating engine overhaul course, which is taken in the final semester.

Students spend the first half of the semester disassembling their engines, measuring and inspecting the engine parts, and then reassembling them. After that they mount the engines on test stands or run stands, put on the accessories, pre-oil the engines and run them. Following this abbreviated break-in period, Hill begins introducing faults into the engines and letting the students troubleshoot them.

The faults are complex enough so that the symptoms could suggest a number of different real-life problems, but the faults are benign enough so that no engine damage will result from them. While these are powerful exercises, Hill is careful to insert only one fault per engine, and each engine has a different fault. More than that would simply

overwhelm and discourage the students, he says. The class is divided into teams of three to five students, each team with an engine.

One teaching tactic is to replace an intake tube with a spare-part intake tube that has a hole in an inconspicuous place. Sometimes the leak will be in a rubber tube that joins two pieces together, Hill says. Based on their knowledge of the engine and their analysis of the "cold cylinder" symptoms caused by the leak, the students working on this engine problem might attribute it to faulty magnetos or spark plugs, he says.

"But if the mixture is lean enough and the engine run stand has a manifold pressure gauge, it will show a higher manifold pressure reading than normal," Hill explains. Since magneto or spark plug issues would not cause an abnormal manifold pressure reading, that manifold pressure reading should be a clue, he says. Then the students say, "Oh, induction leak, and start looking for the leak."

Or Hill could take a couple of spark plugs that look just like the ones in the students' engines and clamp the electrodes closed. This also would produce cold cylinder symptoms because there's no spark, he says.

In the case of an engine with a leak in the induction system, if students think it's a magneto or a spark plug problem, Hill lets them continue to pursue these hypotheses until they begin to use up too much time. Because there are very real time constraints in the courses, the instructor can't let students go too far down a false trail. He would

not let students disassemble the magnetos at this point, for example. Hill doesn't provide any answers to the students but helps them to narrow their search options.

Another instructional tack might be to obstruct the inlet with a sheet metal plate that's the same size as the carburetor air filter. Now the problem might seem to be a very dirty air filter or—if the student is working on a flight scenario—the impact of ice, for example. The engine will try to start, but it usually doesn't get over idle, Hill says.

Yet another puzzle could be created by inserting a solid plug—with a tiny hole drilled in it—into a fuel line fitting, Hill says. The engine will start and idle, but not go beyond idle because the fuel line is restricted. Other problems could be caused by loosening the magnetos or changing their timing. The options are limited only by the ingenuity of the instructors.

The engine overhaul course could be taught with some broken engine parts and non-running engines, Hill says. But Tarrant County College uses runnable engines which the students know need to operate after they get through with them. That fact keeps the students motivated and excited, he says. "So when an engine starts, you'll see students high-five and chest-bump," he says. "There's a lot of motivation there." The engines don't go on airplanes that fly, but other classes, such as ground operations/servicing, will be using them, he says.

In the powerplant section at Connecticut Aero Tech, instructors can



In PCT's engine troubleshooting and inspection course students work on engines they have disassembled and reassembled in earlier coursework.

PCT Photo.

exercise the students' troubleshooting skills by inserting bad spark plugs, throwing off the magneto timing, or loosening an intake pipe, Hilton says.

In PCT's engine troubleshooting and inspection course students work on engines they have disassembled and reassembled in earlier coursework. PCT has about 12 engines, so that in a class of 24 students, each pair of students has an engine to work on. Each pair sticks with the engine the two students had taken apart and put together again in prior courses, so that the problems they are dealing with are of their own creation.

In this course troubleshooting begins when the students install their engines on aircraft or in the school's test facility, Inman says. "Most [of them] have at least a little bit of troubleshooting to do to get the engines working," he says. This engine class is the culminating powerplant offering for associate's degree and certificate students, Inman says.

## Serendipity

Sometimes great teaching opportunities arrive unsought for. In PCT's introduction to turbine engines class, which is taught the semester before its engine troubleshooting and inspection course, Mike Robison, the instructor, was using the auxiliary power unit (APU) of the school's Boeing 727. (The APU can be employed, among other things, to familiarize students with jet engine start procedures.)

"When the APU refused to start, Mike treated it as a teachable event," Inman says. Students were able, with the instructor's guidance, to troubleshoot the APU and determined that the problem was a bad battery. This scenario was not planned or bugged, Inman says. It was "great for both teaching and learning, since most people assume the APU can be started from the ground power cart," he says. "The students know now, this isn't the case. The battery has to be good or the APU won't start." The students replaced the battery and now the turbine runs fine again. Meanwhile the school has another battery, which the students can "deep cycle" for return to service, he adds.

Another example where students get close to a real-world scenario is in an Embry-Riddle powerplant course where they troubleshoot a diesel engine by downloading FADEC (full authority digital engine control) data into a laptop computer, Horning says. Since the fault data isn't always straightforward, some interpretation is involved, so that the student's skill and knowledge of the engine are important.



## Avionics Troubleshooting

Students aiming solely at the A&P certificate have limited time for exercises above and beyond what's called for in the FAA-mandated curriculum. But where A&P schools offer additional training or where the institution provides a bachelor's of science in aviation maintenance, more time can be spent on avionics systems and related diagnostics.

PCT students aiming at the school's B.S. in Aviation Maintenance, for example, have the chance to learn about avionics systems in much greater detail than was provided in the first two years, when the content was necessarily limited by the requirements of Part 147.

At PCT, the avionics emphasis culminates in an "integration management" class, Inman says. Students work on problems in real airplanes, with a maximum of two students to each airplane.

This class was just getting into the troubleshooting arena in March when this story was written. Among the problems that had cropped up was a speaker malfunction on a Piper Dakota. While this problem had not yet

been fixed at the time of this writing, the student was able to prove that the issue was not in the aircraft's wiring but in its audio panel. A second problem involved the headphone on a Piper Tri Pacer, Inman recalls. That problem was easily traced to an improperly installed jack and was promptly repaired.

Another, potentially rich source of troubleshooting experience for the integration management students is a Rockwell Commander 680, Inman says. Students will have to learn teamwork as well, he adds, since more than one group might be working on the aircraft at the same time.

Currently, as part of PCT's bachelor's degree capstone projects, one student is troubleshooting the Rockwell Commander 680's right engine, and another is troubleshooting the aircraft's left engine. These projects involve a combination of electrical and engine troubleshooting on the part of the students. At the same time, as an element of another class, some other students are troubleshooting the 680's DC electrical bus and distribution system. **AM**

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Shown here is a recently completed Dassault 900. Sherwin-Williams SKYscapes coatings were used including their new metallic aerospace coatings.  
Paul Kipping/Sherwin-Williams Photo.

# VIP Aircraft

## Paint Schemes: Creating Flying Works of Art

By Dale Smith

NASCAR Sprint Cup Series Race Driver Greg Biffle's Dassault Falcon 50 was designed by Craig Barnett at Design Scheme and uses Jet Glo Express by Sherwin-Williams. Sherwin-Williams Photo.



**"It's not what you look at that matters, it's what you see."**

— Henry David Thoreau

Back before the TSA took it away, one of my favorite pass times was to hang out at a local FBO just to look at the different private aircraft and their paint schemes. I've seen some pretty cool stuff and some pretty, well, not very pretty, stuff. The Beauty is in the eyes of the beholder...kind of paint schemes.

But, like 'em or not, it doesn't matter if it's Matterhorn white with a thin lipstick red strip or copy of Van Gogh's *Starry Night* on the fuselage—VIP aircraft owners want their paint scheme to be a reflection of who they are. And that's probably more evident today than ever.

"Today, many owners don't want white with stripes. They want bold colors and graphics," stated Guy Amico, president, Global Jet Painting ([www.globaljetpainting.com](http://www.globaljetpainting.com)). "They want to use their imaginations to create what they want on their airplanes."

"John Travolta wanted to stay with the original vintage look. It's classic Boeing/Quantas and it still looks as fresh and new today as it did when the 707 was new, 50-years ago," he said. "Others like Canadian fashion executive, Peter Nygard, wanted his 727's scheme done to reflect his corporate and personal image. It has three shades of metallic blue stripes and his name in a chrome decal—it's pretty wild and was an exciting job to do."

While, obviously the owner's personality has a lot to do with the design, today's new-generation paint formulations do play a role in achieving the intended level of wow factor.



## GOT CHIPS? Call Dr. ColorChip

Sooner or later every paint scheme is going to get scraped, scratched or chipped. And unless you are really steady with an touch-up brush, the fixes often look worse than the wear. Until now.

Bill McLean, owner of Dr. ColorChip, the makers of the popular auto paint repair kits, said his company in the process of introducing a line of Dr. ColorChip touch-up kits formulated for aircraft.

"The paint chips on airplanes are usually much more shallow than those on cars. We've revised our formula to be more aggressive and sticky for airplane use," McLean said. "You just use a small brush to flow the paint in the damaged area. Once it's dry, you use the special blending solution on the wiping cloth to blend the excess paint away from the surrounding area. It's a much easier and consistent way to repair damage to the paint."

McLean also said that another way to help hide damage is to repair the small chips as soon as you see them. "Don't wait. Once the paint is chipped it will just progress to become a bigger problem," he said. "Then you're looking at respraying and color blending a much larger area."

As for available colors, McLean said they currently have Matterhorn white kits on the shelf and that all other colors are custom mixed to meet a customer's needs.

"They can send us a color code, paint sample or even a good color photo and we can custom match it for them," he said. "Over 80 percent of the time we're right on the first mixing. If it's not a perfect match, we'll remix it at no charge."

"The revolutionary technology change in the aerospace paint industry has been the move away from the single-stage systems to new-technologies like the SKYscapes basecoat/clear coat technologies," explained Julie Voisin, global product manager, Sherwin-Williams Aerospace Coatings ([www.swaerospace.com](http://www.swaerospace.com)). "Its formulation allows painters the ability to put down several colors in a smaller window of time."

"The basecoat/clear coat paints are helpful, especially when there are multiple colors or fade effects. It lets you put one down and move on to the next color faster," Amico added. "With the old paints, you may have to wait until the next day, or longer."

The unique SKYscapes process features specially formulated resins that deliver richer color and higher gloss retention, while providing improved hiding with thinner films on bright, multi-colored schemes.

Ms. Voisin also said that the new formulations make it easier to create custom colors. "Sherwin-Williams prides itself in being able to deliver really good custom colors to our customers," she said. "We get all kinds of things to match—the red of a customer's Ferrari or the tan of a Coach purse—we even matched a feather for a stripe color once."

"We worked really hard to develop the exact type of gold for Donald Trump's 757. It was a very specific 'Trump' gold if you will," Voisin said. "We worked diligently with the distributor and must have gone through 20 samples. We finally hit it with a custom-mixed gold mica paint. It's absolutely beautiful in the sun."

Ms. Voisin also said that another big benefit, especially from a maintainability standpoint, of the new formulations is that after the basecoat colors are down and dry, the entire finish is over sprayed with a clearcoat finish. This adds a top layer of protection from scratches, fuel and chemicals.

"With this process, it means longer-lasting coverage and durability," she said. "This gains the aircraft more in-service time and longer periods between repainting."

### It All Begins with the Design

"On VIP aircraft I think a lot of the owners just have the one aircraft so they pay a lot of attention to how that airplane is going to look," Amico said. "They get pretty excited about it and want to get involved with the process."

And an involved owner with good communications skills is just what Craig Barnett, CEO/founder, Scheme Designers Inc., ([www.schemedesigners.com](http://www.schemedesigners.com)) wants to have in a client. "Designing a paint scheme is such a personal activity, and one that owners enjoy immensely. The more involved an owner is, the more interesting the outcome," he said.

"Generally, the less communicative a client, the harder it is to perfect the design," Barnett said. "And as the paint scheme is one of the most personal and visceral part of one's aircraft, it is essential that the owner provides clear and open feedback to the designer throughout the entire process."

"It becomes more interesting when I am dealing with a client's personal style, especially when that style is completely opposite to my design style," he said. "Proper communications enables me to find the best solution to everyone's style."

Barnett also stressed that while communications is invaluable, it has to be the right kind. He often has to work through "third-parties" and that can cause problems.

"Often the individual acting as the go-between will interpret the owner's comments or embellish on them, adding some of their own thoughts into the mix," Barnett said. "That tends to cloud the results and will result in a longer design process."

"It is more important to convey your exact response rather than



## PPG HELPS CATHAY PACIFIC WITH SPECIAL LIVERY

Coatings by PPG Industries' aerospace business create the colorful characters and "The Spirit of Hong Kong" livery on Cathay Pacific Airways' Boeing 777-300ER airplane painted to support the "Hong Kong: Our Home" campaign of the Hong Kong Special Administrative Region Government.

The livery features a dark green fuselage with silhouettes of the 110 winners in an online contest calling on Hong Kong people to submit creative entries that illustrate the spirit of the city.

Eight custom colors of Desothane(R) HS/CA 8800 buffable topcoat by PPG Aerospace were applied over Desoprime(R) HS/CA 7700 primer and waterborne chromate-free DesoGel EAP-12 conversion coating and adhesion promoter pretreatment. The high-solids formulations of the topcoat and primer result in a lower percentage of volatile organic compounds (VOCs).

"With an aircraft as visible as 'The Spirit of Hong Kong,' it was important for Cathay Pacific to have confidence that it would be a showpiece as it flies around the world," said Kent Wong, technical services manager, Cathay Pacific. "Having worked closely with PPG Aerospace, we knew we could count on their products to perform and on their people to provide the exceptional service we needed."

"PPG Aerospace was honored to help Cathay Pacific create the special livery," said Terence Cheng, PPG coatings segment manager, Hong Kong. "Cathay Pacific has long been a PPG Aerospace coatings customer, and PPG supplied coatings for the first and second 'Spirit of Hong Kong' liveries as well."

**"With an aircraft as visible as 'The Spirit of Hong Kong,' it was important for Cathay Pacific to have confidence that it would be a showpiece as it flies around the world."**

**– Kent Wong,  
technical services manager,  
Cathay Pacific**

Cheng said the PPG Aerospace application support center in Suzhou, China, worked closely with Cathay Pacific to produce paint samples for color matching as well as the blended coatings. "With eight colors needed in a short time period, the PPG Aerospace team at ASC-Suzhou worked quickly to provide the samples and specific size packages of the blended paints."

The aircraft was painted by Taikoo Aircraft Engineering Co. Ltd. in Xiamen, Fujian, China.



VIP customers like Donald Trump can be very demanding. In the case of this aircraft, the gold used was custom-mixed with mica.

Sherwin-Williams Photo.

coddle the designer," he stated. "Often negative feedback is just as important as positive. If it is important enough to hire a professional designer/artist to create your paint scheme, then it important enough to give good, clear feedback."

### One Design Does Not Fit All

Personal taste isn't the only challenge facing paint scheme designers, especially when the client has multiple aircraft types. "It takes extensive knowledge of each airframe, of the paint process and of the real shape of the aircraft to develop good design skills and capabilities to work on a successful paint scheme design," Barnett said. "Especially one that is 'out of the box'."

The fact is, when you are working with fleets, there's a lot more to making different aircraft types look alike than simply slapping the same stripes and colors on every airframe. This is where a designer's true understanding of form comes in.

"We recently completed an owner's mixed fleet that included a Falcon 50, Falcon 20, Cessna 210 and a Bell LongRanger," Barnett said. "We implemented a different design solution that changed the scheme dramatically, yet

retained the strong look of the other aircraft in the fleet."

Amico shared a similar mixed-fleet project: "When we did Donald Trump's 757, he wanted it to 'look like' his 727," he said. "Converting a paint scheme from a 727 to a 757 for one of the most recognized celebrities in the world was no easy challenge."

And one of the big hurdles was what color to paint the engine nacelles? "The engines are above the wings and were black on the 727. They are below the wings and we thought they should be white on the 757," he said. "After going back and forth, he went with our solution."

"As artists, we understand that many of our clients do not have a clear vision at the start of a project," Barnett said. "As such, one never knows how many original designs, and variations of those designs are going to be required to complete a project."

"We had one prince work with us for three-years, through nearly 50 unique design directions, each with up to 20 variations of each direction until he finally settled on a design," he said. "We lost money on that one. But he was a very happy client and has continued to work with us over the years."

While matching a current corporate or brand brings its own set of design hurdles,

in today's world making a 757 "look" like a 727 may well be the easiest challenge a designer or painter will face.

"We have completed entire seascapes with extensive airbrushed work. Other clients have wanted complex patterns and fades on their aircraft to achieve different effects," Barnett said. "But by far, the vast majority of our clients want designs that are somewhat conservative. But still, elegant design is the order of the day."

"Working with a designer does not necessarily mean you end-up with a complex scheme," he said. "Sometimes, a highly-designed scheme may come down to a single, elegant stripe."

### A Steady Hand and Miles of Masking Tape

If you think putting a simple stripe on an all-white biz jet is easy—well, think again. Whether it's one solitary graphic or a plethora of stripes, swirls, colors, and effects, doing the basic layout and making sure everything is in its place before you start laying down paint is the most challenging part of any project. Get any line out of place and you've just trashed the whole project.

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Paint designers can help with special requests such as creating a corporate image on clothing designer Peter Nygard's 727 above, or recreating the vintage look of John Travolta's 707 in Qantas' historic livery. Guy Amico Photos.



groups like Scheme Designers provide painters and paint shops with highly detailed, engineered scale drawings with precise directions as to the location of each graphic element treatment. In fact, in Scheme Designers' case, Barnett said they engineer their paint schemes down to one-eighth of an inch.

Barnett also said that Scheme Designers includes full-scale laser-cut masks of the exact scheme. "To ensure accuracy, and to make it easier for the painter, we specify paint masks for part or all of a paint scheme when we feel it will significantly contribute to the layout accuracy," he explained. "This brings major accuracy and money saving benefits to both the paint shop and the owner."

But, the reality is, the vast majority of projects don't have the luxury of laser-cut masks. That leaves the art of transferring a two-dimensional drawing onto an often really big three dimensional aircraft to the skilled eyes and hands of the painter. It's not a task for the weak-of-heart.

"Sometimes we do have the luxury of a computer print out that helps with locations and starting points," Amico said. "But, at the end of the day all the stripes and graphics are laid-out by skilled hands with old school talent and experience. Our guys are really artists at this. I mean they are

really great at doing the layouts and using the aircraft as a canvass."

"They understand the art of it all. It was just pure joy and amazement to get to watch our artists at work on a project like Peter Nygard's 727," he stated. "He knew what he wanted, but we had to make it work on the aircraft."

"I'd have to say, while each project is a challenge, the Nygard 727 was probably the wildest airplane we've ever done," Amico added. "Other projects have been challenging and each for a different reason."

Speaking of walking on the creative wild side, has there been a time when Amico or Barnett has turned-down a project?

"We've never walked away from one, but sometimes you really have to ask; 'Is this something you really want to take on?'" he said. "Up until now, at least, everyone has been up to the challenge. We're currently talking to some prospects now to decide how and if we can really accomplish what they want."

"I have personally finished more than 10,500 unique design projects," Barnett said.

"I have served clients across the spectrum and our business is built around providing very personalized service—and because of that, walking away is not an option!" **AM**



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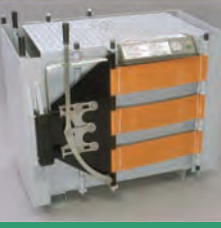
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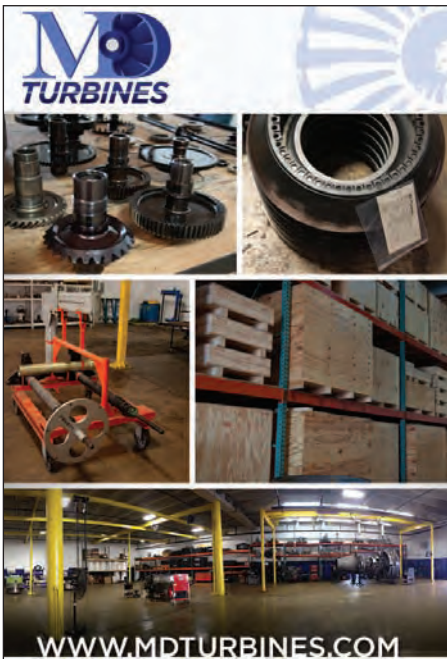
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# New Issues in Repair Station Security

**T**he long-awaited TSA Repair Station Security Rule—a rule a decade in the making—was finally issued in January of this year. The new rule was authorized by Congress under the repair station security statute (49 U.S.C. § 44924). As with any new rule, the TSA repair station security rule will mean a number of changes about which repair stations will need to be aware.

One of the primary effects of the repair station security statute was to bar the FAA from issuing any new foreign repair station certificates until TSA security audits were completed for existing stations. But because TSA had not issued its rule, TSA was unable to conduct any audits because it did not have any standards to audit to. Now that the rules are out, TSA has begun auditing repair stations for compliance with the new security rules. After TSA has completed its audits of all existing repair stations, the FAA may once again start issuing foreign repair station certificates. The FAA has been prevented from issuing foreign repair station certificates for more than five years, so the ability to begin issuing certificates could mean good news for non-US repair stations as well as for U. S. repair stations seeking to expand their operations overseas.

With the advent of new audits and the issuance of new foreign repair station certificates, there are several issues about which business owners and employees should be vigilant.

First, the new security regulations apply quite broadly. The regulations apply to those repair stations certificated by the FAA under Part 145 that are on or adjacent to airports and that have means of access permitting aircraft of 12,500 MTOW to move to the repair station. The exception to this rule is for repair stations located on a U.S. or foreign government military base. Additionally, the rule is applicable to all aircraft over the threshold, not just N-registered aircraft. The key element is access; although all repair stations are subject to inspection as provided in the rule and to Security Directives should there be a security need, the rule text requires only certain repair stations to carry out security measures on a regular basis.

Because of the TSA's security requirements, it is important to know precisely when a repair station is considered on or

adjacent to an airport. TSA will consider a repair station to be "on airport" under the following circumstances: if it is on an air operations area (AOA) or security identification display area (SIDA) of an airport; if it is covered by an airport security program under 49 C.F.R. part 1542 in the United States; or if it is on the security restricted area of any commensurate airport outside the United States that is regulated by a foreign government entity.

TSA will consider a repair station to be adjacent to an airport if there is an access point between the repair station and the airport of sufficient size to allow the movement of large aircraft, as described above, between the repair station and the area described as "on airport." These access points can include any number of taxiways, regardless of their state of improvement.

Understanding to whom the new security measures apply is only the first step. It is obviously also important to understand exactly what is required by these new security measures.

Repair stations that are required to implement "security measures" will be required to meet a number of criteria under the rule. First, the repair station must designate a security point of contact(s) to carry out specified responsibilities. The repair station is required to verify the background information of those individuals who are designated as the TSA point(s) of contact. In addition to background checks for the TSA security point of contact, the repair station must also perform background checks of those individuals who have access to any keys, combinations, codes, or other means used to prevent the unauthorized operation of large aircraft capable of flight that are left unattended. Background checks are expected to look back at least five years into the employee's past, and have no gaps greater than six months.

In addition to the personnel requirements of the rule, the repair station must also take separate steps to prevent the unauthorized operation of large aircraft capable of flight that are left unattended. These steps may include locking out access to the aircraft, moving stairs, lifts, or other equipment that provide access to the aircraft, or using locking wheel chocks.

Furthermore, repair stations are now required to comply with Security Directives (SDs) issued by TSA. In the rule as initially proposed, the process associated with Security Directives was problematic, because it appeared tantamount to rulemaking activities being promulgated in the absence of

the required notice and comment rulemaking procedures.

In response to industry comments, TSA has added language to the final rule to clarify that repair stations are permitted to comment on SDs issued by TSA. Troublingly, however, TSA has imposed on itself no obligation to respond to such comments. There is reasonable concern that Security Directives could be used to promulgate new rules in circumvention of the notice-and-comment requirements of the Administrative Procedures Act. Such circumvention could create numerous problems for repair stations, because it might mean that repair stations are coerced by the SDs into doing things that the U.S. Government might not necessarily be permitted to accomplish if the government were required to try to promulgate the same idea through notice and comment rulemaking. Industry must remain vigilant to ensure that TSA does not take advantage of SDs to unfairly target or unduly burden repair stations.

Oversight and enforcement of the new rule also raises unique challenges. The new rule requires repair stations to allow TSA and other authorized DHS officials to enter the facility, conduct inspections, and view and copy records as needed to carry out TSA's security-related statutory and regulatory responsibilities. This is an expansive authority granted to TSA, and no warrant or special permission is required for such oversight inspections.

For repair stations not required to carry out security measures on a regular basis—those repair stations not located on or adjacent to an airport—TSA has stated that it does not intend to inspect such facilities except in limited circumstances. These circumstances are to inspect for compliance with security directives issued by TSA and with airport security programs required by TSA, when the repair station is included in an airport security program, and to respond to security information provided to TSA by U.S. or foreign government entities.

Possibly the most alarming element of the new rule, and the one about which repair stations must be most aware, is the potentially crippling suspension and appeal process.

49 U.S.C. 44924(c) already requires the FAA to suspend or revoke a certificate upon the advice of TSA. The regulations further detail the process by which the TSA will notify the repair station and the FAA of a security deficiency identified by TSA and provide an opportunity for the repair station to obtain review of a determination by TSA to suspend its operating certification.

Suspensions of an operating certificate are immediately effective under the rule; they are not stayed or tolled through petition for review. Because the FAA is required to suspend or revoke a certificate on the advice of TSA, the mere fact that TSA requests an order of suspension, whether meritorious or not, is enough to suspend a repair station certificate indefinitely.

Under the rule, TSA will have tremendous power to impose interpretations of their standards that may be beyond the published scope of the rule, and a repair station may be largely powerless to seek review of those standards. This is because the only practical way to seek review is to accept suspension during the entire period of the review process. Moreover, TSA is allowed to grant itself an extension so the published time limits on TSA response may be meaningless. It is therefore in each repair station's best interest to do its best to avoid giving TSA any reason whatsoever to suspend or revoke a certificate.

Although the final TSA repair station security rule has taken effect, there are still questions and issues to be resolved.

The issue of when a repair station is considered to be in control of the aircraft is one that still must be resolved. Under the rule, a repair station must take steps to secure an aircraft when it is in control of that aircraft. But there is no strict definition of when an aircraft is "under control." For example, if a line station completes its work but the cleaning contractor remains on the aircraft, is the repair station responsible for the aircraft's security while the cleaning contractor is still on the aircraft?

Another question is how to designate what personnel are "authorized." The rule requires repair stations to prevent unauthorized operation of unattended aircraft capable of flight.

An aircraft is considered "attended" when access to the aircraft is limited to "authorized" individuals. But there is not yet clear explanation of what constitutes an authorized individual. There is an interpretation that any duly employed person could be considered authorized, without need for even so much as a list of authorized individuals. Although this interpretation would be clearly convenient for a business, it also provides the sort of vague regulatory guidance that gives the TSA wide latitude for interpretation. Such latitude could be used to make things difficult for a repair station.

It is also unclear to what extent access to aircraft must be prevented. For instance, if access to aircraft is being prevented by locking the aircraft and moving stairs away, is it required that both the aircraft and the stairs be locked? Recent conversations have suggested that taking steps such as locking access to stairs would not be required. But if simply moving the stairs is sufficient, this may raise questions as to how secure the new rules really are.

Finally, TSA has said that a repair station is permitted to contract out security of its facility. Such contract security is permissible, provided that the contracted employees are considered agents of the repair station, meaning they are under the direct control of the repair station. This means that it is not acceptable to rely upon an airport's standard security staff as a method of compliance with the rule. Any outside personnel relied upon to comply with repair station security requirements must be dedicated agents of the repair station.

The FAA also has issues to resolve. The FAA may soon be allowed to begin issuing new foreign repair station certificates, but this permission must be viewed in light of the resources that the FAA is able to direct toward supporting new repair station applications. In an age of austerity, the FAA may not have the resources to process the applications for repair stations even after the TSA completes its audits. Without FAA resources, other mechanisms for processing applications may need to be developed to assist applicants and expedite the process.

It is clear that the new repair station security rule will create significant new burdens for repair stations; but it is also important to note that compliance, notwithstanding those burdens, is absolutely critical for your business. Safety is always the number one priority of any aviation business, and the industry can and should pride itself on its excellent safety record. But that never-ending pursuit of safety cannot be undertaken if operations certificates are suspended or revoked over security allegations. Part 145 repair stations should take extra care to ensure close compliance with the new rules. As the review and appeal process described above makes clear, the TSA has granted itself powerful tools to not only force the suspension or revocation of a repair station certificate, but also to take advantage of process mechanisms to financially cripple a business. All repair stations should take care to avoid giving the TSA any reason to suspend or revoke a certificate, and should continue to strive for ever-better safety and security.

Want to learn more? Then please register for the MARPA Conference, which will take place in October at the Las Vegas Renaissance Hotel (next door to the Convention Center). Go to <http://www.pmamarpa.com/annualconference/about.shtml> for more information. **AM**





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## Cabin Interior Recycling—The Key to Avoiding Land-Fill

Attention to aviation's' green credentials continues to be of relentless focus. Especially those that are involved in the manufacture, maintenance and ultimately replacement of aircraft cabin interiors. According to Tony Seville, the means of recycling complete cabin interiors is already here and his company, SD Aviation is fully capable of recycling these components to such an extent, that 100 percent of the aircraft cabin interior completely avoids land-fill.

Yet, when approaching some of the industry's leading aviation organizations, the response more often than not is a negative one, citing the cost of re-cycling as higher than that of sending aircraft cabin interior components & materials to land-fill sites, and does absolutely nothing for the 'Green Credentials' of the world's operators, maintainers and OEMs

Modern commercial aircraft have to be complete with complex and commercially and aesthetically attractive cabin interior environments. A large proportion of the on-board equipment uses very exotic plastic solutions that include polycarbonates. Up until now, this equipment only really had two ways to go at the end of their service lives. They were either sold via secondary markets or found their way into land-fills. As an industry, aviation is constantly being derided by its critics for not really taking its green responsibilities seriously.

However, the aviation industry has expended considerable time developing advanced processes that can completely recycle 100 percent of a passenger seat (integrated avionics included), as well as other interior components like floors, side panels and ceilings. According to Tony Seville of SD Aviation, "Few operators even realize that on fuel alone, current recycling processes can off-set their carbon footprint by as much as 66 percent." In other words, for every fifteen tonnes of cabin interiors recycled, the operator can off-set its' fuel-burn by up to the equivalent of ten metric tonnes. How's that for radically enhancing your green image?

Recycling processes and techniques such as these appear to almost completely turn the green image of aviation on its head. Yet according to Seville, the general uptake of these recycling processes is severely curtailed. "The key challenge is one of educating aviation, but more so demonstrating that although the cost-base of these processes may seem steep in the immediate term, 100 percent recycling opens up wider reaching benefits if considered carefully in the context of the longer term".

### Cost-Base in Context

According to SD Aviation's' own research, it is cheaper to land-fill cabin interiors than pay for expensive recycling. "We are not trying to compete with land-fill, more so offer aviation an ethical and ecologically responsible alternative." Seville says.

The cost of land-fill can be anything from £1,500 to £2,000 per tonne (including £150 per metric ton for the actual cost of land-fill gate fees), whereas the recycling process is only marginally more expensive

at £3,000 per metric ton. In both cases cabin interior equipment must be physically removed from the aircraft and then transported to either a land-fill site or to the relevant recycling specialist. "These guys are not taking things into context, and considering the crippling costs associated with potential long-term storage in warehouses that can be as much as 10,000 to 15,000ft<sup>2</sup> in size." Considers that storage of this nature commands up to £8 per ft<sup>2</sup> per year. The costs will add up. Typically, up to 15,000ft<sup>2</sup> of storage space quantifies into £120,000 in storage costs per year. Some of SD Aviation's clientele have held onto their inventories for ten years. This is an eye-watering £1.2million.

Just imagine, that by getting rid of your end of service cabin inventory for as little as £3,000 per metric ton can potentially afford an operator of the 747 up to 1.2 additional flights between London and Singapore per year, not forgetting that image enhancing 66 percent carbon off-set opportunity!

Volume and efficiency is essential to reducing the cost-base. 100 percent recycling is still very much in its infancy and as time and development march on, the cost of 100 percent recycling of cabin interiors will become progressively more attractive. Seville points out that volume and efficiency of the recycling processes will always be key. SD Aviation is already ahead of the game, and is looking for larger and more viable facilities for greater volumes of cabin interior equipment with a view to tear-down, segregation and ultimately despatch to their recycling partners.

SD Aviation have also introduced teams of up to four salvage specialists to attend aircraft destined for retirement. The benefit of this service to mainstream salvagers is the removal of cabin interior components whilst facilitating access to the more attractive on-board equipment that can actually be sold-on or returned to the operator's spares inventory via approved maintenance.

What next for the raw material yielded from the process?

"Right now, anything that we recycle leaves the aviation industry altogether," says Tony Seville. "And potentially can make its way back into the latest high-tech supercar".

However, the ideal solution will be to resell the raw material back to aviation in the form of extrusions and rather ambitiously, powder or wire products for re-use in the manufacture of 3D printed components, which is something that SD Aviation are currently looking into.

In reality, the true benefit of 100 percent recycling will be aviation's creativity with regard to reclaimed plastics from former cabin interiors, whilst ensuring a lowering cost-base and an improving green image.

In closing, the way to drive forward the cause of recycling is ironically in the hands of the end-user of any new product. Simply ask your suppliers the question: "Just how much of the purchased component is reclaimed or recycled?" when he physically hands the keys back to the lessor. **AM**



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