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April / May 2011

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EDITORIAL

Editor-in-Chief and Online Publisher

John Persinos
301-385-7211, jpersinos@aerospace-media.com

European Contributing Editor

Thierry Dubois,
news@avmain-mag.com

Contributing Editors

James Careless
Kathryn Creedy
Jason Dickstein
David Doll
John Goglia
Paul Lombino
Ramon Lopez
Douglas Nelms
Tom Scarlett

ADVERTISING/BUSINESS

Publisher/Owner Adrian Broadbent,
+34 91 804 2577, abroadbent@aerospace-media.com

Sales Director (USA) Daniel Brindley,
+1 414 967 4997, dbrindley@avmain-mag.com

Sales Director (International) Jina Lawrence,
+44 (0) 20 8669 0838, jinalawrence@avmain-mag.com

DESIGN/PRODUCTION

Production Manager Henry Lindesay-Bethune,
production@aerospace-media.com

Production Splash Graphic Design
design@splash.eu.com

SUBSCRIPTIONS

maria@asi-mag.com

CLIENT SERVICES

Administration Maria Hernanz Reyes,
maria@asi-mag.com

LIST RENTAL

Statistics Jen Felling,
(203) 778 8700, j.felling@statistics.com

REPRINTS

The YGS Group 1800 290 5460,
avmaintenance@theYGSgroup.com

US Publisher

Daniel Brindley
ASI Publications Ltd

US Publishing Office Address:
5590 N Diversey Blvd #209
Milwaukee
WI 53217



www.aerospace-media.com



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Calle Mar Mediterraneo 64,
Tres Cantos 28760, Madrid, SPAIN.
+34 91 804 2577 (T)
+44 (0) 20 8090 6211 (F)

www.avmain-mag.com or www.aerospace-media.com

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What's Past is Prologue

BY JOHN PERSINOS, EDITOR-IN-CHIEF

Fortune sides with those who seize new opportunities. Or as Yankee legend Yogi Berra once put it: "If you come to a fork in the road, take it." Accordingly, I must announce my resignation as editor-in-chief of *Aviation Maintenance* magazine.

I'm leaving this magazine, to take a full-time position as Editorial Director with Cabot Heritage Corp., a publisher of investment newsletters based in Salem, Massachusetts. Writing about Wall Street and dispensing investment advice is one of the "beats" that I enjoyed earlier in my career; I relish the chance to again cover the vicissitudes of the financial markets. My departure is in no way a reflection on this fine magazine.

I thank the owner of *Aviation Maintenance* magazine, Adrian Broadbent, for giving me this bully pulpit. Adrian has been a civilized boss with impeccable manners — I guess it's all part of being British. If you meet Adrian at the MRO Americas Show in April in Miami, buy the chap a pint. Or better yet, a Mojito. He's a great guy (and a smart publisher).

For me, putting together this magazine has been creatively fulfilling — and a lot of fun. I'm proud of the work that our entire team accomplished during my tenure. I pass the editor's baton to someone who is no stranger to our readers: Joy Finnegan (for more about Joy, turn to the Publisher's Note on page 6).

Now, let's examine the highlights of this issue:

For our cover story, Paul Lombino, a seasoned business journalist based in Boston, conducted interviews with top executives in the MRO sector. He asked about the direction of aviation, their managerial challenges, innovations that impress them — a wide gamut of questions (see page 18).

In March, I covered Heli-Expo 2011 in Orlando, the helicopter industry's main annual event. I discovered that rotorcraft's comeback is giving MRO providers more work than they can handle (see page 24).

James Careless examines the state-of-the-art in MRO hangars — not just in materials, but also design, fire suppression, HVAC, and communications/LAN systems. James looks at the newest and coolest structures (see page 28).

Tom Scarlett, a transportation expert in Washington, DC, unearths the best ways to find, train and retain aviation mechanics, which is useful information for an

From Gutenberg to Zuckerberg... and back again

industry plagued by a shortage of qualified mechanics (see page 36).

On page 40, AeroStrategy's David Doll weighs in on the fearmongering that plagues the Parts Manufacturer Approval (PMA) sector. Similarly, in Point/Cointerpoint, two air safety experts — John Goglia and Ramon Lopez — square off on how PMA providers can improve their image (see page 44). This magazine believes that PMA is so important, it's sponsoring a special event dedicated to the topic. Go here for details: <http://www.avmain-mag.com/pma-summit>.

This issue is the last one under my editorial management. I began my journalistic journey as a reporter on daily newspapers; I eventually segued to magazines. In recent years, I've been compelled to stay up-to-date with the Digital Revolution, by producing webinars, podcasts, blogs, and various other forms of social media. However, my first love remains hard-copy print, which bestows an in-depth reading experience that electronic media can never quite match.

Long before Larry Page and Sergey Brin of Google, or Bill Gates of Microsoft, or Mark Zuckerberg of Facebook, there lived a media mogul of even greater influence. His name: Johannes Gutenberg. More than five centuries later, his transformative technology still pervades society.

So, put your feet up, flip through the pages of *Aviation Maintenance* magazine, and continue to enjoy the uniquely tactile pleasures of reading print. Of course, if you prefer the web, our magazine also is available online.

In my future travels, I'm sure to bump into many of you again — somewhere, somehow. I've learned in my long career that the past is merely prologue for what will come. **AM**

To stay in touch with John, you can reach him at his personal email address: persinos@yahoo.com





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Put your aircraft in our hands. Because for us, the most important thing is not just having the most highly-qualified personnel or being able to handle every specialised area in aircraft repair, maintenance and overhaul. The most important thing is what we do and how we do it, because our work takes you further: our work... flies with you.

IBERIA MAINTENANCE Commercial & Development Direction. Madrid - Barajas Airport, La Muñoz. 28042 Madrid, Spain.

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CHANGING OF THE GUARD

It was with the deepest regret that I received the resignation of John Persinos as this magazine's editor-in-chief. John is a consummate professional and a gifted writer; he did much to improve the editorial quality of this magazine. He will be missed. We all wish him the greatest success with his new job.

However, it's important to embrace change, not resist it. In that vein, I'm happy to announce his successor: Joy Finnegan. I'm excited about Joy taking over the reins. You should be, too.

Joy has been involved in the aviation industry since she was 15, when she decided that she wanted to learn to fly. She attended Embry-Riddle Aeronautical University and upon graduation pursued a career as a professional pilot, starting as a flight instructor, moving into charter, then commuter airlines, and eventually to a regional airline.

She also has worked as a contract administrator for two aircraft manufacturers, Cessna and Galaxy/Gulfstream. She took charge as editor-in-chief of *Aviation Maintenance* magazine in November 2006, after serving as its managing editor. In 2009, she became editor-in-chief of *Rotor & Wing* magazine, which covers all aspects of rotorcraft. She assumes the position of editor-in-chief of this magazine again, effective with the June / July issue.

Joy knows aviation, especially the MRO sector. And she runs a tight ship. Don't hesitate to contact her with your story ideas and feedback. Under Joy's leadership, this magazine looks forward to a bright future indeed.



Adrian Broadbent
 Publisher/Owner
 abroadbent@aerospace-media.com



Joy Finnegan

QMS: The Deadline Looms By Jason Dickstein

Recent changes to the regulation governing aircraft parts manufacturers require all affected parties to overhaul their Quality Management Systems (QMS) and provide documentation to the FAA by April 16. The revisions, which went into effect in October 2009, are intended to address changes in the global manufacturing environment, an increased number of suppliers and PMA parts producers, and the growing international market for aviation products.

The final rule represents the culmination of an 18-year effort by the FAA to create more broadly applicable quality standards to cover a wider range of aircraft parts.

The new quality systems standards were introduced in amendments to Title 14 of the Code of Federal Regulations, which is where the public can find the FAA's regulations. Those regulations are divided into "Parts" and Part 21 is where one would find the procedural standards for application for design and/or production approval. The Part 21 changes added substantive changes to the certification process and outlined steps that need to be taken to remain in compliance by the April deadline.

The most significant changes for many manufacturing companies are found in the revisions to Sections 21.137, 21.307, and 21.607, all of which now mandate a formal, documented quality management system and FAA-approved manual that meets the new regulatory specifications. Overall, the changes to Part 21 aim to harmonize and simplify quality

systems requirements for all types of production approval holders.

A key high-level difference between the old regulations and the new ones is the requirement for the quality system to be specifically published in a manual that has to be approved by the FAA. While quality manuals have always been standard in the manufacturing industry, the FAA has never before had a specific requirement to approve such a manual.

As of February 5, the FAA had received the required submissions from only 47 percent of the estimated 1,800 production approval holders. This was a concern for the FAA. It is possible that some companies might have felt that prior FAA approval of their quality systems was all that was necessary. But this is not the position that the FAA appears to be taking on the situation.

The FAA has indicated that failure to comply with these changes, which require an overhaul of quality management procedures and submission-and-approval of quality system manuals, may result in revocation of FAA approval of those quality systems. The maintenance community will want to watch carefully their manufacturing partners to assure that their parts sources remain in compliance with the new regulations.

Jason Dickstein is president of the Modification and Replacement Parts Association (MARPA). You can reach him at: jason@washingtonaviation.com

Sargent to Acquire \$4 Million in Boeing 737 Spare Parts

Sargent Aerospace & Defense announced that its Aftermarket Services group is acquiring more than 1,200 Boeing 737 line-replaceable units (LRUs), valued at approximately \$4 million.

Sargent's Miami-based aftermarket facility will receive the majority of these components in overhauled condition ready for outright sale, as well as exchange and lease programs. The acquired inventory will range from avionics, fuel pumps, electromechanical actuators, engine components, to landing gear top assembly units. Sargent will utilize the non-overhauled material for inventory, improving their stocking levels for subassemblies and piece part items.

The imperative of increased provisioning and competitive turnaround times is a key metric within the aftermarket segment of the aviation component repair industry.



The Boeing 737 on the assembly line

Specifically, increased demands on the third-party aftermarket repair industry have motivated companies to employ unique strategies to support the strength, quality and superiority of their repair offerings. Inventory acquisition is a strategic method to support reduced turnaround times, as well as provide value added offerings such as exchange units.

Eastway Jet Services Named Phenom MRO Center

Expanding its private jet maintenance capabilities, Eastway Jet Services announced that it was named an Embraer Phenom Service Center, providing Phenom 100 and Phenom 300 owners with a full offering of maintenance services. Eastway Jet Services, located at MacArthur Airport (ISP), is the only independently owned authorized Level 3 Service Center in the Northeast.

For Phenom 100 and 300 jets, Eastway Jet Services provides a range of services including all scheduled inspections, warranty repairs and AOG service throughout the Northeast.

Eastway Jet Services, an FAA-approved repair station, provides a full line of services for a range of aircraft. Its team of factory-trained technicians are experienced on maintenance of Gulfstream II through V, Hawker, Falcon and Global Express jets, as well as Legacy, Phenom 100 and 300 jets. Eastway's employees receive continual training at factory-authorized facilities, such as FlightSafety International, CAE and Global Jet Services.



The Phenom 100

about people

Sargent Names Gil Jackson as Technical Business Development Manager

Sargent Aerospace & Defense, a supplier of precision engineered components and aftermarket services, and an operating company within Dover Corporation's Industrial Products Segment, appointed **Gil Jackson** to fill the new position of technical business development manager, aftermarket services.

In this role, Gil will focus on increasing Sargent's business opportunities within their landing gear component product offering, as well as new products and services for Air Transport Association (ATA) Chapters 78 (power plant exhaust) and 27 (flight controls).

The company provides original equipment and third-party Maintenance, Repair and Overhaul (MRO) work in Miami, Florida; Tucson, Arizona; Franklin, Indiana; and Torrance, California.

Gil has more than 24 years of experience within the aerospace landing gear industry, including engineering roles within Delta Airlines, Goodrich Aerospace-Landing Gear, and American Airlines. He has worked on numerous successful projects with OEM suppliers, OEM repair and overhaul, as well as airline engineering departments.

Chromalloy Appoints Dolan as Military Affairs Director



Chromalloy named **Paul Dolan** as Director of Military Affairs, responsible for leading the company's strategy for growth in military aircraft engine aftermarket services.

Dolan joined Chromalloy in 2010 as KC-10 Program Director, leading the company's production, supply chain and overall service performance as part of the KC-10 Extended Logistic Support Program team for the U.S. Air Force.

The company recently completed its first program year of that nine-year contract, meeting all U.S. Air Force scheduled milestones and engine performance improvement targets.

Dolan previously was Vice President of Sales & Marketing at Avioserv, an aviation material sales and engine leasing company. He was responsible for global sales, acquisitions and leasing of commercial aircraft engines and engine materials. He led the company >>>

about people

from being a broker and dealer to a worldwide brand for engines and material services.

Prior to that he co-founded Western Solar, a San Diego based renewable energy producer of photovoltaic technologies.

Dolan began his career as an F/A-18 fighter pilot in the U.S. Navy. He holds a Bachelor of Science degree with distinction in mechanical engineering from the U.S. Naval Academy, a Master of Science degree in Aerospace Engineering from the Georgia Institute of Technology, and a M.B.A. from the Marshall School of Business at the University of Southern California.

West Star Appoints Appleby Technical Sales Manager



West Star Aviation recently welcomed the newest addition to their sales team, **Dale Appleby**, as Technical Sales Manager. Dale will be based in Dallas, TX.

In his new position, as Technical Sales Manager, Dale will be responsible for inside sales at the Dallas facility. In addition, he will handle various outside sales duties in the Dallas/Fort Worth metropolitan area. Dale brings 18 years of experience in sales, operations, and business ownership to West Star Aviation.

West Star Aviation specializes in the repair and maintenance of airframes, windows, and engines; as well as major modifications, avionics installation and repair, interior refurbishment, surplus avionics sales, accessory services, paint and parts.

Duncan Aviation Names Michael Cox as VP of Human Resources



Duncan Aviation named **Michael Cox** as the company's new Vice President of Human Resources.

Cox comes to Duncan Aviation after spending 28 years in the insurance industry. His background includes leadership responsibility for marketing, public affairs, education and training, strategic planning, finance, sales administration, recruiting, change management and insurance claims.

In his new role, Cox will provide leadership for the Human Resources and Professional Development departments and for the Wellness and Safety programs for all Duncan Aviation locations.

Vector Offers UH-1 Upgrade



The UH-1H

Vector Aerospace Helicopter Services-North America, an independent provider of helicopter MRO services, has launched a unique UH-1H helicopter upgrade program, ready for delivery to operators around the globe.

Vector's customizable UH-1 upgrade program addresses a wide variety of operator-relevant issues, from minor system enhancements to larger scale solutions that deliver appreciable increases in aircraft performance and addresses major obsolescence issues.

Options available range from operational and logistics support such as maintenance and overhaul planning, up to a complete range

of airframe, engine and avionics solutions, made available in scalable packages that are flexible enough to fit various operator needs.

The goal of Vector's new UH-1 program is to provide operators with a scalable upgrade solution rather than providing an "all or nothing" scenario. The program addresses a variety of recurring obsolescence and support challenges associated with legacy mechanical, electrical and avionics systems. This enables operators to reduce costly trouble-shooting activity, and refocus on performing routine maintenance to improve aircraft availability and safely and efficiently meet mission requirements.

Bell's Lafayette Facility Gets AS9100 Certification



Bell Helicopter's Louisiana facility has successfully achieved AS9100 Implementation and Certification.

This certification confirms that the Lafayette quality management system (QMS) is certified for manufacturing composite panels and allows Lafayette to operate as an extension of Bell Helicopter's Fort Worth headquarters.

The Louisiana operation, formerly Acadian Composites and a former division of Aeronautical Accessories, was integrated into Bell Helicopter in January 2011.

As a part of the integration, Bell Helicopter conducted an audit and evaluation of the composites plant's quality system in 2010. To extend Bell

Helicopter's production certificate to the Lafayette location, the quality system had to meet the same requirements as other Bell Helicopter facilities.

It typically takes a company more than a year to become certified to AS9100, yet the composites plant completed the certification in less than 60 days. A team of experienced quality system experts was challenged to implement the program on an aggressive schedule; Lafayette established a premier QMS and certification to AS9100 in record time.

The Bell Helicopter facility in Lafayette, Louisiana is an FAA approved manufacturer of composite panels and related services. The plant manufactures products in accordance with OEM data and provides panel overhaul and repair services.

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about people

CIRCOR Aerospace Selects Sara Kruse as Group Director of Human Resources



CIRCOR Aerospace Products Group appointed **Sara Kruse** as Director of Human Resources.

Sara brings extensive industry and human resources leadership experience to this role and will report to Group Vice President Christopher R. Celtruda. She will also represent the aerospace business unit within the CIRCOR International Council for Human Resources.

Sara will have full responsibility for the implementation of improved human resources processes and service across the CIRCOR Aerospace North American, Asian, European and North African businesses. She will oversee site level staff and change initiatives, drive the annual Talent Management process and be actively engaged in the development and execution of group strategy and change efforts.

In her career, Sara has spent over 20 years with Goodrich, Parker and Eaton. She brings extensive experience in HR process and systems, talent acquisition, change management, and business partnership from her career assignments in the U.S. and Mexico.

Sara joins CIRCOR Aerospace from Eaton, where as an HR Leader, she supported and led various projects for the Aerospace Group. Previously, she was a Division HR Leader with Parker Hannifin and held an HR staffing role at Goodrich.

Sutterer Joins West Star Board of Directors



West Star Aviation announced that **Kurt Sutterer** has joined the company's Board of Directors.

Sutterer recently retired as president of Midcoast Aviation and head of Jet Aviation's MRO & Completions lines of business in North America, after 29 years of service with the company.

Sutterer started his professional aviation career at St. Louis-based Midcoast Aviation in 1981 and held positions of increasing responsibility, ranging from Inspector to Manager of Technical Services, Vice President, and General Manager of Midcoast Aviation operations before his promotion to president in 2004.

Technoavia Buys GE's H80 Engines

Technoavia, a Russian-based aircraft manufacturer, signed a 10-year sales and cooperation agreement with GE Aviation for the purchase of H80 engines.

The engine agreement is for the newly designed Rysachok aircraft, a twin-engine, 10-seat general aviation aircraft, which will primarily be used by Russia's Civil Aviation State Pilot Schools. Technoavia signed firm engine orders for 30 aircraft and has options for another 30 aircraft.

The agreement between Technoavia and GE also includes collaboration on engine certification, engine installation and development of service and support for GE products in Russia.

Technoavia plans to complete GE H80-powered Rysachok aircraft certification by the end of 2011. The first flight of the Rysachok aircraft took place in December 2010 with GE's M601 engines.

Technoavia's Rysachok will be a multi-purpose aircraft used as utility, commuter, cargo, taxi, medical transportation and more. The Rysachok aircraft will be built at a production plant in Samara, Russia, with initial manufacturing capacity of up to 12 aircraft per year.



GE's H80 Turboprop Engine

Scientific Commercial Firm (SCF) Technoavia LLC, located in Moscow, Russia, specializes in the design of small aircraft and modernization of existing aircraft. Founded in 1992, Technoavia has designed and introduced more than seven aircraft types into production.

GE Aviation's Business & General Aviation Turboprops has more than 1,600 M601 engines in service that have accumulated more than 17 million flight hours on 30 applications.

P&W to Provide PurePower for ILFC's A320neo

Pratt & Whitney will provide power for up to 100 Airbus A320neo family aircraft ordered by International Lease Finance Corporation (ILFC), as part of a new contract.

The agreement includes 120 firm PurePower PW1100G engines for 60 aircraft and options for up to 80 engines for the additional 40 aircraft with deliveries scheduled to begin in 2016.

Each ILFC Airbus A320neo family aircraft as part of this agreement

will be powered by two PurePower PW1100G engines, with benefits including double-digit reductions in fuel burn, environmental emissions, engine noise and operating costs when compared with today's engines.

Pratt & Whitney has more than 800 PW1000G engines on order, including options. ILFC is the international market leader in the leasing and re-marketing of commercial jet aircraft to airlines around the world.



PAL Signs Deal with AFI KLM E&M

Philippine Airlines (PAL) entered into a long-term contract with AFI KLM E&M for maintenance and engineering support of its GE90 engines, the primary workhorses of PAL's fleet of Boeing 777-300ERs.

The agreement covers on-site and on-wing maintenance, shop visits, component support, spare engines and engineering support for PAL's extended-range Boeing 777s. During the past several years, PAL has tapped the services of AFI KLM E&M not only for CF6-80E engine maintenance but also for airframe and FTR support services.



A PAL Boeing 777-300ERs

Now celebrating its 70th anniversary, PAL is the flag carrier and national airline of the Philippines. Air France Industries and KLM engineering & Maintenance, which joined forces following the Air France KLM merger, are major multi-product MRO providers with a joint workforce of 14,000.

AgustaWestland Signs MRO Contract for the Royal Navy Merlin

AgustaWestland, a Finmeccanica company, announced that it has signed a contract with the UK Ministry of Defence (MoD) covering the second five-year period of the 25-year Integrated Merlin Operational Support (IMOS) contract. The contract for the period 2011 to 2016 is valued at approximately GBP570 million.

The IMOS contract provides a comprehensive availability based support package for the UK MoD's fleet of AW101 Merlin helicopters operated by the Royal Navy and the Royal Air Force.

The contract includes payments for achieved flying hours and incentive-based arrangements associated with delivering agreed levels of aircraft serviceability, operational fleet aircraft numbers and Royal Navy AW101 Merlin Training System availability.

In March 2006 AgustaWestland was awarded the 25-year IMOS contract to increase the availability of Merlin helicopters to the Front Line Commands. AgustaWestland has partnered with Total Support Services (TSS), an alliance between SELEX Galileo, Thales UK, GE and the Defence Support Group (DSG), to support air vehicle avionics and with Lockheed Martin to provide support for the Royal Navy's AW101

Merlin mission system and the Merlin Training System at RNAS Culdrose.

AgustaWestland also providing IOS solutions for the UK MoD's Sea King and Apache helicopter fleets, as well as developing an IOS and training solution for the AW159 Lynx Wildcat, 62 of which are on order for service with the UK's Royal Navy and Army.

The UK Royal Navy's AW101 Merlin helicopter



about people

CIRCOR Selects Pritesh Patel as Group Director of IT



CIRCOR Aerospace Products Group appointed **Pritesh Patel** as the Director of Information Technology for the CIRCOR Aerospace Products Group.

Pritesh brings extensive business and system integration experience to this role and will report to CIRCOR Aerospace Group Vice President Christopher Celtruda. He will also represent the aerospace group on the CIRCOR International Information Technology leadership team.

Pritesh will have full responsibility for CIRCOR Aerospace implementation of Information System processes, infrastructure and improvements, and overall IT management across the North American, Asian, European and North African aerospace businesses.

He will oversee site level staff and change initiatives, partner with Continuous Improvement personnel and programs driving the annual Strategy Deployment process. Pritesh will be actively engaged in the development and execution of group technology strategy and change efforts.

In his career, Pritesh has spent over 15 years in the IT sector with OK International, Timken Corporation and Boeing. He brings extensive experience in strategic guidance, risk management, infrastructure and system integration and implementation, resulting from his career assignments in electronics and industrial product manufacturing.

Pritesh joins CIRCOR from OK International, Inc., where he was the Director of Information Technology for a soldering tools and equipment manufacturer in Dover Corporation's \$1.4 billion electronic technology division.

Pritesh earned a Bachelor of Science degree in Business Administration from California State University, Long Beach.

If you have a press release or news tip that you'd like our editorial team to consider for publication in our Intelligence section, go to: www.avmain-mag.com and upload your information via the "Other News" link on the horizontal nav bar. All items will be reviewed for possible publication.

Banyan Completes Helo Avionics MRO

Banyan's avionics team recently completed work on a Sikorsky S76, Augusta 109, and an American Eurocopter AS-350. Upgrades included Garmin GNS-430W, GMX-200, Avidyne EX600 and Honeywell MK-22 EGPWS Safety Package installations.

Banyan is located at Fort Lauderdale Executive Airport and is an authorized dealer for all major avionics manufacturers. The company provides comprehensive avionics installations, repairs, and modifications for helicopters, including Glass Cockpits, Weather

Radar, Flight Management Systems, Enhanced Ground Proximity Warning Systems, Multifunction Displays, Terrain Awareness Warning Systems, Cockpit Voice and Flight Data Recorders and Traffic Collision Avoidance Systems.

Banyan's avionics department is certified as both an FAA and EASA repair station and has also earned repair station designations for Argentina, Brazil, Bermuda and Venezuela.

An S76, A109 and AS-350 in a Banyan hangar



Superior Ships Millennium Cylinders

Superior Air Parts announced that the company has begun the next phase of its product reintroduction efforts by beginning the delivery of production quantities of new Millennium Cylinders to its global dealer network.

The first new Millennium shipments included cylinders for the popular Lycoming O-235 engines and the Teledyne Continental O-200 and IO-550 engines. The company has now added cylinders for Lycoming's O-360/IO-360 and O-540/IO-540 as well as the Continental O-470/IO-470 and IO-520/TSIO-520 engines.

With the increasing availability of cylinders and piece parts, Superior can now set its sights on restarting the production of its experimental XP Series Engines and certified Vantage Engines.

Superior Air Parts, a wholly owned subsidiary of Superior Aviation Beijing, is a manufacturer of FAA approved aftermarket replacement parts for Lycoming and Continental aircraft engines. In addition, the company manufactures the FAA certified Vantage Engine and the XP Series Engine family for experimental and sport aircraft builders.



The Lycoming IO-360

Aircelle to Supply LEAP-X Engine Nacelle for A320neo

Airbus has selected Aircelle, a subsidiary of the Safran group, to supply the complete integrated nacelle package for the A320neo Family powered by CFM International's LEAP-X engines. GE's Middle River Aircraft Systems (MRAS), its established partner in the Nexcelle nacelle joint venture, will participate.

The A320neo is Airbus' new engine option for its A320 aircraft family, offering significant fuel savings. The A320neo nacelle will benefit from Aircelle's technology developed for the nacelles used on Airbus' A380. This will be re-enforced by a comprehensive technology roadmap that includes innovations in systems, composite materials and acoustic treatment to further enhance operating efficiency, lower noise levels, reduce weight and improve maintenance.

Aircelle's existing CFM56 thrust reverser assembly line was totally re-engineered three years ago using lean sigma methodology. It has delivered up to 500 thrust reversers annually since then.



The CFM LEAP-X engine

GE Aviation Invests \$60 Million in Flying Testbed

GE Aviation announced a \$60 million investment to purchase and refurbish a Boeing 747-400 aircraft and turn it into a new flying test bed that will test the next generation of jet engines, starting with the LEAP-X engine.

The recently purchased 747 aircraft features GE's CF6-80C2 engines and will be home-based at GE's Victorville, California facility. It will replace the current 747 flying testbed, which is the oldest version of the 747 still flying in the U.S. and the fifth oldest in the world. GE has been operating the current 747 flying testbed since 1992 and has operated a flying testbed since 1945.

To prepare the aircraft for flight-testing, its wing and strut will be redesigned and strengthened to accommodate experimental

engines of varying size and weight. The plane's interior will also be modified, and GE will install data systems for testing and systems integration equipment to transform the aircraft into a flying testbed.

GE's Flight Test Operation moved to its Victorville facility in 2003 and was the first tenant at the Southern California Logistics Airport. Most test missions are flown within the Edwards Air Force Base Restricted Test Area, which is restricted airspace for test flights located around the Lancaster, California base.

Test missions are also flown to Colorado Springs, Colorado; Yuma, Arizona; Seattle, Washington; and Fairbanks, Alaska.



GE's new Boeing 747-400 aircraft in foreground with the current GE Aviation flying testbed in the background at the Victorville, California facility.

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Sikorsky and Alpha Star Join Forces in Saudi Arabia

Sikorsky Aerospace Services (SAS) announced the signing of a letter of intent (LOI) with Alpha Star Aviation Services, to engage in discussions to form a joint venture dedicated to providing comprehensive military and commercial aviation support and maintenance services in the Kingdom of Saudi Arabia.

In a significant milestone for Sikorsky's aftermarket activities, SAS recently announced the delivery of the first upgraded S-61 helicopter to the U.S. State Department.

Sikorsky Aerospace Services has a long history of providing aviation support and maintenance within the Kingdom of Saudi Arabia. Alpha Star is a major aviation services company based in Riyadh, Kingdom of Saudi Arabia, providing services in the areas of Aircraft Management, Private Aviation and Aviation Consultation.

SAS' Upgraded S-61



FL Technics Services First A320

First Airbus A320 arrived for servicing at FL Technics hangars in Vilnius. The aircraft is owned by Latvian charter flight services provider SmartLynx.

The Airbus A320 aircraft family recently was added to the EASA Part-145 certificate of FL Technics, expanding the company's capability list to provide line and base maintenance as well as other repair and maintenance services. The certification was carried out by Civilian Aviation Administration of Lithuania.

FL Technics also applied for Airbus A320 type EASA Part-147 certification. This certificate will allow it to train Airbus A320 technicians, increasing the scope of FL Technics services for this Airbus A320 aircraft family.

There are about 4,300 of Airbus A320 type aircraft in operation around the world, of which around 1,700 are in Europe. In the CEE countries and Russia, airlines operate about 200 of Airbus A320 family aircraft. Another 80 aircraft have been commissioned by the airlines of this region. In 2010, Airbus delivered 401 aircraft of the Airbus A320 family to its customers.

Additionally, FL Technics provides maintenance services for Boeing 737 CL, Boeing 737 NG, Boeing 757, Saab 340 and Saab 2000 aircraft.



The First A320 at FL Technics

Lufthansa Technik Expands MRO for PrivatAir

PrivatAir and Lufthansa Technik have taken their existing partnership, which dates back over 30 years, to a new level with a much expanded Total Technical Support TTS contract.

The main elements of the wide-ranging contract are the implementation of the Technical Operations Management TOM concept with Fleet Manager and service level agreements, coupled with the new Total Base Maintenance Support TBS product.

The contract also includes an innovative customer support concept under which PrivatAir's aircraft will be managed centrally by a Fleet Manager. As a result, the customer will have a single point of contact to deal with for all operational matters. This person will have an intimate knowledge of PrivatAir's needs and demands and also of its Boeing fleet, and will thus be in a position to guarantee a fully integrated and dovetailed service.

Total Base Maintenance Support TBS is the latest Total Support Service from Lufthansa Technik. As the launch customer, PrivatAir is buying the new service for five Boeing 737NG aircraft. The main features of TBS are a sweeping slot guarantee and pricing that is geared towards the customer's requirements.

The wide-ranging contract also includes engine support (Total Engine Support TES) and auxiliary power units (APU) plus Total Component Support TCS. In addition Lufthansa Technik will provide Maintenance Management Services for the Charter Fleet.

PrivatAir is a leading international business aviation group with its headquarters in Geneva, Switzerland and operating bases in Düsseldorf, Munich and Frankfurt (Germany), Amsterdam (The Netherlands) and Zurich (Switzerland).



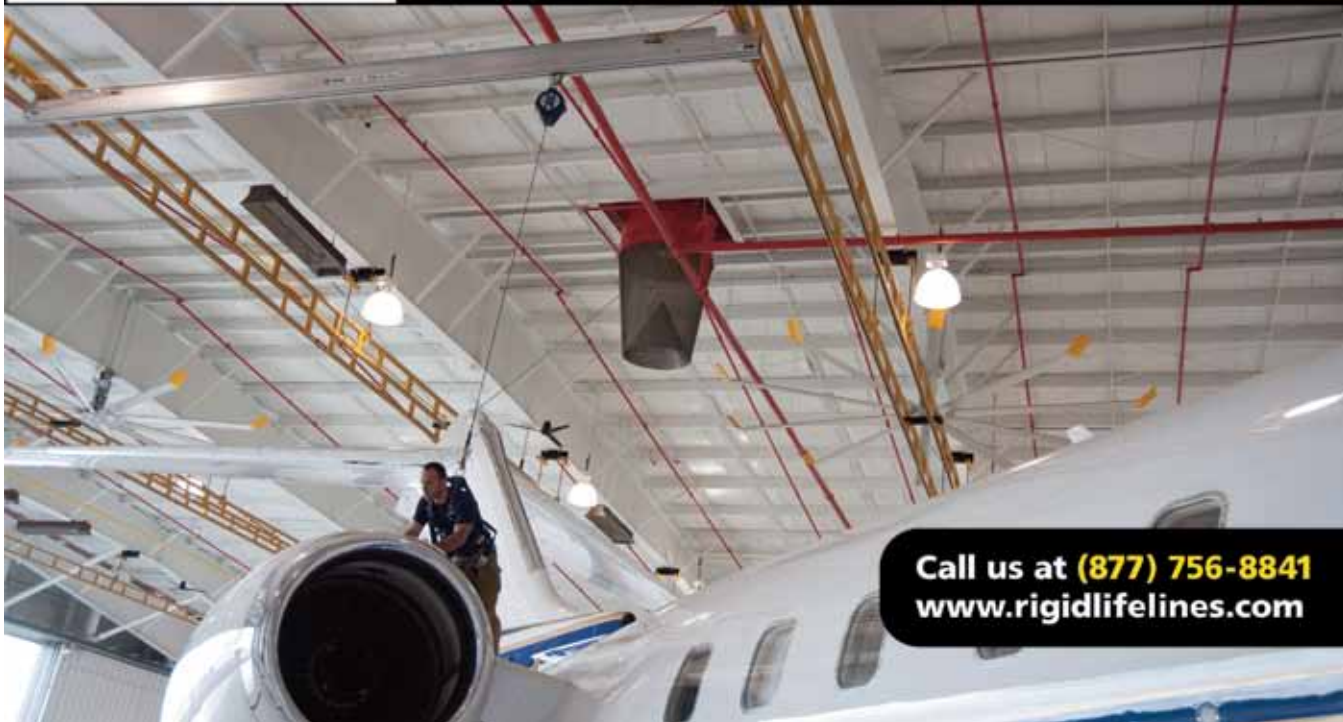
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Lufthansa Technik to Provide MRO for Camair-Co

The new Cameroon based Camair-Co airlines, which began operations in late March, and Lufthansa Technik have signed a contract regarding line maintenance and component services for Camair-Co's B737 NG and B767 aircraft.

Within the two-year line maintenance contract, Lufthansa Technik intends to hire and instruct up to ten local employees who will take over the line maintenance services from Lufthansa Technik Maintenance International staff, who initially will provide the maintenance work at Camair-Co's homebase in Douala/Cameroon.

In the next ten years, Camair-Co will be provided with Lufthansa Technik's comprehensive Total Component Support TCS for its fleet of four aircraft. Under the Total Component Support TCS agreement, Lufthansa Technik's experts will take care of all aspects of

supplying Camair-Co with components for the airline's daily operations, from access to the pool of components, repair and overhaul of the units removed from the aircraft on to engineering and troubleshooting support.

MRO activities of components will take place at Lufthansa Technik's component shops in Frankfurt and Hamburg in Germany. A home base will be placed at Camair-Co's Douala airport facilities. A worldwide pool access is also part of the agreement.

Camair-Co's B767



SR Technics and Airberlin Enhance Engine Partnership



SR Technics and the Airberlin Group have agreed to expand their ten-year engine maintenance contract.

The new contract covers exclusive maintenance services for more than 300 engines. This will include CFM56-7B, CFM56-5B, and PW4168 engines for their whole Airbus and Boeing fleet. SR Technics will provide maintenance services for 95 percent of all engines of the Airberlin Group.

A key element of the new agreement is the expansion of financing solutions for Life Limited Parts (LLP) and additional spare engine support, provided by SR Technics and Sanad Aero Solutions, Mubadala's new asset finance and leasing entity.

Sanad offers a broad spectrum of spare component and engine leasing solutions that enable airlines to monetize existing assets, secure inventory solutions required to support fleet growth and access a growing array of MRO and technical service services offered by Mubadala Aerospace's global MRO network.

CMC's Sensor System Gets Falcon Certification

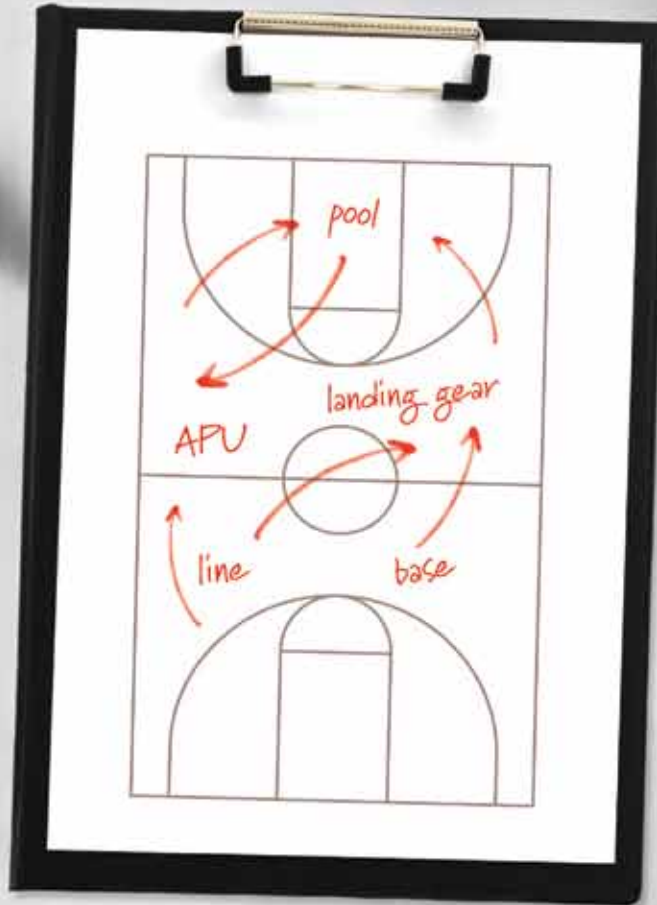
Esterline CMC Electronics (CMC)'s second-generation SureSight CMA-2600 I-Series Integrated Sensor System is now approved for use as an Enhanced Flight Vision System (EFVS) on the Dassault Falcon 7X.

This approval was granted recently by the Federal Aviation Administration (FAA) and follows the certification by the European Aviation Safety Agency (EASA), the lead certification authority, received in July 2010. With these approvals, F7X operators can now take advantage of expanded operational credits afforded to aircraft equipped with an EFVS.

CMC's expanding SureSight family of integrated sensor systems includes the CMA-2600, CMA-2600i, and the CMA-2700, a higher resolution, increased capability sensor system that is currently in development. They are designed to meet demanding video performance, reliability and quality standards.



Esterline's SureSight



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- Landing gear overhaul for 737 Classic/737 NG A300-B4/A310/A320 family/A330/A340/RJ.
- Honeywell authorised repair station for CFM56-7B HMUs.

Executive Roundtable

MRO

IN 2011:

The Challenges and Opportunities

From the trends of the recent past, our interviewees extrapolate as to what our sector can expect in the coming months.

BY PAUL LOMBINO

Not since 9/11 — when the widespread installation of reinforced cockpit doors became a symbol of the heightened standards for the Maintenance, Repair and Overhaul (MRO) industry — has the aviation sector faced so many financial and logistical challenges.

The 2007-09 global monetary meltdown and, more recently, erupting regional political conflicts and fuel-price spikes have forced many company leaders to adjust their thinking to meet evolving

customer demands and compete more effectively for market share.

How are business managers adapting to today's new market environment and what do they see for the future? Those were among the questions we recently asked seven executives, to get a better understanding of the health of the MRO arena. *Aviation Maintenance* magazine conducted an exclusive roundtable interview of key decision-makers representing major industry players around the world.

Although 2010 was a bounce-back year for many MROs, challenges still exist. For a snapshot of opinions, AM spoke to Jose Luis Quirós, vice president, Iberia Maintenance; Luiz Hamilton Lima, vice president, Embraer; Ed Dolanski, chief operating officer, Aviall; Ismail Demir, chief executive officer, Turkish Technic; Jorge Sobral, executive board, TAP Maintenance & Engineering; Brian Howell, vice president, Hawker Beechcraft; and Dave Kvasnicka, president, Aviation Component Solutions.

Here's what they had to say:

How would you characterize the current business climate?

Lima: The airline market worldwide is starting to recover from the economic downturn, but is still very unstable. Recent increases in oil prices and political unrest in the Middle East are major concerns. Competition is increasing worldwide as more companies try to enter the marketplace.

Demir: The global downturn did not affect everybody equally. It was strongly felt in Europe and North America. My region, Turkey, did not feel the full impact of the crisis in aviation. Overall, after a difficult 2009 and 2010, the airline industry is in a cyclical recovery. Operator airlines are picking up, which should benefit the MRO sector, which tends to lag other areas of the aviation market.

Sobral: As Ismail said, MROs follow the rest of the airline industry. Different parts of the world reacted differently to the downturn. While South America



“ Once these multiple crises settle down, I think you’re going to see a hunger for airline growth. ”

- ISMAIL DEMIR CHIEF EXECUTIVE OFFICER, TURKISH TECHNIC

was hardly touched by the crisis, Europe and the United States were hit hard. But recovery in the States is much faster today than overseas.

Howell: The business-jet marketplace is starting to come around led by larger aircraft and utility-type applications. We see significant movement in government special missions-type apps all over the world and have special niche products that are starting to see fairly good growth.

Kvasnicka: Our business is to supply folks who repair components and accessories for large commercial aircraft. So our customers are major airlines that do their own maintenance as well as repair stations that support them. We’re seeing the beginnings of some recovery in certain areas of the world. Asia has been relatively strong, but there’s still some softness in North America and Europe.

Was there any core management decision that helped your company get past the downturn?

Quirós: As commercial aviation suffered over the past two years, Iberia had to become more flexible to adjust to shifting market opportunities.

Lima: Embraer made adjustments to its workforce capacity and overall cost structure in order to match a reduction in demand on the world airline market.

Dolanski: During the economic downturn, many companies cut inventories to save money. Aviall didn’t. We made a conscious decision to maintain high inventory even though customer demand and supplier capacity fluctuated. Our mission was to be a rock-solid source for critical parts

through thick and thin. The idea was to help cushion our OEM suppliers from the sudden drop in demand and ensure that our customers would have ready access to parts once the recovery began.

At the time, that was a risky management decision because there was no guarantee the market would come back. We worked diligently on process improvements both internally and with our suppliers to help control operating costs. We rolled out a brand-new website for our customers in early 2010 and continue to add features and functionality to it this year.

Demir: Today, cost is the number-one priority for airline operators in choosing an MRO. As a service provider, Turkish Technic has had to adjust pricing to reflect the lower demand of customers, some of whom have actually had difficulty making payments. This has caused us to get leaner and look at our own financial structure in a more critical way.

Howell: From Hawker Beechcraft’s perspective, two things we’ve done over the past 18 to 24 months is invest in technology and focus more on the STC [Supplemental Type Certificate] aftermarket, which we had long ignored. STC is a market with over 37,000 fielded aircraft. These existing airplanes can seek avionics modifications and enhancements, providing a source of revenue when new aircraft production is slow.

Keep in mind, too, that the military market behaved very differently from than civil aviation market. Hawker Beechcraft has a successful government business, which did not slow down at all. We build and maintain all of the T-6 Texans, single-engine U.S. fighter-trainer aircraft.

We’ve designed and are bringing to market an attack version of the AT-6 for our special missions business – for ambulance, surveillance or reconnaissance. That has

been a huge pick-up for us in areas from Morocco, to Saudi Arabia to Colombia. In 2009, we delivered over 20 King Air 350s for reconnaissance in Iraq and Afghanistan.

One disturbing trend has been that private aircraft have come to be viewed as a luxury item as opposed to a standard business tool. That perception is still something we’re working to overcome in certain parts of the world.

Kvasnicka: ACS’s business is 100 percent focused on the commercial aftermarket. Spare parts suppliers have intensified price competition over the last two years. During that time, the biggest thing we’ve done is to redouble our efforts to reduce price by better managing the direct costs of our product and indirect administrative costs. Some companies are more susceptible to downsizing than others.

Most stable are OEMs like Honeywell, Ham Sundstrand, Eaton, and Parker due to the sheer scale of their operations. More susceptible players include component MRO providers, PMA suppliers like ourselves, and distributors, all of which face tough competition across all product lines. In the commercial marketplace, the guys that do best when times are tough are those positioned as low-cost providers with the capabilities to offer superior customer service.

What current events worry you most about the future?

Kvasnicka: The success of the MRO business is dependent on the health of the entire airline industry. What keeps me awake at night is the cost of fuel, typically the biggest part of an airliner’s cost structure. Higher fuel prices trigger higher airfares, which dampen the amount of flying. Less flying means less maintenance activity and fewer parts needed.

“ Diversification, creative product development, effective cash-flow management and customer loyalty are keys to surviving any economic downturn. ”

- LUIZ HAMILTON LIMA VICE PRESIDENT, EMBRAER





“ I think the [mergers-and-acquisitions] trend is going to continue for a long time. ”

– JORGE SOBRAL EXECUTIVE BOARD, TAP MAINTENANCE & ENGINEERING

Lima: Yes, increases in oil prices to over \$100 per barrel are a concern.

Quirós: Because OEMs are facing the effect of lower business margins, this could impair demand for MRO after-sales services.

Sobral: And the spreading Mideast conflict will have an impact on the recovery.

Demir: To all those cautions, the IATA [International Air Transport Association] recently downgraded the airline industry's 2011 profit outlook to \$8.6 billion from an estimated \$9.1 billion last December. A weak dollar and strong euro also adds uncertainties surrounding exchange rates. But once these multiple crises settle down, I think you're going to see a hunger for airline growth.

Let's switch gears. What new technologies excite you?

Howell: We've made significant investments in composite technology, an area that differentiates us from our competition in the manufacture of aircraft. We're proud to have recently built two airplanes out of carbon-fiber composite materials — the same technology Boeing uses on its 787. Carbon fiber is much stronger than aluminum with significant weight benefits. We'll continue to look at composite technologies as a way to reduce airplane weight and enhance performance.

Kvasnicka: First and foremost we're an engineering firm, so we're investing in new technologies that support product development activities. Compared to just five years ago, the inspection equipment, measuring machines and optical scanners on the market today have made great strides and help us do a more effective job.

Lima: We are in the process of implementing state-of-the-art tools to our aircraft in the areas of prognostics and health management, structured health

monitoring, and real-time monitoring of aircraft condition.

Demir: To increase our volume of engine repairs, we're using more sophisticated detection devices and robots. We're using new coatings and materials to improve engine maintenance.

What new regulations do you see coming down the runway?

Demir: Fuel-carbon emission regulations are getting stricter. I think this is going to affect our industry in a positive sense because tighter rules will reward the better players in the market.

Kvasnicka: We're a highly regulated industry with the FAA, IASA and other foreign civil aviation authorities looking for ways to make flying safer and more reliable. Although regulations can make it a little tougher on parts suppliers, we certainly support those activities. Fortunately, the regulatory process is very deliberative, sometimes taking years before a law goes into effect.

Generally, that gives us time to plan and implement our compliance strategies. Our approach is to stay ahead of the regulatory process. That said, I am concerned about the additional taxes and fees that airline passengers have to pay. Germany recently passed a new green tax on takeoffs and landings that could have a negative impact on flying activities.

Howell: To follow up on that, there's a bill circulating Congress that, if passed, could force single-engine pilots to pay the same fees as 737s in certain airports. Such onerous fees could hurt the single-engine, dual-piston market because of the rising cost of aircraft operation. It's not the direction we want to go.

Lima: There are new regulations that have a direct impact on our customers' operation such as IP-44, Part 26 and CASS – Continuous Analysis and Surveillance System. These rules could require OEMs to seek additional support and services, which could serve as a boost to our business.

Do you anticipate further mergers and acquisitions?

Sobral: I think the [M&A] trend is going to continue for a long time.

Quirós: A personal example would be the merger of IB and BA. [Iberia and British Airways consolidated in November 2010.] Volume and critical mass have become more relevant than ever for MROs to survive.

Demir: The recession forced several MROs to declare bankruptcy or put them in a difficult operating position. So yes, I expect the trend in joint ventures to continue, especially for companies in the U.S. and China, which still has relatively low production costs. OEMs will do the same thing.

Kvasnicka: In fact, ACS is looking to become one of those consolidators. We're actively looking at acquisition candidates. Our segment of the industry, PMA parts, has a lot of opportunity for consolidation. There are many synergy opportunities because these companies are very scalable.

Howell: In the general aviation segment, we've seen partnership models where two companies have wanted to make a significant investment in, say, engineering. Instead of each firm investing a billion dollars each to upgrade, they've split the costs and both have reaped the benefits with a lower up-front payout.

What core business lesson have you learned from the Great Recession?

Lima: Diversification, creative product development, effective cash-flow management and customer loyalty are keys to surviving any economic downturn. In 2007, Embraer launched an in-depth corporate standards program called the Embraer Excellence in Customer Experience (EECE) with the following objectives: To be a company

“ The military market behaved very differently from the civil aviation market. ”

– BRIAN HOWELL VICE PRESIDENT, HAWKER BEECHCRAFT



“What keeps me awake at night is the cost of fuel, typically the biggest part of an airliner’s cost structure.”

– DAVE KVASNICKA PRESIDENT, AVIATION COMPONENT SOLUTIONS



of excellence in which customers, stakeholders and employees benefit from the best practices in terms of business processes and derived results.

Besides productivity and profit, it also means satisfaction, growth, achievement and improvement in each employee’s life, as well as the company’s perpetuation. This program has enabled Embraer to endure the economic downturn and come out even stronger. It’s an important tool to help us shape the service experience of our customers.

Demir: The main lesson we learned was not to put all our eggs into one basket in terms of market or region. We are changing our business concept towards more varieties of components and full services, including some manufacturing and heavy modifications. The crisis taught us to be more aggressive and agile in pursuit of a more dynamic client base.

Sobral: Because the airframe industry operates with a very small marginal rate, we are trying to get longer-term contracts with our customers. In addition to pursuing components and engine business, we’re establishing relationships with smaller airlines for five- and ten-year periods. We believe longer contracts can help us better negotiate up-and-down market cycles. We also recently bought a facility in Brazil, which has cheaper hourly operational rates than either New York or Europe.

Howell: For a long time, Hawker Beechcraft’s profit model focused on selling new aircraft. The recession taught us that we can’t forget about our aftermarket business. From this point on, every decision we make will not only consider aircraft production and reliability, but also the 30-year lifespan of an aircraft. How do we maintain it? How do we make sure it’s reliable? How do we ensure the operator has a positive experience? Business diversification has probably been the biggest eye-opener for me.

Kvasnicka: For the last couple of years, we’ve been growing at a modest single-digit annual rate. During that time we’ve been reminded about our core principles. Maintaining an educated, experienced workforce can help you get through a recession by focusing on fundamentals: excellent customer service and new product development. We’re also keeping a closer eye on cash-flow forecasts, particularly with aging accounts receivables.

Any other management or operational changes?

Howell: In past years, we stored all our spare and rotatable parts in one facility in Dallas. Whether we were supporting clients in Nigeria or New York, that storage system served us well because times were good and everybody was selling aircraft in a backlog situation.

When the market changed, we had to figure a way to give our customers faster service. So two-and-a-half years ago, we began establishing spare parts facilities — storing everything an operator would need — in the Middle East, Europe, South America and Asia. We had to globalize quickly to stay in front of our customers. This year we’re making investments in South Africa, Russia and India.

What countries or regional markets do you see as strong or weak in the coming year?

Sobral: When you look at projections for Boeing and Airbus in the Far East and South America, those are two markets with opportunity.

Quirós: Following China where a significant amount of capacity has already been installed, Asia Pacific and India are growing markets where there is still potential to generate business. On the contrary,

the Middle East is becoming very difficult due, in part, to the large number of regional players.

Lima: All markets are active again with emerging economies leading worldwide growth. While Latin America, the Middle East, Africa, Asia and China are currently growing faster, North America and Europe will soon have to renew aging aviation fleets.

Demir: Although Turkey is still an emerging market, our growth in the region has been impressive over the last 60 years.

Kvasnicka: Geographically, we’re anticipating a lot of growth in Asia over the next few years, especially in China. Today a lot of Asian airlines are buying PMA parts, where not too long ago they were only buying parts from OEM suppliers.

Howell: In the private aviation segment, there are only so many people who can afford a \$10- to \$20-million private aircraft. Fifteen years ago, almost all private aircraft for business or personal use was made in North America. Today our competition is global, especially up-and-coming countries like Brazil, China, and India.

We’re also exploring attractive pockets of growth potential in areas of Central Africa, Angola and Nigeria. There’s a lot

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“ During the economic downturn, many companies cut inventories to save money. Aviall didn't. ”

– ED DOLANSKI
EXECUTIVE VICE PRESIDENT AND CHIEF OPERATING OFFICER, AVIALL

of opportunity for private and business jets in portions of Latin America. Brazil's economy is doing very well and it's a great place for us to sell aircraft. At the end of last year, we did experience a surprising uptick in the U.S. market driven by new legislation for accelerated depreciation.

What business strategies have you implemented recently or plan to in 2011?

Dolanski: We plan to invest a significant amount of capital in information technology. Strengthening Aviall's planning, forecasting, logistics, warehousing and transportation systems will enable us to get parts to customers faster and more efficiently. In addition, last year we delivered a brand-new website for online transactions.

We will continue to focus on our worldwide network of 40 customer service centers with inventory and sales professionals on hand every day. Nearly every facility is new or recently renovated, so we are clearly committed to that strategy.

Demir: Turkish Technic is planning to invest about \$500 million in our operations at the end of 2011 and into 2012. This investment is designed to triple our current capacity. On the revenue side, our target is to reach \$1.5 billion in a couple of years, with \$550 million of that in Germany.

Sobral: In 2010, TAP grew by about 6 percent. If we can match that in 2011, I would be very happy. Pursuing more work in engines and components is one of the aspects that would help us toward this goal.

Kvasnicka: We have short-term and long-term plans with specific targets for top-line and bottom-line growth for both the broad MRO industry and PMA parts sector. Our industry is largely cost-driven so we will to continue to position ourselves as a low-cost producer. It may sound trite, but our fundamental strategy

is to stick to our knitting by listening to our customers' needs with an intense focus on providing custom solutions — and try to make a buck while we're doing it.

Howell: Hawker Beechcraft has invested significant money in improving product reliability. In addition, over the past 12 months we've invested \$25 million in our global distribution system. Now, instead of having to ship a spare part all the way from Dallas to an airline operator in Abu Dhabi, for example, we can drive the aircraft part from Dubai to Abu Dhabi. That's a significant differentiator for our business.

Quirós: Iberia must continue to achieve the expected level of integration with British Airways Engineering. Cost will be a driving factor and good service is a must.

If you were Supreme Pilot of the MRO world, what single course correction would you make to improve your market?

Howell: Regulatory authorities in all regions of the world seem overburdened by numerous certification projects. If I were Supreme Pilot of the MRO world, I would make sure those organizations are properly staffed to support the needed improvements to aircraft performance standards that customers truly want. I think lightening these regulatory agencies' queues may help stimulate buying behavior that we all want to see.

Kvasnicka: I would like to see policies that help maintain more stable fuel prices. Fees and taxes on air travel are a brake on airline growth. Elsewhere, easing cross-border ownership rules would help our industry. Current constraints on cross-border airline ownership tend to drive up the cost of capital, making it tougher for airlines to expand and upgrade. Most countries limit the percent of equity that can be owned by non-domestic owners.

So, for example, Singapore Airlines could not buy American Airlines. Lufthansa may acquire an airline in Europe, but they can't come over here and pick up Delta or Continental. Synergies that might result from certain M&As are precluded. This dates back to an era when airlines were national flag carriers. Germany didn't want to have a non-German owner of Lufthansa. Likewise, in the United States, England, and so it goes.

Sobral: Throughout our industry's history, you've had OEMs, manufacturers, airlines, and MROs fighting each other. As long as that continues, we are not going to maximize success. The important point is to try to get everyone convinced that we are all in the same industry. It's not just success for one sector over another.

In a word or phrase, how do you see the recovery playing out ahead?

Howell: Cautious optimism. While we're excited about certain segments of our business in parts of the world, we don't want to get ahead of the game.

Kvasnicka: I agree with Brian. The word I would pick is tentative.

Lima: Subject to change for the better or for the worse, one has to be prepared.

Quirós: The pessimist complains about the wind; the optimist waits for the wind to change; the realist adjusts the sails. **AM**

Paul J. Lombino is a business writer based in Somerville, Mass. His byline has appeared in a number of magazines and newspapers. Paul has written on a range of business topics, including several roundtable articles eliciting the opinions of some of the nation's most recognized names in economics and investments. You can reach him at: pjlombino@aol.com

“ The pessimist complains about the wind; the optimist waits for the wind to change; the realist adjusts the sails. ”

– JOSE LUIS QUIRÓS VICE PRESIDENT, IBERIA MAINTENANCE



THE HELICOPTER SECTOR OPENS THE THROTTLE

This year's Heli-Expo provided encouraging news for the MRO outfits that keep rotorcraft in the air.

BY JOHN PERSINOS, REPORTING FROM ORLANDO

While making my editorial rounds at Heli-Expo 2011 in Orlando, I was reminded of a passage from Tom Wolfe's nonfiction account of the space program, *The Right Stuff*: "There are no accidents and no fatal flaws in the machines; there are only pilots with the wrong stuff."

This quote also applies to helicopter mechanics. Building rotorcraft requires an engineering prowess that's singularly complex. To stay aloft, these miraculous flying machines also require constant and intensive maintenance. This magazine made that truism clear, in our cover story for the February/March issue (see "The Right Stuff", our profile of Duncan Aviation's James Prater).

Heli-Expo, held March 5-8, was by all yardsticks a success. Breakfasts, luncheons, dinners, cocktail parties, press conferences, workshops — there was plenty of networking, news announcements and camaraderie at Heli-Expo. The special passion of the helicopter industry was once again on colorful display.

By attending the show and conducting interviews on the show floor, I gathered evidence of the improving fortunes of helicopter MRO.

The annual show is the world's largest exhibition and convention dedicated to the civil helicopter industry. It attracts manufacturers of helicopter airframes and engines, avionics, heliport equipment, components and parts, instruments, gauges, tools and transmissions. More than 21 percent of attendees are mechanics.

According to officials with Helicopter Association International (HAI), the sponsors of Heli-Expo, total attendance at the show this year exceeded 20,000 — a record, and up from about 17,000 in the previous year. More than 600 exhibitors showed their wares within almost one million square feet of display and meeting areas.

Held in the Orange County Convention Center, this year's show was the venue for several interactive "workshops" that allowed customers and OEMs to exchange information.

Notably, Pratt & Whitney Canada (P&WC) invited owners, operators and maintenance personnel of its PW200, PT6B, PT6C and PT6C-67C turboshaft engines to attend special MRO sessions.

The meetings were part of P&WC's "Customer Reach Out" initiative, allowing the engine maker's turboshaft customers to meet with its senior leadership. End

users and mechanics seized on the chance to make MRO recommendations to the company executives in attendance. Since the 1970s, P&WC has manufactured more than 12,000 engines for the rotorcraft sector, accumulating more than 43 million flying hours.

Reliably Strong Demand

Helicopters are lifesaving and productivity enhancing tools; demand for their inherent capabilities has remained reliably strong, despite the recent ups and downs of the world economy.

Abby Thompson, business planning executive—defense, Rolls-Royce, said that activity for her company at this year's Heli-Expo was strong and a likely harbinger of future growth. "We're really busy at the booth," Thompson said. "We're seeing great foot traffic."

Thompson's optimism was borne out by her company's forecast for the helicopter market, which was announced at Heli-Expo.

Rolls-Royce forecast long-term growth in demand for new turbine helicopters. Over the ten-year period beginning 2011, the engine manufacturer predicts that helicopter deliveries will soar, as the global



economy improves. Another impetus for growth: military and homeland defense entities around the world continue to need helicopters, which war-fighting strategists perceive as particularly adept tools for fighting terrorism and protecting borders.

In the civilian helicopter sector, Rolls-Royce forecasts that operators in most niches will enjoy robust demand for their services. Moreover, OEMs are boasting backlogs that stretch well into the foreseeable future and MRO shops are getting more work than they can tackle. Demand for the replacement of aging and retired helicopters, together with technological innovation, will further boost sales for helicopters in the civil and military sectors.

For the 2011-2020 timeframe, Rolls-Royce expects deliveries of more than 16,900 new turbine helicopters valued at \$140 billion. These helicopters will need about 27,000 new turbine engines, worth more than \$12 billion.

Rolls-Royce expects the civil market to experience modest unit growth, particularly in new entry-level turbine helicopters. The company predicts that roughly 10,900 civil helicopters will be delivered during the ten-year period, with an overall airframe value estimated at \$34 billion and associated engine value of \$4.6 billion.

Military OEM deliveries are projected to reach about 6,070 new military helicopters during the ten-year period, with an airframe value of approximately \$106

billion and an associated installed engine value of around \$7.8 billion.

Honeywell's forecast for the helicopter market is another annual statistical tradition at Heli-Expo. This year, Honeywell boosted its expectations for deliveries over the next five years by five percent. The increase amounts to roughly 4,400 turbine-powered civilian helicopter deliveries in 2011-2015, in contrast to Honeywell's forecast a year ago that about 4,250 helicopters would be needed in 2010-2014.

A Positive Kick-Off

Those statistics were greeted by the helicopter industry with an emotion that bordered on sheer relief, providing a positive way to kick-off the industry's biggest gathering of the year.

I spoke with several key players in the helicopter MRO sector, asking them to convey their impression of the big issues at the show, from the perspective of their particular niche.

Ed Mongiovi, v.p. of marketing, Able Engineering & Component Services, Phoenix, Arizona, said that economic indicators for the helicopter industry are upbeat, boding well for OEMs and MROs.

"The helicopter market is coming back and it's alive and well," Mongiovi said. "The people that I've met here are ready to do business. However, the memory of the recession is still with us. There's still a powerful urge to save money on MRO, even though the economy is doing better. The MRO companies here were hurt in

the downturn. Now, they're looking for ways to not get hurt again. They are coming out wiser."

Mongiovi revealed an impressive achievement: Able has performed 7,000 approved repairs without a single in-service failure. He said that helicopter fleets are aggressively pursuing the repair of their aircraft, as opposed to replacing them. His company helps operators realize significant MRO cost reductions, in large measure through the provision of Parts Manufacturer Approval (PMA) parts.



Attendance this year at Heli-Expo exceeded 20,000, up from about 17,000 in the previous year. More than 21 percent of attendees are mechanics.

"When Able develops PMA components we are subject to the same regulatory scrutiny as the OEM," he asserted. "In many cases, our component designs are qualified and approved by the same FAA officials who initially certified the aircraft. Considering the threat approved PMA parts pose to their sales, it isn't surprising

that OEMs spread a lot of propaganda about PMA parts not being as safe as OEM parts."

Larry Shiembob, general manager, aerospace MRO, at Timken, Moon Township, PA, noted that PMA is gaining more prevalence in the helicopter sector.

"There's constant pressure to reduce cost and turn time," Shiembob said, "We've introduced more PMA parts. We've bought several companies in the aftermarket and integrated them, to enhance our PMA offerings. We're a \$4 billion company committed to the aftermarket. We have the overhaul capability and the parts; that's quite a combination."

PMA is a controversial topic with wide ramifications for the MRO sector. To shed light on the matter, *Aviation Maintenance* magazine is producing the "International PMA Summit", November 3-4, in London. To register or learn more, go to this URL: <http://www.avmain-mag.com/pma-summit>

Steven Jordan, technical supervisor, 1800endoscope, Bradenton, Florida, said he's seeing at the show a big demand for diagnostic tools for mechanics.

"Miniaturization is the big story," Jordan said. "The smaller the better. With the new technology that's available now, it's amazing what's achievable. Nowadays, you can get a two millimeter-wide cord

through a component and videotape what you see."

Shayne Gallo, quality manager, Borescopes-R-Us, Clarksville, Tennessee, underscored the fact that helicopter mechanics are demanding miniaturization and ease of use from their equipment on the shop floor.

"Price also is an issue," Gallo said. "Despite the recent economic downturn, we've grown significantly during the last two years. That's because everyone wants equipment that's light-weight, smaller and portable."

Borescopes-R-Us touted at Heli-Expo its Pratt & Whitney Canada-approved PWC34910-109 inspection kit for PT6 engines. The kit comes with a removable SD card for snapshot and video recording. "It's compact, complete and cost-effective," Gallo said.

Jay Carpenter, technical instructor, Abaris Training, Reno, Nevada, said his company's job at Heli-Expo is to urge mechanics to reach their potential.

"Helicopter OEMs want operators to replace parts through the OEMs, rather than have operators do their own repairs," Carpenter said. "It's our task to get mechanics to feel more confident and to do their own repairs rather than go to the OEMs."

Bruce Maxwell, president, Luma Technologies, makers of cockpit displays in Bellevue, Washington, said the attendees at the show are, above all else, pragmatic. "The impetus is to keep the helicopter flying," Maxwell said. "A helicopter on the ground is not productive. Operators want me to be ready with an STC'd product they can pop in, right away."

Where's The Action?

Thomas Carleton, implementation manager, Corridor, makers of aviation service software in Austin, Texas, said that from his perspective at Heli-Expo, the action seems to be coming from overseas.

"The international market is moving faster," Carleton said. "A lot of demand and interest at this show is coming from international groups. It seems that the European and Asian economies are improving faster and earlier than in the United States."

Rick O'Quinn, sales manager, Aircraft Belts, Creedmoor, NC, said military demand continues to be manna from heaven for the helicopter industry.

"We're seeing a spike in military demand," O'Quinn said. "We've found lots of opportunity in new programs. More and more OEMs are pulling me in, because they're not happy with their current supplier. The recent slowdown gave OEMs a chance to catch their breath and look at alternate suppliers. When activity is booming, they're too busy to explore their options. So we've actually benefited from the recent downturn."

Charlie Elkins, senior managing director, Marketing & Supplier Services, Aviall, Dallas, Texas, said the helicopter market's rebound is coupled with the increasing digitization of services, putting intense pressure on parts suppliers to quickly modernize their web offerings and search engines.

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More than 600 exhibitors showed their wares within almost one million square feet of display and meeting areas.

"We're seeing signs of revival," Elkins said. "That's encouraging. Everyone has just been trying to get by the last two years. We see a huge opportunity in automation and it hasn't fully materialized yet. Across the aviation industry, and not just in helicopters, people really aren't investing in the technology that they need."

Elkins points out that Aviall, one of the world's largest distributors of new aviation parts, recently revamped its web site but the work isn't over.

"We're now updating it, to make it more intuitive," Elkins said. "We've always dealt with people who've known what they're looking for, but younger people are coming along and the demographics are changing. The mechanics using our site now are expecting a Google experience. We're not trying to be Amazon or Facebook, but our users want instant gratification nowadays and they have certain expectations when it comes to their experience with the Internet. We must adapt to this reality."

South of the Border

Susan Roberts, program manager, security and survivability, with the Individual Protection Systems division of BAE Systems, said that she's seeing helicopter demand emerging from the usual suspects.

"We're not seeing really strong rotorcraft-related growth yet from North America, but there's really a large surge coming from South America," Roberts said. "The helicopter sector, especially in Brazil, is booming. Helicopter OEMs are taking advantage of big opportunities there. Operators in that region of the world also are interested in sustaining the life of their current helicopters and they're consequently refurbishing interiors. A lot of activity is being generated nowadays in helicopter interiors."

StandardAero, Tempe, Arizona, marked its 100th year in business, with festivities at Heli-Expo. StandardAero is the world's largest independent small gas turbine engine and accessory repair and overhaul facility. Kyle Hultquist, v.p. of marketing, said: "We're so singularly focused on helicopters, we've successfully weathered the downturn."

Indeed, StandardAero was busy in Orlando, trumpeting expansions of its network. The company announced that it has signed Servicio Tecnico Aereo de Mexico of Mexico City as an Authorized Support Center (ASC). It also announced that HeloAir, in Richmond, Va., would serve as an ASC.



Heli-Expo attracts manufacturers of helicopter airframes and engines, avionics, heliport equipment, components and parts, instruments, gauges, tools, and transmissions.

Brad Martin, director of marketing, Aero Products Component Services, Show Low, Arizona, said that strong purchase plans in South America and Asia are accelerating the helicopter market's momentum.

"South America, in particular, is a great source of prosperity for the helicopter market, which in turn drives MRO work, of course," Martin said. "That part of the world still has infrastructure problems, making helicopters important. Deep water oil and gas transportation is a big driver, too."

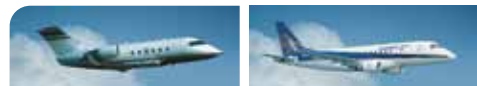
All indicators at Heli-Expo in Orlando pointed to increased MRO demand, as helicopter OEMs and operators go full throttle and the economic downturn recedes into the distance. **AM**

John Persinos is editor-in-chief of *Aviation Maintenance*. You can reach him at: persinos@yahoo.com



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An Air France A380 sits with room to spare inside AFI KLM E&M's Paris hangar.

HOW FORM FOLLOWS FUNCTION: ADVANCES IN MRO HANGARS

Computer technology, green environmental systems and the demands of large aircraft like the A380 are changing how new MRO hangars are being built today.

BY JAMES CARELESS

Once upon a time, MRO hangars were drafty wooden barns that were littered with hand tools, oily rags and spare parts. But things have changed.

Today's MRO hangars are clean, climate-controlled and well-organized vast spaces featuring the latest in customized machines and computer technology.

That's not all: The newest hangars are being built to maximize energy efficiency, both for public relations reasons and to save heating/cooling costs.

"The biggest trend we see is the desire for customers to achieve LEED (Leadership in Energy & Environmental Design) certification on their buildings or to build 'green' hangars," says Pierre Varlamoff, Megadoor's Manager of Sales for Civilian Aviation/Aircraft Manufacturing.

Megadoor is a leading supplier of hangar doors worldwide. "Another big trend is improving technicians' work environment with the goal of increasing quality and productivity," he adds. "This is done by climate controlling the hangar and providing natural day lighting of the hangar."

In those instances where customer demands require immediate facilities, MROs are coping by setting up temporary fabric hangars. "For those short-term projects — like an

AOG repair — temporary structures work well, as they can be installed and fully functional in less than one week," says Beth Wilson, Marketing Manager with Mahaffey Fabric Structures. "Semi-permanent structures, such as an engineered tension structure, are often used for MRO facilities," she adds. "For example, if an airport is not made for a stand-alone MRO and there's a plan to bring in a Boeing 737 when it's used to housing G4s, this is where a short-term hangar provides the best option. Or say there's a ground lease coming to the end of term and there's no plan for a permanent hangar, or perhaps there's a need for an expansion capacity; these are just two more reasons to install a temporary or semi-permanent structure."

To find out where the science of hangar technology is going, *Aviation Maintenance* contacted major MROs worldwide. Here are the stories they told us:

Abu Dhabi Aircraft Technologies' Colossal New Hangar

"Colossal" is the only word that fairly describes Abu Dhabi Aircraft Technologies' (ADAT) new A380 hangar at Abu Dhabi International Airport, in

the United Arab Emirates. In fact, given that the C-shaped triangular hangar can handle three A380s at a time, colossal may be an understatement.

"The C-shaped triangular design concept was conceived to maximize operational effectiveness, reduce project cost and allow for the future expansion and development of the ADAT land bank," says ADAT CEO Jeremy Chan. "Specialists planned the facility to minimize distances between the aircraft being maintained and the workshops, offices and amenities and staff facilities optimizing operational efficiency."

Everything associated with this hangar is huge, including the vertical lifting doors provided by Megadoor. Each of the three five-section doors measures 115 meters wide x 26 meters high. These doors help maintain cool air in the hangar, which is fully air conditioned to counter the region's desert climate, plus the ability to lift them only as much as required minimizes cool air loss.

"The reduction of these losses is particularly important in Abu Dhabi when the external temperature can be in excess of 50 degrees in the summertime," says Chan. "The superior sealing achieved with the vertical rise doors also reduces dust

ingress which is especially important during dust storms. When moving aircraft and vehicles in and out of the hangar it is only necessary to open those doors required, and to the height required, to allow the movement which again avoids loss and conserves energy."

The ADAT A380 hangar project stands as Megadoor's largest order to date, and exemplifies the company's success in this region. "Our hottest markets continue to be the Middle East and Asia," notes Megadoor's Pierre Varlamoff. "We are also getting excited about opportunities in Eastern Europe and Russia."

Technologically, ADAT's A380 hangar is truly state-of-the-art. "Each hangar bay has dedicated satellite control rooms, tool cribs and stores," Chan says. "Goods hoists are centrally located in each bay with the capacity to move aircraft components between floors."

Service pits have been built into in the hangar floors for utility supplies, covering capabilities such as electrical power, compressed air, mass airflow, preconditioned air, fuel exhaust and water. "The arrangement of the pits provides direct delivery of services to the work area rather than delivering these

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services from mobile equipment or from the internal walls of the hangar building," Chan says. "As well as improving operations, it obviates the need for pipes and cables being on the work area floor."

AFI KLM E&M Makes Room for A380

With Air France planning to have 12 A380s in its fleet, having a properly-equipped MRO facility is a must. This is why Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) has built the extra-large Hangar H6 at Paris Charles de Gaulle airport. Designed to hold a single A380 plus two short-haul aircraft at any one time, Hangar H6 has a trapezoidal shape that is 100 meters long, 110 meters wide and 40 meters tall.

hatches," Page says. "This allows us easy access to the cabin, for seat removals and reconfigurations."

A sophisticated crane system covers the entire hangar space, allowing components to be removed and replaced efficiently. "We also have a centralized ventilation and hydraulic power system," says Page. "The A380 consumes more than 300,000 kilowatts when fully powered up, and we have to be able to supply that power externally during servicing."

As big as the current A380 is, AFI KLM E&M's Hangar H6 has been designed to handle the "stretched" version of this superjumbo. Known as the A380-900, this plane will be capable of carrying 900 passengers in an all-economy layout, or 650 in a mix of service classes. "Should it be built

Built by Iberia and the Spanish engineering firm Assad Desarrollo, the new Iberia hangar is designed to be high-tech, safe, and efficient. But achieving these goals did not come easily: Iberia and Assad Desarrollo had to devise a space that could provide enough headroom for the A380's tail, plus handle heavy floor loads and the weight of the massive 40-ton doors.

"To overcome these challenges, a 2,000 tonnes steel structure was developed," says Iberia Maintenance spokesperson Ángel Saucedo. "A 3D grid, consisting of 12,800 bars and 3,000 structural spheres covering the entire hangar, now carries 1,100 of those tonnes." The resulting oval-shaped structure is supported by two structural arches set inside the hangar and another one located outside,



Iberia Maintenance's Barcelona hangar during and after construction, revealing its innovative structural design.

"It covers 25,800 square meters in all," says Hervé Page, AFI Vice President for Line Maintenance & Airframe Engineering. "The weight of the air alone inside Hangar H6 is 600,000 kilos."

Hangar H6 contains a complete docking system for the A380, allowing work to be performed simultaneously on the airframe, wing, and engines. "We have a mezzanine raised five meters above the floor that gives us complete access to the A380's rear

one day, we will be ready for it," says Hervé Page. "We have the space!"

Iberia Maintenance's Cutting-Edge Barcelona Hangar

Iberia Maintenance's new 13,200 square meter hangar at El Prat de Llobregat Airport was built to handle an increase in MRO business in Barcelona. The resulting airy facility is extremely flexible. It has enough space to service one A380; or two A340s; or three Boeing 757s; or four A321s.

on the top of the main doors. "All the bars and spheres were designed mechanically and geometrically to provide a strength-to-weight ratio higher than conventional structures used in this type of work," he says.

One of this hangar's unique features are its 4,000 square meter curved doors, which are divided into 12 sectors of 25 meters each one. Their geometry and surface makes them the largest curved doors ever installed in a Spanish hangar!

The new Iberia Maintenance hangar is equipped with the most advanced maintenance facilities," Saucedo says. "These facilities provide everything needed to carry out the maintenance activities, by means of eight pop-ups distributed all around the surface — compressed air, electric power at 400 Hz, grounding, voice and data," he says. "In addition, the hangar is equipped with four cranes and telescopic platforms suspended from the roof structure."

To save energy during its round-the clock work schedule — in an unpartitioned space of 4,000 cubic meters — the Iberia Maintenance hangar has been designed to take maximum advantage of natural lighting. This has been achieved by using window-filled "curtain walls built on both sides and another one in the land-zone," says Saucedo. "This way, a great natural lighting is brought in the appropriate areas, as well as reducing excessive sunlight in the others." Thanks to the hangar's tall ceiling, summer heat flows away from the work areas, and is vented out of the roof using ceiling fans. In the winter, an underfloor heating system connected to a solar power systems provides economical warmth.



Jet Aviation Basel: Room for an A380 and a Boeing 747-8 — At The Same Time!

Jet Aviation Basel (Switzerland) is one of the world's top aircraft completion centers. It has everything needed to outfit aircraft as large as an A380 or Boeing 747 down to a range of business jets. Its Basel facilities include in-house design and engineering departments, on-site cabinetry, carpet, electrical, upholstery, fiberglass and paint shops. The hangar features system integration and installation capabilities, a customer center with a lounge, and full aircraft ground and flight test capabilities.

In November 2007, Swiss firm Losinger Construction was hired to build a giant new hangar for Jet Aviation Basel at

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Summit Aviation's hangar complex in Middletown, Delaware.

EuroAirport Basel-Mulhouse-Freiburg. The 10,000 square meter wide-body hangar was designed to house an Airbus A380 and a Boeing 747-8 simultaneously, as well as a number of mid-size aircraft.

"Building started in earnest in December and was finished within a month," says Eugen Hartl, Jet Aviation's vice president of market development. "On March 30, 2008, the entire 10,000 square meter roof, which weighed more than 1,500 tons, was lifted in place, and two weeks later the doors were installed. To ensure customer's aircraft were totally protected, final tests involved flooding the hangar and checking the sophisticated fire detection and prevention systems. The hangar was finished April 30, 2008, and we inducted the first aircraft, an A340-600, on-time May 1, 2008."

Since being opened, the new Jet Aviation Basel hangar has already completed several Airbus 319ACJ, A320, A340 and Boeing 737, 757 and 747-400 aircraft. "The wide-body hangar was an important milestone in the largest expansion of Jet Aviation Basel in its 40-plus year history," says Hartl. "On any

given day, the facility at EuroAirport hosts an average of more than 70 head-of-state or corporate aircraft for completions, refurbishment, painting or maintenance services."

Lufthansa Technik's A380 Hangar: The More, the Merrier — and the Greener

Two A380s or three Boeing 747s: That's how many superjumbo aircraft Lufthansa Technik's A380 MRO hangar in Frankfurt, Germany can accommodate. And that's just the beginning.

The current 25,000 square meter facility "is designed to be doubled in size when more space is required," says Lufthansa Technik spokesperson Wolfgang Reinert. When this occurs — possibly in the next few years — the Frankfurt facility will have space for four A380s, or six Boeing 747s, or a mix of the two.

Today, Lufthansa Technik's A280 hangar measures 180 meters wide and 140 meters deep, with an internal height of 27.5 meters. "The most striking architectural feature of the hangar is the positioning of its main load-bearing structure on the outside," Reinert notes. "This meant the ceiling could be constructed as low as possible above the required clearing height for the aircraft's vertical stabilizer."

The back 20 meters of this hangar are occupied by a seat shop, sheet metal shop, tool stores, ground support equipment repair section and offices. A 270-tonne (595,200 lb) taildock was installed in late 2009. It can be used with Boeing 747-400/-8 and A330/A340 aircraft as well.

"The maintenance staff uses mobile platforms to access the areas on the wing and fuselage, which are

out of reach from the taildock," says Reinert. "Cranes are used to lift personnel working on the crown of the aircraft. Some of the cranes also have to have a maximum lift of 12.5 tonnes for engine work on the Rolls-Royce Trent 900 engines of the A380."

The A380 hangar's doors and parts of the roof are fitted with translucent panels, to take full advantage of natural light. Nearly all of the mobile platforms run on electricity, except for the diesel-powered high level loaders used to remove upper-deck seats. "Their use is very limited and all other vehicles are kept outside," says Reinert. Meanwhile, "no painting — except for small patches to cover repair work — is carried out, and all waste material is handled in accordance with the strict German requirements."

Summit Aviation's New Hangar To Go Wireless

Summit Aviation of Middletown, Delaware (U.S.) is in the midst of a 7,246 square meter plant expansion. When completed later this year, the new facility will have hangar, paint shop, and warehouse/office space. The hangar will have enough space to service eight CH-47 Chinook model aircraft or three Bell V-22 Osprey aircraft at any given time.

"We are integrating significant work flow and safety technologies in our new facility, in order to better serve our customers," says Summit Aviation President Robert Fitzpatrick. "We recently completed the installation of a new enterprise software application across the company, which will be supported by a completely wireless environment to maximize data sharing, material tracking and work order handling. Our paint facility will be equipped with latest environmental controls for managed cure of paint finish, and the new complex is protected by a state of the art fire suppression system."

The Delaware State Fire Marshall has already certified Summit's improved fire suppression system in its existing hangars. Summit's expansion is scheduled to be completed during the summer of 2011.

As the economy improves, MROs can be expected to launch a host of new hangar expansions in the coming year and beyond. **AWM**

James Careless has been covering the MRO sector for the last 15 years. He can be reached through abroadbent@airspace-media.com.



Jet Aviation Basel's new hangar has space to service an A380 and B747 at the same time.

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THE FUTURE FOR AIRLINE PARTS

With savings of up to 40% over OEM parts, the usage of PMA parts has become accepted practice in America but in Europe they are still a very small percentage of the overall parts market. Now that airline maintenance companies including Lufthansa Technik and BA use PMA parts, it is time to re-look at the issues surrounding it.

According to Tom Tran of AeroStrategy, the PMA market began to recover in 2010 with a 7% growth rate and estimated double-digit growth through to 2014 to reach a value in excess of \$600m. Robust growth of 11% is expected to show in 2011. Most of this growth is will be in the components and airframe areas, not engines. By 2014, PMA penetration is expected to reach 3.3% of total material consumption. By 2019, AeroStrategy estimates PMA penetration will reach about 5%.

Aviation Maintenance magazine and key partners have joined together to bring you the first International PMA Summit based in Europe. This comprehensive, independent event is designed to give you clear insight into the opportunities and possible pitfalls associated with PMA. As a net exporter of engine overhaul, Europe is a very dynamic section of this growth

market. The conference programme is currently being finalised but will cover the following issues:

- ▶ When could you pick PMA products over OEM?
- ▶ The bottom line: what could you save?
- ▶ Stock Cost: order quantities, inventory levels & speed of delivery issues
- ▶ Life-cycle cost savings – cost of parts, ease of fit, durability & repair or replace
- ▶ Opportunities for customised parts & improvements over known service issues.
- ▶ Leasing & PMA
- ▶ Certification: Navigating the regulatory maze.
- ▶ FAA & EASA approval
- ▶ New legislation and guidelines
- ▶ Guaranteeing airworthiness

As well as the formal conference, the summit offers attendees the opportunity to attend a networking breakfast and cocktail reception. Meet the key players and discuss the issues in a closed-shop environment. The breakfast includes an anonymous survey designed to identify ways that sections of the industry can work together better. The results of the survey will then be presented and discussed that day. Don't miss this opportunity for a candid dialogue and your chance to change the way the industry works.

Confirmed Speakers Some of the confirmed speakers at the event are detailed below. For a full list of speakers



Jason Dickstein
- President of the Modification and Replacement Parts Association (MARPA)

Dickstein has served on the Board of Directors of the PMA trade association, MARPA, since its inception in the 1990s and has served as its President since 2007. As a lawyer in the Washington, D.C. area, Dickstein has counseled aircraft parts distributors, repair stations, air carriers, and aircraft parts manufacturers on compliance and enforcement issues, and he has advised many of the aviation industry's trade associations. Dickstein works with regulators to help establish safe and sane policies and he has served on rulemaking committees in both the United States and Europe.



Joy Finnegan -
Editor-in-chief *Aviation Maintenance Magazine* – PMA Summit Conference Chair

Joy has been involved in the aviation industry since she was 15, when she decided that she wanted to learn to fly. She attended Embry-Riddle Aeronautical University and upon graduation pursued a career as a professional pilot, starting as a flight instructor, moving into charter, then commuter airlines, and eventually to a regional airline. She also worked as a contract administrator for two aircraft manufacturers, Cessna and Galaxy/Gulfstream. She took charge as editor-in-chief of *Aviation Maintenance* magazine in November 2006, after serving as its managing editor and has recently returned to us after a stint with *Rotor & Wing Magazine*.



David Doll -
Aviation consultant / United Airlines

He has held key technical manager positions at United Airlines, including process engineering, fleet technical services, manufacturing engineering and component re-manufacturing. He holds a B.S. degree in mechanical engineering from Trinity College and an M.S. degree in mechanical engineering from the University of Santa Clara. He is the author of *The Airline Guide to PMA*.

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John Goglia - Former NTSB board member & Independent Air Safety Consultant

John Goglia served as a member of the U.S. National Transportation Safety Board (NTSB). With more than 30 years experience in the aviation industry, he was the first NTSB Board Member to hold an FAA aircraft mechanic's certificate. As a Board Member, Goglia distinguished himself in numerous areas of transportation safety. He played a key role in focusing international attention on the increasing significance of aircraft maintenance in aviation accidents. Also as an NTSB Board Member, Goglia participated in numerous air, rail and bus accident investigations.



Richard Brown - Senior Associate with AeroStrategy at the EMEA office in Amersham, UK

Richard has 10 years experience in aerospace, including five years consulting with AeroStrategy. During this time he has managed projects with a broad global client base including airlines, manufacturers and training suppliers. Richard's areas of special interest include mechanic training and aircraft component manufacturing and support. His career previous to AeroStrategy included various market analysis roles at TRW Lucas Aerospace and Goodrich Corporation. Richard has extensive aerospace market forecasting experience and developed the AeroStrategy business aviation maintenance market forecast. Richard holds a BSc in International History from the London School of Economics and an MSc in Air Transport Management from Cranfield University.

FINDING THE MECHANICS YOU NEED

THE MRO SECTOR CONTINUES TO REPORT A SHORTAGE OF SUFFICIENTLY TRAINED MECHANICS. HERE'S HOW TO FIND, TRAIN AND RETAIN THE RIGHT TALENT.

BY TOM SCARLETT

MROs are in a bind these days: they've been squeezed by this endless

recession as much as anyone, yet the government and the media are scrutinizing airplane maintenance more than ever. In this environment, recruiting, training and retaining the best "wrench turners" you can find is as crucial as it's ever been.

The commercial aviation industry will require 596,500 maintenance personnel over the next 20 years to accommodate the strong demand for new and replacement aircraft, according to a crew assessment forecast done by Boeing last year. Airlines will need an average of 30,000 new maintenance personnel per year from 2010 to 2029.

If the industry doesn't stay ahead of the curve, it risks being caught without the qualified personnel it absolutely cannot do without. "We've found that about 65 percent of our member companies have had difficulty finding skilled workers over the last two years," Christian Klein, executive vice president of the Aeronautical Repair Station Association (ARSA), told me recently.

But the stakes are so high in airplane maintenance that companies are understandably cautious about making wholesale changes to their policies. Just last month the PBS series *Frontline* aired a report called "Flying Cheap" (how's that for subtlety?) that basically made the case that contract maintenance work in aviation is not subject to the same standards as work done by the airlines themselves. Any changes in how the industry's mechanics are recruited and trained will have to be done carefully.

Also, the job market for mechanics has changed enormously in the last generation. Like police and firefighting jobs in the old Irish and Italian neighborhoods of Boston and New York, airplane mechanic positions were often handed down from father to son and seen as employment for life. But in today's turbulent economy, employment for life is something you read about in history books. And increasingly the work is being sent offshore to places like El Salvador and Argentina.

Is Automation the Answer?

Perhaps the most important trend in maintenance personnel training is increased automation. One way to save money on training of mechanics is using advanced technologies like simulators, which enable the trainer to impart a wide range of knowledge relatively quickly to a large group of trainees. Simulators have long been used in the training of pilots, but now the technology is being adapted for maintenance workers as well.

But for a long time, the regulatory agencies in Washington were skeptical of such an approach. With so many human lives on the line, regulators would ask, how can we settle for anything less than hands-on training with the actual airplanes and parts?

In recent years, however, technologies have improved to the point where an increasing number of wrench turners are getting their training in a high-tech manner, at least initially.

One of the objectives of the new training systems is to replicate the airplane — not just the flight deck — and bring real, performance-based information to pilots and mechanics.

One example is the maintenance training classes currently being used for Boeing's 787 Dreamliner. The maintenance personnel

spent more than 30 days learning how to maintain the world's most advanced commercial jetliner, including 20 days of theoretical training, two days of engine runs and taxi testing, five days of practical training and five days of troubleshooting exercises. To conclude the training, students conduct component identification exams on production airplanes, as well as troubleshooting exams in the full flight simulator.

Boeing Training & Flight Services, a division of Commercial Aviation Services, Boeing Commercial Airplanes, says it has developed an all-digital, Internet-based teaching system for maintenance training, along with training tools that connect real-time to a virtual airplane and airplane systems.

The advances in laptop and personal tablet computers of recent years have made a big difference in how maintenance personnel are trained. Systems now exist that can provide three-dimensional images of crucial aviation equipment, allowing for more comprehensive classroom training.

New software can conduct an initial assessment of a student's level of knowledge and a subsequent "prescription" of training materials to prepare the student for classroom training. This ensures the student's understanding of certain system concepts (such as central maintenance computer signals, and crew-alerting system messages) before the formal classroom training begins.



An engine under repair at a Jet Center MFR hangar. Jet Center operates an apprenticeship program for mechanics, through its local community college.

The foundation training is delivered on a DVD or via the internet. Learning management systems monitor the results of a student's assessment test, determines training modules that must be taken, and monitors completion of these modules.

For a long time computer-based training was in a kind of regulatory limbo, as the Federal Aviation Administration (FAA) did not specifically authorize it but did not have regulations against it either. In the old days, frankly, the technology simply wasn't sophisticated enough for serious maintenance training to be done this way.

But as computer technology has gone from expanding to exploding in the last decade, the regulatory agencies have given the green light. An FAA spokeswoman told me that the agency has no general rule against automated training, as long as graduates of these programs can meet the standard tests required of all aviation mechanics.

The Apprentice

Another interesting approach is the increased use of apprenticeship programs, which can impart crucial skills while also creating loyalty between the new employee and the company.

"We have actually started an apprenticeship program through our local community college," Gary Hudnall, general manager at Jet Center MFR, said. "It allows us to train technicians to our standards. We have noted several disconnects between FAA requirements and what is actually taking place in the industry today. So we have developed our own curriculum to enable us to better train technicians to today changing environment."

This also allows the company to find people with a good work ethic and teach them a new trade, Hudnall continued. "It also allows us to keep the work force local. No added expenses to move people around. For my end of the business – corporate aviation – it has allowed me to find people with excellent customer service skills also. That's very important in my business."

On a rather larger scale, British Airways is working with three London colleges—Farnborough, Kingston and Brooklands—to create an apprenticeship program designed to bring in 80-90 new hires per year beginning in 2011. After completing a year at college, students in this program will become full-time employees of British Airways, based at Heathrow. They will work in British Airways engineering departments to gain real-world experience for another two to three years.

Like so many companies, Pemco World Air Services is also looking at ways to reduce its training costs. The number of training hours required will not decline, but some of them will be moved off company time under a new system. The strategy involved using an Internet-based training tool where technicians could do some of their training from home, on their own time. Executives are also looking at ways to incentivize workers to do the training from home.

Christoph Meyerrose, director of technical training at Lufthansa, says the most important trend in the field is from "knowledge-based" training to "competency-based" training. In other words, new employees often showed up with theoretical knowledge but not the kind of skills that enabled them to immediately perform the necessary tasks. The



A mechanic training class for the Boeing 787 Dreamliner. These maintenance personnel spent more than 30 days learning how to maintain the world's most advanced commercial jetliner.

new training programs, both automated and otherwise, are trying to address that.

Who Pays?

AAR Aircraft Services, an MRO facility in Oklahoma, has increased its training program from a seven-hour program to one that runs 40 hours. Officials at the company worked with the Spartan College of Aeronautics to develop what they call a "bridge" program, which takes a worker fresh out of school and proceeds to impart the specific skills he will need to be a fully functional MRO technician.

Whether the program ultimately will be a completely separate course—several of additional training after completion of the program—or whether some or all of that information could be incorporated into the standard training is under review.

One interesting aspect of the program, and something that has broader application to the whole issue, is that the financial burden is shared between the trainees and the trainers.

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If the program is structured correctly, it's a win-win: the workers get valuable skills that can translate into good incomes once they acquire a few years of experience, and the MROs get to reduce the costs on their bottom lines.

Perhaps you've heard of the current economic downturn being described as a "man-cession"? We've seen enormous job losses in fields like manufacturing and construction, while traditionally female-dominated sectors like education and health care have been hit much less hard. (I'm not trying to be chauvinistic — there are certainly women who have had fine careers in aviation maintenance — but it's just a fact that the field remains overwhelmingly male-dominated.)

The result is that there are an awful lot of men out there looking for work, many with construction backgrounds and skill sets that could be translated to the aviation business — with the right amount of training.

As in so many comparable industries, increasing offshoring of jobs is rampant, at least in the United States. Starting pay at maintenance contractor Aeroman in El Salvador is around \$4,500 a year, while veteran workers take home perhaps \$15,000. In America, by contrast, airplane mechanics earn an average of \$55,000 annually.

Just recently, the U.S. District Court for the Eastern District of Wisconsin ordered Frontier and Republic Airways Holdings Inc. to adhere to a collective-bargaining contract

with Frontier mechanics and stock clerks. "This is a tremendous victory that saved 325 good-paying jobs in the U.S.," said Teamsters General President Jim Hoffa. But how many jobs are lost in the long run if unions are unwilling to adjust contracts to reflect current economic realities?

Offshoring is becoming easier thanks to the increasing number of bilateral aviation safety agreements, which reduce regulatory obstacles, making it easier for repair stations to serve foreign customers. But these agreements are facing threats in several countries.

On January 28, ARSA launched a survey to assess the economic impact of bilateral aviation safety agreements (BASAs). This is part of an on-going effort by ARSA and other associations to obtain economic data that will inform lawmakers, regulators, media, and other key audiences about the aviation maintenance industry.

After Training — Retaining

Of course, finding potential trainees and giving them the skills they need is just one side of the equation. After investing in these workers, how do you go about retaining them?

The economic situation makes it tougher than ever. Income for aviation industry technicians (measured in real, inflation-adjusted dollars) has been stagnating, or in some cases even falling, for more than a decade now. With company balance sheets already strained to the breaking point, how do you keep your best employees from jumping ship (sorry about the nautical metaphor)?

One way is to allow the workers more of a say in how the company is run, particularly as it affects their own jobs. After all, these guys are seeing the problems from the ground up — literally. Worker-management councils, flexibility on benefits, opportunities for further education that could lead to promotion — these are all crucial management tools in an age of reduced revenues.

When recruiting new employees, you can never afford to ignore drug and alcohol issues. The FAA just recently hit San Antonio Aerospace LP with a penalty of more than \$1 million for violating the Department of Transportation's Workplace Drug and Alcohol Testing programs. The agency alleges San Antonio Aerospace failed to conduct required pre-employment drug tests and receive verified negative drug test results before hiring 90 people to perform safety-sensitive functions, a violation of federal safety regulations.

"Required pre-employment drug testing is an important part of the government's effort to ensure safety at all levels of transportation," said U.S. Transportation Secretary Ray LaHood. "We take these violations very seriously."

Whether they involve automation, apprentice programs or other new approaches, new methods of training the industry's mechanics are arising all the time. And the workers are out there. **AM**

*Tom Scarlett is a contributing editor to the magazine. He has been reporting on the business world for more than 20 years, and is the former managing editor of *Forecasts and Strategies*. He also has covered transportation issues for the Bureau of National Affairs, based in Washington, DC. Mr. Scarlett is a graduate of Georgetown Law School. You can reach him at: tomsclar@yahoo.com*

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FUD AND THE FEAR OF FLYING



Certain engine OEMs have raised FUD to a sublime art form. What is FUD? It is "Fear, Uncertainty, and Doubt", a not-so-subtle propaganda campaign that preys upon the natural and necessary conservatism of aircraft maintenance personnel. FUD is designed to reduce competition by discrediting the competitors for spare part sales.

I recently ran across this account in an industry magazine:

"The company (the OEM) related the following story: In 2009 a CFM56-5 LLP failed in operation. This particular engine included a mixture of CFM parts, PMA parts, and non-CFM (DER) repaired parts. This combination from multiple suppliers resulted in changes being introduced to the engine operating system. As a result the LLP was operated under conditions that had not — and could not — have been evaluated by CFM."

GUEST
OPINION
COLUMN

BY DAVID DOLL

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This is a classic! Note that there is no specific information in the statement. What was the responsible PMA part or DER repair? What uncontrolled conditions caused the failure, and how? What was the FAA response? When can we expect the airworthiness directive? All we have is a vague statement tying the competition to a catastrophic and dangerous failure.

As an engineer, I prefer to evaluate facts rather than rumors. Facts are the best weapons to combat FUD. Let's take a look at this OEM concern that a "combination from multiple suppliers resulted in changes being introduced to the engine operating system".

OEMs do not now and never have manufactured everything that they sell on their products. They have always relied on a combination of internal manufacturing and multiple external suppliers. Over the last two decades, the OEMs have emphasized outsourcing to external suppliers to the extent that they have become systems integrators rather than manufacturers.

If you own an IAE or CFM engine, different portions of the engine were designed and built by different companies on different continents. In spite of the potential communication difficulties, these are highly successful engines that perform very well.

Furthermore, any mass produced item uses dimensionally controlled parts that are interchangeable. (If they weren't interchangeable, the OEMs couldn't sell spare parts.) It is not uncommon to have an original engine part manufactured by multiple external suppliers according to prints supplied by the OEM.

PMA suppliers act in the same manner as any OEM supplier. Instead of receiving a print from the OEM, however, they develop their own print using samples of OEM parts and reverse engineering techniques. In many cases these reverse engineering techniques produce parts that have tighter tolerances than the OEM originals.

How well do the PMAs function? The FAA conducted a Repair, Alteration, and Fabrication (RAF) study in 2008 to determine the facts. They reported:

"...the team did not find substantive evidence of failures or unsafe conditions arising from non-TC/PC holder (non-OEM) developed data. The general population of PMA parts and non-TC/PC holder repairs, alterations has increased substantively in past years particularly in the commercial aviation sector yet the occurrence of service difficulties and airworthiness directives on such parts for design or compliance shortfalls have not increased proportionally."

My own informal study showed that since 1992, 287 Airworthiness Directives have been issued for turbine engines. Exactly three of these included PMA parts, and two of these were for PMA parts that so closely followed the OEM design that they built in the OEM problems that caused the ADs.

The conclusion is simple. Data and facts beat rumor and hearsay. Respond to FUD campaigns with penetrating questions, and demand the facts. Don't be surprised by the embarrassed silence that follows. **AM**

David Doll is an aviation consultant who has held key technical manager positions at United Airlines, including process engineering, fleet technical services, manufacturing engineering and component re-manufacturing. He holds a B.S. degree in mechanical engineering from Trinity College and an M.S. degree in mechanical engineering from the University of Santa Clara. He is the author of *The Airline Guide to PMA*. You can reach him at: DDoll@aerostrategy.com

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BURDEN FALLS ON INDUSTRY TO PROMOTE EXPORTS

GUEST
OPINION
COLUMN

A leading voice in the aerospace industry discusses how the MRO sector can help improve the U.S. balance of trade.



BY JASON DICKSTEIN

Aerospace reflects the number one positive contributor to the United States balance of trade. It is an export sector that has continued to produce positive numbers, even as other U.S. export sectors have lost steam.

On March 11, the White House issued an Executive Order that takes steps to promote exports. The stated purpose of the program is "to facilitate the creation of jobs in the United States through the promotion of exports." A close look at the initiative, though, reveals that our industry must help itself if we expect exports to bail out the U.S. economy.

Over a year ago, during the State of the Union Address, President Obama pledged to double exports. This pledge was known as the National Export Initiative (NEI).

On September 16, the White House released the NEI Report. The report explained that U.S. exports must grow from \$1.57 trillion in 2009 to \$3.14 trillion by 2015, to meet Obama's goal of doubling over five years. While this might look like an ambitious goal, the administration is starting from a trade dip as their baseline.

In 2008, the U.S. exported \$1.84 trillion in goods and services. Merely returning to 2008 levels would reflect a 17 percent increase in exports — and, in fact, in 2010

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the U.S. exported \$1.83 trillion in goods and services (this rounds up to 17 percent).

If we sustain a 17 percent increase each year for five years, we would be able to more than double exports during the five-year period established by the president. U.S. Trade Representative Ron Kirk recently announced that the latest export data was encouraging. It certainly seems to reflect the president's five-year plan, but it really reflects a return to 2008 levels after a 2009 export nosedive.

The real challenge stands before us. Can the U.S. continue to increase exports at this rate? One preliminary answer to this question lies in the past 20 years' worth of export data.

What is the real rate of increase among exports? If we consider the 2008 high-water mark of \$1.84 trillion in exports, and work backwards, it is clear that it took us a dozen years to double our exports. Between 1988 and 2008, we quadrupled our exports in 20 years. Therefore, the idea of doubling exports over five years essentially means that we need to increase exports at a rate twice the historical growth rate. Even with the "head start" created by using the 2009 dip as a baseline, this is still a pretty tall order.

The President's March 11 Executive Order creates an Export Promotion Cabinet (EPC), made up of the heads of a dozen different agencies as well as presidential advisors on national security and economic policy. This group is supposed to develop and coordinate the implementation of the NEI.

One problem with this is that the group was established 14 months into the five-year plan, and they are tasked with establishing the strategy for accomplishing the NEI's goals. A well-thought-out export promotion plan probably should have started out with a plan.

The EPC is expected to have a written plan in September, which is then end of fiscal year 2011. This means that it will be FY 2012 before the administration actually has a plan for increasing exports.

MARPA has been working with the International Trade Administration (ITA) on strategies for increasing exports of U.S.-made aircraft parts. ITA has been a leader in promoting exports, by conducting aerospace trade missions and taking other steps.

We still need to increase aerospace exports to create jobs and bolster the economy. However, the administration's sluggish pace makes

it clear that the aerospace industry should help itself before we expect the government to help us.

MARPA is doing its part. We'll continue to provide our members with resources to support their exports, including export compliance guidance. We're also inviting air carriers from around the globe to our 2011 Annual Conference in October.

MARPA is a sponsor of this magazine's "International PMA Summit", which will be held in London in November. Readers of this magazine can help, by supporting these events. 

Jason Dickstein is president of the Modification and Replacement Parts Association (MARPA). As a lawyer in the Washington, D.C. area, Jason has counseled aircraft parts distributors, aeronautical repair stations, air carriers, and aircraft parts manufacturers. You can reach him at: jason@washingtonaviation.com. Jason will serve as a speaker at our magazine's "International PMA Summit" in London in November.



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EDITOR'S NOTE:

This issue, we once again turn our attention to the heated debate over Parts Manufacturer Approval (PMA) — an often controversial topic for which there is no shortage of strong opinions. To learn more about this magazine's forthcoming PMA Summit, consult this landing page: <http://www.avmain-mag.com/pma-summit> — **John Persinos**

PMA Parts: When FAA Approval Isn't Enough

BY JOHN GOGLIA

What does it say about our government — the FAA in particular — when parts produced under the FAA's seal of approval are still rejected by so many aircraft owners, particularly lessors?

I'm not sure what it says, although I suspect it's nothing positive. I am sure, though, that we could have some lively debates around this subject. As much as I enjoy a good debate, a better and more profitable use of our time might be to come up with ways to reassure aircraft owners as to the safety, quality and affordability of these parts.

As far as safety, it would be nice if the FAA clearly explained the process it uses to grant Parts Manufacturer Approval (PMA). Knowing the detailed and thorough nature of the FAA's approval process might make believers of some reluctant aircraft lessors.

I don't mean a recitation of the regulations, which even lawyers and engineers have a hard time interpreting. I mean a clear step-by-step explanation of what it takes to qualify for a PMA in the first instance and what ongoing FAA oversight exists to ensure continued PMA qualifications.

Maybe a pitch from some of the MROs to the FAA would work. Or from some of the PMA holders, like Pratt & Whitney. Those large companies hold a lot of sway in FAA headquarters. However this gets done, it's important to bring this information to the large leasing and financing companies. An easily accessible, web-based presentation could be cost-effective. But the work of reassuring lessors perhaps should rest with the MROs, which have a significant financial incentive for using PMA parts, because they tend to be considerably less expensive and often more readily available.

With regard to the quality of PMA parts, of course, quality and safety go hand-in-hand. A safe system tends to produce quality parts. But a concern of aircraft owners is also how long the parts will last as compared to OEM parts.

From everything I've read and heard from maintenance organizations using PMA parts, there is no difference between

PMA and OEM parts when it comes to quality or reliability. But the perception continues. What to do?

Data from the FAA, NTSB and operators needs to be independently reviewed and analyzed. Publication of such an independent review could then be used to convince reluctant lessors that the value of their aircraft is not diminished by the use of PMA parts. I'm sure there are a number of university researchers that could pull this data together for a relatively modest cost.

And last, but not least, the affordability of PMA parts vis-à-vis OEM parts needs to be clearly presented to aircraft owners. The savings are not inconsiderable and over the life of the aircraft add up significantly. While many may deny it, my experience in maintenance — especially my almost ten years of accident investigations as an NTSB member — is that the lower the cost of maintenance, the more likely it is to be done and done correctly. Aircraft lessors have an interest in making sure maintenance is affordable to ensure that their aircraft are in fact properly maintained.

Although it would be nice to think that PMA holders would go out and do this legwork, it may ultimately behoove MROs to convince aircraft owners, particularly the major lessors, that PMA parts are cheaper than OEM parts — and just as safe. **AM**



John Goglia is an independent air safety consultant. Previously, he served as a member of the U.S. National Transportation Safety Board (NTSB). With more than 30 years experience in the aviation industry, he was the first NTSB Board Member to hold an FAA aircraft mechanic's certificate. As an NTSB Board Member, Goglia participated in numerous air accident investigations. Prior to becoming a Board Member, Goglia held several senior positions in the airline industry.

You can reach him at: gogliaj@yahoo.com

Communicate Better!

BY RAMON LOPEZ



Don't shoot the messenger just because the message isn't getting out.

This life lesson applies to the controversy surrounding the value and safety of aircraft parts holding the Federal Aviation Administration's seal of approval, officially known as FAA Parts Manufacturer Approval.

PMA is an approval granted by the FAA to a manufacturer of modification and replacement parts for aircraft. It is generally illegal in the U.S. to fabricate replacement or modification aircraft parts without a PMA (although there are a number of exceptions to this general rule, including parts made to government or industry standards, parts manufactured under technical standard order authorization, etc.).

PMA-holding manufacturers are permitted to make replacement parts for aircraft even though they are not the original equipment manufacturer (OEM) of the airplane. PMA holders must demonstrate that they have a safe design for a part and adhere to quality assurance.

The aircraft parts aftermarket expanded greatly in the 1980s as airlines sought to reduce the cost of spares by finding alternative sources of parts. In the 1990s, the FAA launched an "enhanced enforcement" program to make sure the aftermarket manufacturers were in full compliance with FAA regulations. This caused an explosion of PMA parts to the marketplace.

The FAA published a significant revision to the U.S. manufacturing regulations in October 2009. The new rule, which becomes effective in April 2011, eliminates some of the legal distinctions between forms of production approval issued by the FAA, which should have the effect of further demonstrating the FAA's support of the quality systems implemented by PMA manufacturers.

In practice, all production approval holders were held to the same production quality standards before the rule change. This should now be more obvious in the FAA's regulations. Let's hope so.

Critics argue that the aircraft lessors reject PMA items in favor of OEM parts because the FAA has failed to reassure the aircraft owners as to the quality and safety of these parts.

They say the U.S. aviation agency needs to 1) offer a clear

step-by-step explanation of what it takes to qualify for a PMA in the first place and 2) better describe what ongoing FAA oversight exists to ensure continued PMA qualifications.

The critics admit there is no difference between PMA and OEM parts when it comes to quality and reliability, but the negative perception as regards the former persists. I have to agree with this position, but erasing the falsehood will be a hard nut to crack if reluctant lessors are to be convinced that the value of their aircraft is not diminished by the use of PMA parts.

For the past four years, I served as editor-in-chief of an air safety newsletter. During that period I found no reason to question how the FAA handles PMA. Even the Government Accountability Office (GAO) — the so-called congressional 'watchdog' agency — has had nothing bad to say about the FAA's PMA performance.

A check of GAO records produced only one report, way back in 1984, on FAA practices and procedures to regulate aircraft and engine parts manufacturers. The report said, in part:

"The FAA has tried to change the [PMA] process for several years to eliminate procedural burdens, improve safety, and standardize the process between FAA regions. However, parts manufacturers have resisted the changes because they believe that the FAA actions would restrict small business opportunities, and original equipment manufacturers are concerned about protecting proprietary design data. GAO found that parts manufacturers and original equipment manufacturers have generally been satisfied with the PMA process. FAA officials and those who use parts manufactured under the PMA process found no safety problems with the parts."

So....just because "we have a failure to communicate" doesn't mean the system is broke and needs fixin'. **AM**

Ramon formerly served as editor-in-chief of the weekly newsletter Air Safety Week, widely recognized as the "bible" of aviation safety. He has been a regular contributor to Defense Technology International, Jane's Airport Review and Professional Pilot magazine.

You can reach him at: scooplopez@erols.com

BRAZE REPAIR REACHES NEW HEIGHTS

Want to know the latest, most innovative methods for extending the life of gas turbine engine components? Read on.

BY ZENGMEI KOENIGSMANN

The evolution in gas turbine engine design, component design and the materials used to produce today's engines has resulted in ever more reliable, fuel efficient and higher thrust power systems for aircraft. Advancements in today's jet engines also have spawned the parallel development of new repairs to restore the critical turbine engine components in these high performance systems.

In the gas turbine engine — an extreme environment that subject components to very high temperatures for extended periods — all parts are carefully monitored for routine or unplanned wear during operation and scheduled maintenance events.

Federal Aviation Administration (FAA) approved repairs are an alternative to replacing components when the life cycle of the part allows it — i.e., many components in the hot section or gas path of a turbine engine may be repaired for a specific number of times during maintenance events before FAA guidelines require the part to be replaced.

From an operator cost perspective — whether a commercial or military aircraft operator — refurbishing or repairing engine components can significantly reduce part replacement costs and return savings to the maintenance operation.

Successful implementation of a new repair, however, requires a multi-disciplinary understanding of the materials, design and processing technologies that are critical to the proper functioning of the part. A detailed understanding of metallurgical and physical properties of the component alloys during the repair is essential.

Using this approach, a new braze repair was developed for the life extension of advanced turbine engine parts that are made of Ni-based single crystal alloys. The repair developed by Chromalloy was approved by the FAA in 2005 and utilized by a commercial airline for five years.

A review of the data from five years of engine service performance of the repaired high pressure turbine part by the airline shows the braze repair to be extremely effective.

Longer Life at Constant Stress

Chromalloy, a turbine engine services provider, has offered airlines and military aircraft operators advanced repairs for hot section engine components for several decades. The company's new component repairs paralleled new engine development and similarly evolved over the years to include today's materials and superalloys. In addition to repairs, Chromalloy also serves the industry with advanced thermal barrier coatings and

with the manufacture of new replacement parts for many of the aircraft engines on today's commercial jetliners.

High temperature vacuum diffusion braze, a metal joining method operating in at least 1×10^{-4} torr or 0.1 micron level vacuum environment and at a temperature of above 2000 degrees F, is a common industry practice used to repair cracks and surface erosion of engine-run high pressure turbine parts, as it introduces less thermal stress and distortion as compared to welding methods.

This technique uses a component alloy based filler material, which contains a rapidly diffusing melting point depressant such as boron. Upon brazing at an adequate high temperature for the duration time, the braze filler first melts and then solidifies isothermally through the boron diffusion from the liquid braze alloy into the adjacent solid component alloy. Fully isothermal solidified braze joints exhibit similar properties to the component base alloy. It has been well established that the diffusion braze is a very effective method for repairing many turbine engine components over the last couple of decades.

Ni-based single crystal alloys are known for their superior strength and creep resistance at high temperatures. The material creep resistance is the resistance to a time dependent permanent deformation or distortion induced by a stress at a temperature close to the material melting temperature.

These alloys are used extensively in the manufacture of today's advanced jet engines, particularly in the high pressure turbine parts. Because there are no grain boundaries in the single crystal alloy, the strength properties of these single crystal alloys primarily depend on the alloy microstructure characteristics such as primary gamma prime precipitates size and their volume fraction.

An optimal microstructure is therefore very critical for single crystal alloys, and it is normally produced by carefully controlled

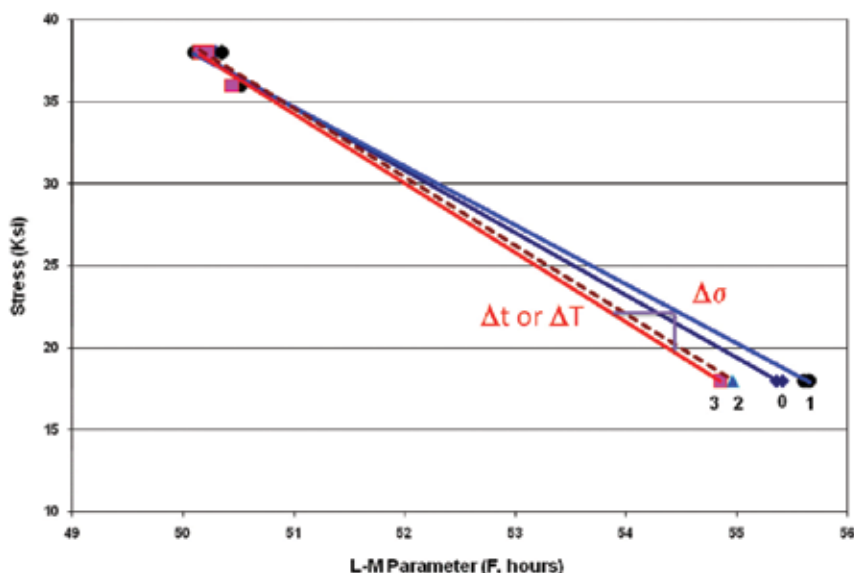


Figure 1 Creep properties in the Larson-Miller plot for four types of thermal processed PWA 1484 equivalent samples. The original alloy is presented as condition-0; the samples processed with the new Ni braze repair are presented as condition-1; the samples processed with traditional braze repairs are as conditions-2 & -3; Δt , ΔT or $\Delta \sigma$ indicate the differences in time, temperature or stress. At high temperature and low stress state, comparing with condition-0, condition-1 has a significant advantage while conditions-2 & -3 exhibit debits.

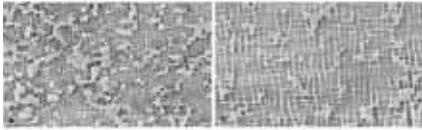


Figure 2 Back scattered electron images at 5000x show the PWA 1484 alloy part microstructure: the key indicator - square shape primary gamma prime size and distribution at (a) prior to the braze repair; and (b) post the braze repair.

heat treatments. However, this unique nature of these alloys presents challenges during diffusion braze repairing of the single crystal alloy parts. The heat treatments for producing a good joint often result in an irreversible microstructure alteration in the single crystal alloys thus in turn modifies the original alloy properties.

This alloy microstructure alteration primarily reduces the alloy creep resistance significantly, which cannot be easily recovered by any further possible treatments. During the testing, it was found that the commonly practiced braze thermal treatments employed in traditional Ni braze repairs induce such alloy microstructure alterations and therefore result in irreversible creep property debits in Ni-based single crystal alloy parts.

For repairing Ni-based single crystal alloy components, such as PWA 1484 alloy components, a new braze repair was developed that not only provides a good braze joint property but also preserves the part alloy properties.

As illustrated in Figure 1, the PWA 1484 equivalent alloy sample creep properties in four types of thermal possess conditions — i.e. the original alloy condition, the new braze repair and the traditional braze repairs, are compared in a Larson-Miller plot. At a high temperature and low stress state that is close to the engine operation condition, the new braze repair has a significant advantage over the two types of current braze repairs.

The new braze repaired alloy is stronger at a constant temperature or can experience higher temperature and has a longer life at a constant stress. A high melting temperature filler with a good wetting and bonding properties verified by metallurgical assessments was also defined for this repair in order to increase the high temperature capability of one repaired part.

Metallurgical evaluations confirmed the part alloy properties are preserved based on the similarity of the part alloy microstructures of the prior to and after the braze repair (See Figure 2)

Good Engine Service Performance

The first application of the developed braze repair was to the PW2000 high pressure turbine first stage duct segments that are made of Ni-based single crystal PWA 1484 alloy. More than 300 engine sets of the PW2000 HPT first stage duct segments have been successfully refurbished since 2005 with this new braze repair that goes beyond the engine manual repairs.

The manufacturer does not offer a braze repair. One commercial airline utilized the repairs — and the engine service experience reports from the operating airlines showed positive feedback on the repair. Detailed evaluations on the repaired and engine service duct segments were performed on

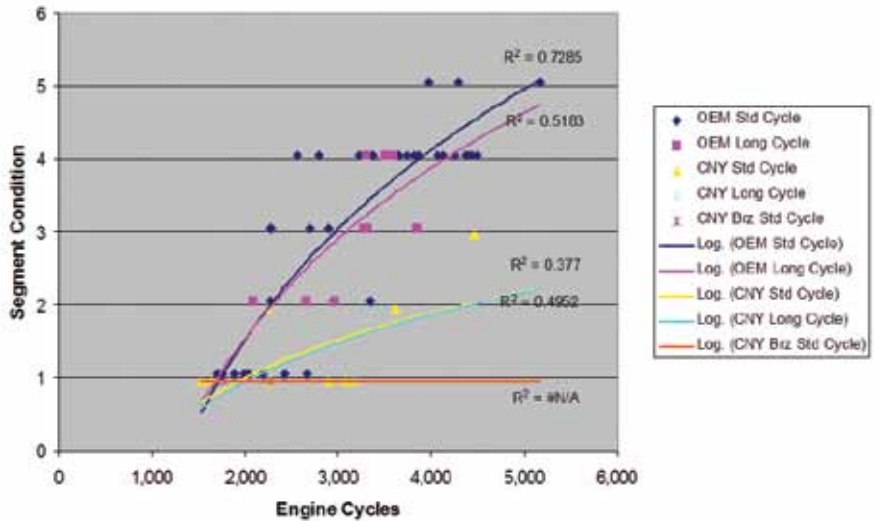


Figure 3 The plot shows the trend of PW2000 HPT segment condition vs. engine service cycles. The grade level (i.e. 1, 2, ...) represents the severity of the segment distress level. As seen, after about 5000 engine cycles the Chromalloy repaired segments (CNY or CNY Brz.) were less degraded at grade levels of 1 and 2, while the OEM segments were more degraded at a grade level close to 5.

two engine sets. After the engine service, the distress shown on the repaired segments is better than that of seen on the OEM segments. The Chromalloy repaired segments were more durable with a low level distress (i.e., 1 or 2) than the OEM segments after about 5000 engine cycles (see Figure 3).

In addition to the new braze repair, a Chromalloy advanced abrasion resistant thermal barrier coating system was also included in the repair package for this segment. The application of the TBC further warrants the brazed joint integrity and may also slow down the component alloy degradation rate during engine operation.

Figure 4 shows that with a sufficient thermal barrier coating protection, the original braze sealed micro-cracks remain closed after the engine service. Overall, the new braze repair has been proven to be effective on the component life extension by providing a good braze joint and at the same time preserving the original component alloy properties.

A Viable Alternative

Aircraft operators routinely examine their business models to determine cost effective strategies for all aspects of equipment acquisition and operation. While the cost

of new equipment is substantial, so are maintenance and repair costs over the many years life cycle of aircraft equipment.

In the gas turbine engine, new and innovative repairs that are certified by the FAA and have demonstrated to increase performance and wear are today providing a valuable benefit to commercial fleet operators. **AM**

Dr. Zengmei Wang Koenigsmann is Senior Material Scientist and Process Engineer in Chromalloy's Technology & Quality Assurance group. Her work involves metallurgical processes in gas turbine component repairs and castings. Previously, she was a Research Scientist at the NASA Langley Research Center in Hampton, Va. Prior to that, she worked as a Research Associate at York University in Toronto, Canada. As a Research Graduate Student, she had also worked at the Institute of Metal Research of the Academy of Science in Shenyang, China.

Dr. Koenigsmann received her Bachelor and Master Degrees in physics from Nankai University in Tianjin, China, and her Ph.D. degree in materials science and engineering from the University of Virginia in Charlottesville, Va. She can be reached at ZKoenigsmann@chromalloy.com

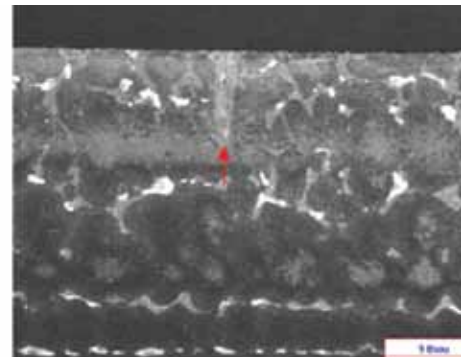
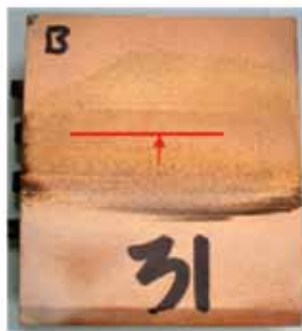


Figure 4 Engine serviced component evaluations: (a) An engine serviced segment that was previously repaired by the new braze process; and (b) Cross section plane at the center gas path shows a previous brazed crack remains closed during the engine service.

THE NUTS AND BOLTS OF HELICOPTER MAINTENANCE

Keeping helicopters aloft requires a high level of maintenance and repair. The more the helicopter vibrates, the faster various components will wear out. Here's a fresh look at the MRO basics for helo mechanics.

BY BOB SERABIN

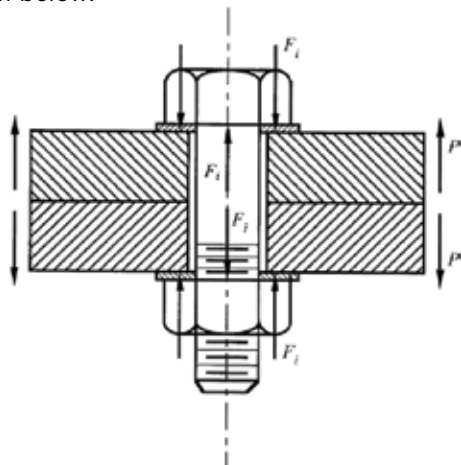
Vibration affects everything bolted to the structure. This includes rotor drive train, electronics, cooling, and cargo. One approach to reducing unscheduled maintenance is proper tensioning of bolted joints. In theory, this is a matter of tightening the joint to its maximum safe clamp-load. The practical reality of this undertaking is fraught with challenges.



Assuming the right fasteners are selected, proper tensioning requires a calibrated torque wrench, consistent lubrication, adherence to torque-tension tables and/or ideally, use of a load cell (e.g. Skidmore-Wilhelm Unit shown below) to measure clamp-load directly.

Bolted Joint Behavior

A typical bolted joint consists of a bolt, nut and two flat washers in combination with other mating components, as shown below:



Forces acting upon a preloaded bolted connection: bolt tension F_i and compression load F_i of the clamped members are in equilibrium prior to the externally applied load, P .

Most joints are relatively stiff, so the bolt does not bear the majority of the external load. Once the joint is taken out of compression, however, the external load will be carried entirely by the bolt. If the external load is cyclic, this can lead to loosening of the joint or in the extreme a fatigue failure — the bolt can suddenly break without warning. **Vibration induced loosening of joints is a very serious issue, because it affects personnel safety and the survivability of equipment.** Maintaining the joint compression is the key in shielding the joint from this condition.

Preventing Fatigue Failures

To prevent fatigue failure, it is recommended that joints be tightened as close to the material yield stress as practical. This value can be determined experimentally using a Skidmore-Wilhelm machine in combination with a calibrated torque wrench.

Most maintenance mechanics use torque-tension tables in lieu of a load cell. These values are set well below optimal to allow for variations caused by friction, calibration accuracy and the mechanic's technique.

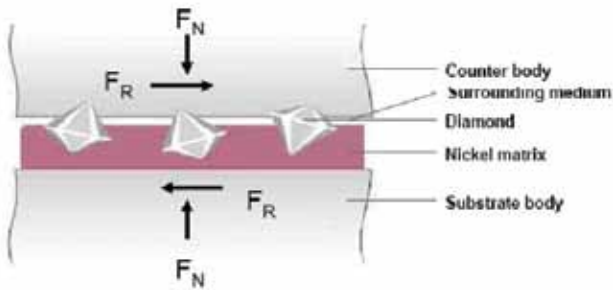
Cyclic Loading

Under intermittent cyclic external loading, as long as there is no loss of clamp-load, the joint integrity will be maintained indefinitely. However, in a helicopter with thousands of bolted joints, it's unlikely every joint will sustain optimal clamp-load under constant vibration.

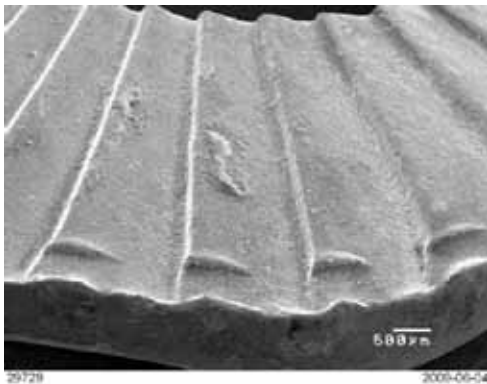
The frictional resistance of the washer is the often main thing preventing loosening under vibration. Therefore, increasing the coefficient of friction greatly improves a joint's resistance to vibration. Most "lock washers" do not provide the proper combination of load carrying capacity and coefficient of friction (See comparative performance test results below.)

A new product, Tiger-Tight friction washers were developed specifically to address this issue.

The Tiger-Tight washer operates on a micro-topographic scale. Industrial diamonds embedded in an electro-less nickel matrix penetrate and interlock with the mating surfaces to create an extremely high retaining force and prevent joint relaxation. See diagram below:



Because the interaction is at the micro level, there is no critical damage to the affected surfaces. This is an enormous benefit over other lock washer designs, which have serrations that score the mating parts. See Serrations photo below:



The scratches caused by these serrations can be a source of "spider" cracks, which can lead to failures such as crack propagation. No serrations to scratch the mating surface also means there is no need to recondition the surfaces after replacement or maintenance of the joint. This can be a tremendous labor savings.

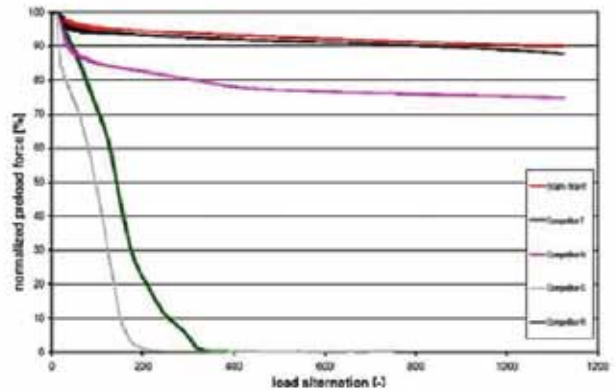
Tiger-Tight washers have the same footprint as standard USS or SAE flats, so there is no risk of installation error, and they can be directly substituted for standard hardened flat washers. See photo below:



Performance Data

Tiger-Tight has run extensive tests comparing its friction washers to competitive products using a Junker Test Rig, designed to impart transverse cyclic loads on the joint. See attached graph of performance results below:

JUNKER VIBRATION TEST -
SUBSTRATE MATERIAL ALMGSI1



TIGER-TIGHT LOCKWASHER
A NEW JOINT LOCKING DEVICE

As the tests results show, most lock washers fail to provide the intended safeguard, that is to prevent joint relaxation. The clamp-load drops off in only a few cycles. Use of Tiger-Tight washers promote safe, effective joints under dynamic load conditions by distributing the clamp-load and resisting loosening from external transverse loads.

A properly tightened joint can sustain millions of load cycles without problems, an under tightened joint can fail within a few cycles.

A high friction washer should be an integral component of a bolted joint. Its principal function is two-fold:

1. To distribute the clamp-load and
2. To resist loosening under vibration.

When there are no serrations to score the mating parts, there is no need to re-condition surfaces after replacement/maintenance of the joint. This is a tremendous labor savings. A scored surface is also vulnerable to fatigue failure. Because Tiger-Tight friction washers have no serrations, they can be safely used in aerospace applications. **AM**

Robert Serabin is general manager of Tiger-Tight Corp. of Staten Island, NY. Mr. Serabin graduated from Carnegie Mellon University, where he earned a BSME. He received his MBA from Baldwin Wallace College. He has written several technical articles on fasteners. As a member of ASME, he participated on the fastener standards committee and was chairman of the subcommittee for the Fastener Glossary of Terms. You can reach him at: bserabin@fresupco.com

Aircraft Spruce Offers True-Lock Aviation Fastener Systems



True-Lock LLC and Aircraft Spruce have partnered together to provide the only STC'd fastener system to the aviation community.

True-Lock LLC, headquartered in Boise, Idaho,

is the world's leading innovator of the only patented aviation fastener system in the world.

Aircraft Spruce is the largest aviation part supplier selling aircraft accessories and pilot supplies worldwide. Aircraft Spruce recently celebrated 45 years of service to the aviation community.

True-Lock is the only patented aviation wheel fastener system in the world that holds an FAA Supplemental Type Certificate for axle nut technology. True-Lock aviation fastener systems reduce premature wear on all wheel-end assembly components (brakes, bearings, axles, including tires and wheels).

These systems eliminate the conventional axle nut system's inherent adverse torque setting characteristics off-set by the castle nut and cotter pin (end-play). The result is a substantial savings in part replacement and aircraft downtime.

The True-Lock Aviation Fastener Systems are available for fixed wing aircraft as well as rotorcraft. For more information: 1-877-477-7823 or www.true-lock.com.

Product & Service Spotlight

No-Maintenance Batteries



WEPPS (Wireless Emergency Primary Power System) is a radically new application of current technologies for managing and powering emergency lighting systems, with a built-in wireless monitoring and diagnostic capability. It gives airlines:

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STG Aerospace thomascj@stgaerospace.com

OEM Expertise



60 Years of Experience Servicing Both OEM & Aftermarket Repair – Overhaul and Replacement Services Temperature Sensors and Harness Assemblies Capabilities to provide repair services or replacement hardware for the entire

Aircraft. We will work with your team to develop cost effective, OEM quality solutions for all your repair and replacement requirements.

Harco hoytr@harcolabs.com

Ground Support Equipment and Tooling



Alberth Aviation specializes in GSE and tooling for the corporate operator and small FBO's. See our online product demo videos for our aviation tire cage, wheel/brake dolly, lav cart, water cart and specialty tooling.

Pictured is our newest tool, the Oxygen Fill Adapter: 3 tools in one, includes exchange program, and services most aircraft, the last O2 tool you will ever buy.

Alberth Aviation lou@alberthaviation.com

Videoscope



The Machida Videoscope, model VSC-3-140-N(P), boasts a remarkable 3mm outer diameter and state-of-the-art mini HD technology. Affordable and easy to use, the VSC-3-140-N(P) has LED technology, gain control, high-definition image enhancement, portable

image archiving, auto focus, auto light, and picture-in-picture viewing. This lightweight unit comes complete with keyboard, SD card, carrying case, and choice of video processor 7-5050 or 7-6060.

Machida ahagan@machidascope.com

PWC34910-109



Lightweight and Portable Pratt & Whitney inspection kit. The entire kit comes complete with a 4.5mm Portable Videoscope and the supporting guide tubes. Easy to use and compact storage case for easy shipping.

Borescopes-R-Us bill@borescopesrus.com

Broken Compilers Are Expensive



Testing the quality of compilers is imperative. A compiler in the field can cause immense problems by producing incorrect code. The consequences of quality defects are far more expensive than the investment in a reliable test suite such as SuperTest. Engineers should never take the quality of compiler tools for granted. SuperTest gives you the confidence that your compiler is up to the task.

ACE marianne@ace.nl

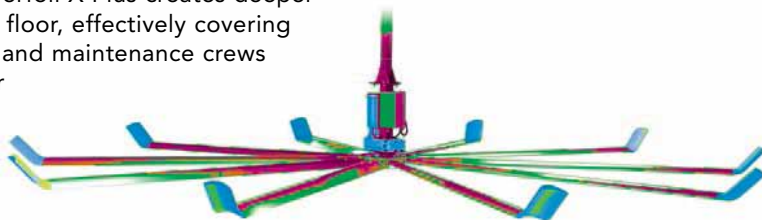
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For more information: 1-877-BIG FANS or www.BigAssFans.com

AC TECH Announces Key Qualification for AC-131 Product

AC TECH, a leading provider of aerospace sealants and specialty chemical products, announced that its AC-131 CB environmentally friendly surface pretreatment product has been qualified by the Performance Review Institute.

AC-131 CB is the second member of the AC-131 family to earn AMS3175 qualification, an industry standard material specification that allows the U.S. military to specify its use as a non-chromate surface treatment.

AC-131 BB was qualified to this specification in December 2010. Both products are based on Boeing's patented Sol-Gel technology and are the only two in the industry to achieve AMS3175.

AC-131 benefits include a complete lack of hazardous hexavalent chromium, the elimination of scrubbing or

rinsing and associated wastewater, compatibility with composites and mixed metals, improved paint adhesion and overall cost savings per aircraft.

The Performance Review Institute is a not-for-profit organization created by SAE International in 1990 to develop and administer performance standards for quality assurance, accreditation and certification programs for aerospace and other industries.

Established in 1997, Advanced Chemistry & Technology, Inc. (AC TECH) is a technology-driven manufacturer of aircraft sealants and environmentally friendly surface treatment products for the commercial, military and general aviation markets.

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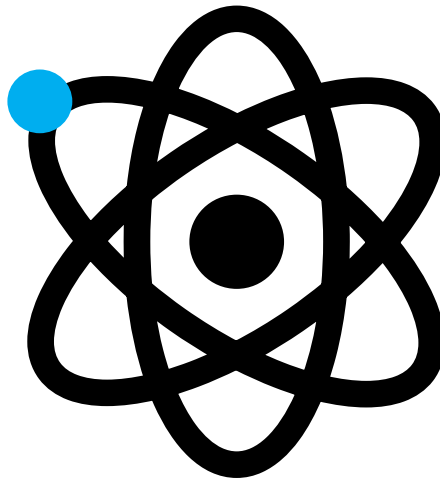
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