

APRIL 2017

AMT

MANAGEMENT • OPERATIONS • INSIGHT

AIRCRAFT MAINTENANCE TECHNOLOGY

COMMERCIAL MRO

AAR ROCKFORD

The new MRO location features two 10-story hangars with an aircraft maintenance school right next door for the needed workforce

PAGE 38

**BUSINESS AIRCRAFT
JUST BECAUSE
YOUR AIRPLANE'S
BROKE DOESN'T
MEAN YOU HAVE
TO BE**

PAGE 6

**COMMERCIAL MRO:
HOT SPOTS
AMIDST
LUKEWARM
PASSENGER
TO FREIGHTER
CONVERSIONS**

PAGE 44

*The 2017 Aerospace Maintenance
Competition Presented by Snap-on*

NO MILLION-DOLLAR CONTRACT.

NO SHOE DEAL.

NO SHORTAGE OF PRIDE.

Great work is its own reward. But a nice trophy every now and then isn't bad either. Stop by Booth 239 at MRO Americas 2017 and cheer on our industry's finest as they are tested in speed, precision and ingenuity.



SNAPONAVIATION.COM

Snap-on®





COMMERCIAL MRO

38 **AAR'S AIRFRAME MRO NETWORK ADDS NEW LOCATION**

AAR's newest MRO facility located on the Chicago Rockford International Airport (RFD) in northern Illinois features two 10-story hangars each measuring 300 feet by 300 feet for 238,000 square feet. And Rock Valley College is right next door to train the needed workforce.
By Ronald Donner

FEATURES

BUSINESS AVIATION

- 6 JUST BECAUSE YOUR AIRPLANE'S BROKE DOESN'T MEAN YOU HAVE TO BE**
By Joe Stanley

GENERAL AVIATION

- 14 GEIGER MOTOR GMBH DELIVERS NEW WANKEL AVIATION ENGINES**
By Marino Boric

INDUSTRY OUTLOOK

- 24 RAISING THE STANDARDS - ATEC, PRIVATE SECTOR DOING THEIR PART TO TRAIN AVIATION MAINTENANCE STUDENTS**
By Steve Staedler

PROFESSIONALISM

- 30 HOW TO RECRUIT AND RETAIN NEW EMPLOYEES IN THE MRO WORLD**
By Christine Hill

COMMERCIAL MRO

- 44 PEMCO: HOT SPOTS AMIDST LUKEWARM PASSENGER TO FREIGHTER CONVERSIONS**
By Jerome Greer Chandler

COMMERCIAL MRO

- 50 PATTONAIR: FORECASTING PARTS SUPPLY DEMAND**
By Michelle Carter

FROM THE FAA

- 52 HOMEGROWN HUMAN FACTORS TRAINING: NO FAA SPEAKER REQUIRED**
By Dr. Bill Johnson



AIRLINES

- 54 SWISS REFLEETS**
By Ronald Kuhlmann

INDUSTRY OUTLOOK

- 60 ATP: IT CONTINUES TO EVOLVE**
By Ronald Donner

SAFETY MATTERS

- 62 LESSONS UNLEARNED: PHONING IT IN**
By Stephen Carbone

ONLINE EXCLUSIVE:
COMMERCIAL MRO
THE HUMAN-CENTERED MRO
By Jerry Voith



COLUMNS

- 4 EDITOR'S VIEWPOINT**
Trade Show Travel Reaches Full-Speed Ahead Mode
By Ronald Donner

- 59 ARSA INSIGHT**
ARSA Legislative Day & Symposium: What We Learned
By Brett Levanto

- 66 GAMA INSIGHT**
Engine Safety and Proper Maintenance
By Pete Bunce

DEPARTMENTS

- 34 TOOLS & EQUIPMENT**
64 INDUSTRY NEWS
65 CLASSIFIED ADVERTISING
65 ADVERTISERS' INDEX

AVIATIONPROS.com



TRADE SHOW TRAVEL REACHES FULL-SPEED AHEAD MODE

This time of the year the staff here at *Aircraft Maintenance Technology* (AMT) find ourselves crisscrossing the country and the globe engaging in any number of aviation industry trade shows, conferences, and association events.

I recently attended the General Aviation Manufacturers Association (GAMA) Communications Roundtable which was held at GE Aviation in Cincinnati OH. Dozens of GAMA members were there and it was great to spend time with people I usually only speak with on the telephone, communicate with on email, or say a quick hello to at the large busy trade shows. This small setting was not only a great way to learn more about the hard work that GAMA does for our industry, but also what's going on at many GAMA member companies. This is just one example of how we at AMT stay connected with manufacturers, aircraft maintenance organizations, and the aviation industry.

An interesting added benefit of the GAMA event was to go on a tour of the GE Aviation Additive Manufacturing facility where our group was provided an overview of what GE is doing with additive manufacturing or 3D printing as it is sometimes referred to as, and we were able to see and handle printed parts and watch a number of machines in operation.

Next on AMT's schedule were the HAI Heli-Expo, AERO Friedrichshafen, and the Minnesota Aviation Maintenance Technician Conference. I found myself writing this column on my return flight from Seattle, WA, the location of this year's Aviation Technician Education Council annual conference. ATEC is one of the industry organizations I've become very involved with and serve on the board of directors.

Very likely by the time you read this column, AMT will be at MRO Americas 2017 which is also the location for the Aerospace Maintenance Competition. AMT will have a booth near the AMC so stop by and say hello to everyone. Directly after MRO Americas is the NBAA Maintenance Conference, and in the months ahead this year's European Business Aviation Convention, the International Paris Airshow, EAA AirVenture Oshkosh, and ... well you see how it goes.

At times the travel becomes exhausting and some people will say, "Is that all you do, run around going to trade shows"? However, my response to this is that being engaged and active is really the best way for a media company to stay in touch with what is happening in our industry, with our readers and advertising clients, and the many people, companies, and organizations that keep our industry flying.

See you at the next event, Ron

AMT AIRCRAFT MAINTENANCE TECHNOLOGY

Published by SouthComm Business Media, LLC.
PO Box 803 • 1233 Janesville Ave., Fort Atkinson, WI 53538
(920) 563-6388 • (800) 547-7377

Volume 28, No. 4, April 2017

Brett Ryden, Publisher, Aviation Group
brett@AviationPros.com, (847) 454-2738

Ronald Donner, Editor
ron@AviationPros.com, (800) 547-7377 Ext. 3315

Barb Zuehlke, Senior Editor
barb@AviationPros.com, (920) 563-1641

Marino Boric, International Correspondent, info@aeronauticmedia.de

Contributors: Pete Bunce, Stephen Carbone, Michelle Carter, Jerome Greer Chandler, Christine Hill, Dr. Bill Johnson, Ronald Kuhlmann, Brett Levanto, Steve Staedler, Joe Stanley

Julie Whitty, Art Director

Carmen Seeber, Media Production Representative
cseeber@southcomm.com

Debbie Dumke, Audience Development Manager

SALES

Michelle Kohn, National Accounts Manager
michelle@AviationPros.com, (224) 324-8529

Greg Szatko, National Accounts Manager
Greg@AviationPros.com, (920) 568-8314

SOUTHCMM, INC

Chris Ferrell, CEO

Bob Mahoney, CFO

Blair Johnson, COO

Eric Kammerzell, VP Technology

Curt Pordes, VP Production Operations

Gloria Cosby, Executive Vice President, Transportation and Aviation Group

Gerry Whitty, VP Marketing

Lester Craft, Director of Digital Business Development

SUBSCRIPTION CUSTOMER SERVICE

(877) 382-9187; (847) 559-7598

circ.amt@omedia.com

PO Box 3257, Northbrook, IL 60065-3257

ARTICLE REPRINTS

Brett Pettillo

Wright's Media

877-652-5295, Ext. 118

bpettillo@wrightsmedia.com



**SouthComm
Business Media**

Aircraft Maintenance Technology (USPS 004-989; ISSN 1072-3145 print; ISSN 2150-2064 online) is published 9 times annually in January/February, March, April, May, June, July, August/September, October and November/December by SouthComm Business Media, LLC, 1233 Janesville Ave, Fort Atkinson, WI 53538. Periodicals postage paid at Fort Atkinson, WI 53538 and additional mailing offices. POSTMASTER: Send address changes to *Aircraft Maintenance Technology*, PO Box 3257, Northbrook, IL 60065-3257. Canada Post PM40612608. Return undeliverable Canadian addresses to: *Aircraft Maintenance Technology*, PO Box 25542, London, ON N6C 6B2.

Subscriptions: Individual subscriptions are available without charge in the United States, South America, Europe, Asia and the Middle East. Complimentary electronic subscriptions are available to subscribers worldwide. Please visit www.aviationpros.com and click on "Subscribe". Publisher reserves the right to reject non-qualified subscriptions. Subscription prices: U.S. Students \$25.00 per year. Non-Industry related subscribers \$36 per year, \$72 two years; Canada/Mexico \$62 per year, \$120 two years; All other countries \$88 per year, \$165 two years. All subscriptions payable in U.S. funds, drawn on U.S. bank. Canadian GST#R42773848. Back issue \$10 prepaid, if available. Printed in the USA. Copyright 2017 SouthComm Business Media, LLC.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recordings or any information storage or retrieval system, without permission from the publisher.

SouthComm Business Media, LLC does not assume and hereby disclaims any liability to any person or company for any loss or damage caused by errors or omissions in the material herein, regardless of whether such errors result from negligence, accident or any other cause whatsoever. The views and opinions in the articles herein are not to be taken as official expressions of the publishers, unless so stated. The publishers do not warrant, either expressly or by implication, the factual accuracy of the articles herein, nor do they warrant any views or opinions offered by the authors of said articles.

The material presented in *Aircraft Maintenance Technology* is intended to complement technical information that is currently available from supplier and regulatory sources such as manufacturers and the Federal Aviation Administration. Every effort is made to assure that the information provided is accurate. However, if information presented by *Aircraft Maintenance Technology* is in conflict with supplier and regulatory sources, the latter shall take precedence.



Visit us at MRO Americas, booth 2603

OH BEAUTIFUL *for* SPACIOUS SKIES

AAR Airframe MRO
Rockford, IL



DOING IT RIGHT
To better connect
the world

**Based in the heartland,
AAR MRO is All-American.**

We are proud to provide good-paying jobs to 3,000 American workers who maintain, repair and overhaul commercial aircraft at our six U.S. locations—from sea to shining sea.

HEAVY MAINTENANCE | CABIN MODIFICATIONS | INTERIOR UPGRADES | ENGINEERING | LANDING GEAR



IMAGES COURTESY OF ELLIOTT AVIATION

JUST BECAUSE YOUR AIRPLANE'S BROKE DOESN'T MEAN YOU HAVE TO BE

Knowing you have options when it comes to repairing an avionics or airframe part can give a huge cost savings to the aircraft owner

By Joe Stanley

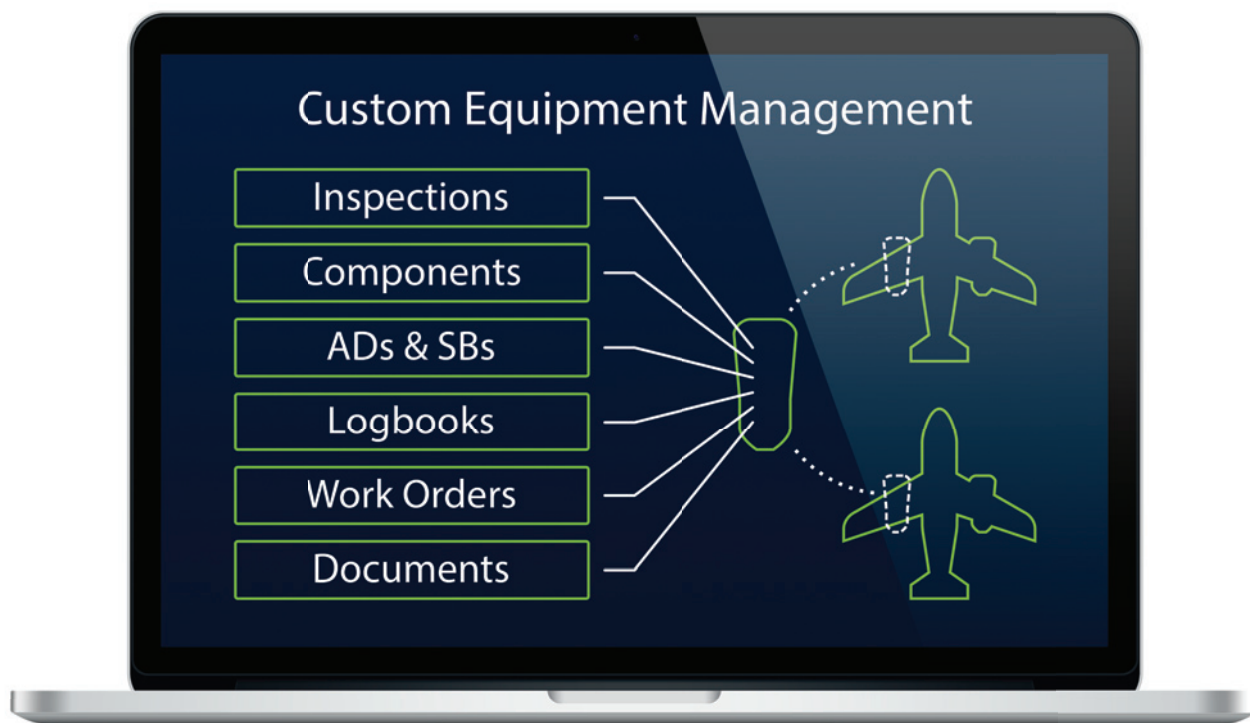
REPAIRING AN AIRCRAFT CAN BE INCREDIBLY EXPENSIVE and whether you are working to repair your company's or a customer's aircraft, knowing you have options when it comes to repairing an avionics or airframe part can give a huge cost savings to the aircraft owner. There are several options in the industry to find PMA certified parts saving your customer money and in extreme cases adding up to \$140,000 or more.

These PMA parts options are primarily for airframe parts that have been engineered and made available by the companies holding the PMA. These parts meet FAA regulations and can give you and your customers a significant cost savings. Although the use of PMA parts can save money, be sure to check any warranties or programs the aircraft may be on to see if using these parts will void any warranties.



Introducing

Flightdocs **CEM**™



Process engine and custom equipment swaps in less than a minute. Instantly transfer compliance history, logbooks and documents without any data entry needed.

Another powerful and intuitive feature available to Flightdocs Customers, at no additional cost.

 **NBAA**
MAINTENANCE
CONFERENCE
MAY 2-4, 2017
BOOTH 821



DESIGNED, BUILT AND SUPPORTED IN THE USA

1-800-747-4560 • WWW.FLIGHTDOCS.COM



If you are looking for aftermarket options, some of the more popular part search sites include ILS, Partsbase, Stockmarket, AEA, and even Ebay can yield positive results. Many of the repair stations, with their constantly rotating inventories will post their excess inventories on their web sites. These can be easily found by just inputting your desired part number onto a search engine. However, since those inventories are constantly changing, it is always beneficial to make personal contact with the repair station and see if the part you have found is still available and in stock.

AFTERMARKET AVIONICS OPTIONS

There is a fundamental misunderstanding when it comes to “As Removed” parts and if you can install parts without an 8130-3 form. Many people believe that the existence of a 8130-3 is a license to install, however, this is not the case. The fact is that the 8130-3 document was and is intended to document any testing that was done on the component and any repairs completed to return a unit to service. The absence of an 8130-3 does not disqualify a component from being returned to service, but the lack of traceability can be a major issue.

Shops that deal heavily in the aftermarket avionics market remove equipment everyday normally as part of installing newer technology equipment. This is exactly the methodology behind selling “As Removed” working equipment. This equipment is from working aircraft, which allows for full traceability to allow you to reinstall in your aircraft. All major suppliers will give you full traceability and their CoC with every component you purchase. This not only gives you working components, it saves you standard repair practices and OEM bench tests that may not enhance the functionality of your unit.

For instance, any EFIS-CRT that you send to a bench level repair facility is required to meet a luminance test in accordance with its current repair manual. These CRTs will all have some phosphor burn by nature of the

design of the component. This will cause the unit to fail a bench check and require a new CRT to be installed. The CRT may work just fine but has degraded over time. It is still functional and very usable. By purchasing aftermarket EFIS-CRTs, as an example, you can spend less than half the cost of exchange or repair.

SPARES

In addition to having a good resource for aftermarket avionics in an emergency, many flight departments, 135 operators, and legacy aircraft that fly over 400 hours a year keep a set of spare equipment for high fail items on hand to avoid extra downtime. Given the cost of re-booking or postponing a flight, it may make sense for you or your customer to have high fail items on hand like EFIS displays, weather radars, and more.

AFTERMARKET AIRFRAME AND NON-OEM PARTS

Although they may be more difficult to find, in addition to aftermarket avionics parts, there are several options for finding serviceable aftermarket airframe parts. In fact, there are a couple of organizations dedicated to decommissioning aircraft and recycling aircraft parts.

Having a good partner to work with to source these types of needs can save you and your customers both money and downtime and can increase your bottom line.

The Aircraft Fleet Recycling Association (AFRA) holds a conference in conjunction with the Aviation Suppliers Association (ASA) where they seek to standardize the parts distribution network, educate suppliers, and certify distributors.

As we mentioned in the beginning of the article, there are numerous options for new, non-OEM parts. These can be something as simple as a bolt or a wire harness, or as complex as a set of reverse-engineered landing gear. Since there are so many options and different types of parts available, having a good partner to work with to source these types of needs can save you and your customers both money and downtime and can increase your bottom line.

FAA REGULATIONS AND ADS-B OPTIONS

Another item to consider that is going to have a major effect on the industry is ADS-B OUT compliance. Any

INSIDER ACCESS. REAL-WORLD EXPERIENCE.



GET HANDS-ON TRAINING FROM THE EXPERTS WHO'VE HAD A HAND IN BUILDING THE AIRCRAFT.

Combining technology-led courses with real-world experience, TRU Aviation Maintenance Academy has created the most robust EASA and FAA certified training program for Textron Aviation equipment. Exclusive access to Cessna, Beechcraft and McCauley gives your technicians the most current and authentic training possible. Let our experts unlock your technician's potential.



aircraft that operates in controlled airspace in the USA over 10,000 feet will need to be ADS-B Out compliant by Dec. 31, 2019. This impacts over 100,000 airplanes and can be incredibly difficult to price, as it is dependent on the current equipment in the aircraft. While the standard avionics OEM ADS-B path to upgrade can cost hundreds of thousands of dollars, in many cases, there are options that can work within a given avionics suite by swapping transponders. These options can be much more cost effective and take less than five days to

these upgrades add to an aircraft the available slots in the shops start to dwindle. Waiting can be costly and depending on your mission, it can have grounding consequences. The upgrading option is inevitable, but the timing is always a judgment call by the DOM/owner. While supporting and keeping the aircraft flying is always at the forefront of our mission, the timing for avionics upgrades is an opinion. Wait, gamble, or get a slot and get it done, the latter would be my recommendation.



complete. In addition, many ADS-B Out solutions give you the ability to not only meet the mandate, they give you valuable ADS-B IN options as well, like graphical weather, traffic, and more.

You can also save your customer money and downtime of having to move their airplane for an ADS-B upgrade by purchasing an STC. STCs are available for many different airframe and avionics suite combinations and many are available that include kits that consist of all parts and instructions needed for the upgrade.

WHEN IS IT TIME TO UPGRADE AN AVIONICS SUITE?

When a new avionics suite becomes certified, there are always hold outs that don't want to take advantage of the new features and capabilities. As the product gains popularity in the marketplace, and the industry starts to fully understand the advantages and values

KING AIR OPERATORS

The popularity of the King Air G1000 is a great example of making a cost-benefit analysis. During a five-year period, a traditional upgrade could look like this:

- WAAS/LPV - \$95,000
- ADS-B - \$75,000
- RVSM - \$83,000
- Yearly Avionics Maintenance - \$20,000 (Times Five Years = \$100,000)
- Total - \$353,000
- Value Increase to Aircraft - \$0

With the average cost of a King Air G1000 installation at \$335,000, it adds an average value increase to the airplane of \$275,000, so owners typically get a very good return on their investment. This example, of course, assumes no prior traditional upgrades and it may not make sense for your customer to make an upgrade depending on their mission, length of time they plan on owning the airplane, and current equipment needs. That is where aftermarket avionics options, including stocking spare sets may make more sense. Regardless of their decision, the more you know, the better relationship you are going to build with your customer to keep them coming back for service.

IT'S ALL ABOUT OPTIONS

Understanding all of your options can lead to a huge cost savings for you and your customer. When an aircraft part inevitably breaks, with a little bit of research you can find several options that can help your customer make a more informed decision about what to do. Doing so will not only help move your project forward, but will ultimately solidify your reputation with the customer. **AMT**

JOE STANLEY is the parts sales manager for Elliott Aviation. He has spent over 30 years in the aviation industry sourcing aircraft parts for customers around the world. He is an aviation enthusiast and a commercial, multi-engine, IFR pilot with light-sport, tail-dragger endorsements. He has over 1,000 hours and continues to fly today. He manages over 20 employees and over 20,000 active part numbers. He is a member of AEA, NBAA, AOPA, and EAA.

DEDICATED TO HELPING BUSINESS ACHIEVE ITS HIGHEST GOALS.



MAINTENANCE CONFERENCE

May 2-4, 2017 | West Palm Beach, FL

PDP COURSE – STRATEGIC LEADERSHIP:

How to Inspire, Influence and Achieve Results | May 5, 2017

REGISTER TODAY: www.nbaa.org/mc/amt



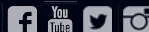
The closer we look at your engine,
the better you see it.

Pratt & Whitney keeps a close eye on every engine we build and service. Then we share our decades of engine intelligence and advances in big data to bring unprecedented performance, predictability and service life to your engine. It's the operational advantage you'll see only from your engine maker. **Take a closer look at www.pw.utc.com.**

A United Technologies Company

Visit us at MRO Americas Booth 2217.

Connect with us



IMAGES COURTESY OF MARINO BORIC



GEIGER MOTOR GMBH DELIVERS NEW WANKEL AVIATION ENGINES

**ALEXANDER
GEIGER** and
Wolfgang Baier
with a Flight
Design CT with a
two-rotor Geiger
A2-74 engine in the
background.

Geiger debuted at Aero 2017 in Germany a new engine/generator solution for electric aircraft, and is also developing versions with a direct (combustion chamber) fuel injection

By Marino Boric

Last year the German company Geiger Motor GmbH introduced two new Wankel aviation engines advertising them as “Power-to-Weight-Heroes.” We have heard many similar slogans in the past from almost all

other Wankel engine manufacturers, but Wankel engines never achieved success in the aviation engine market. Some projects disappeared, other were renamed many times, and just a few have found limited



MAINTENANCE



CONNECT WITH EXPERIENCE™

Experience has long been a focus at West Star Aviation. Not only the experience of our people, but your experience as our valued customer as well. In fact, we believe that both are critical to delivering the highest quality aircraft services available today.

In 2017, we are adding to this focus of making our experience in Paint, Interior, Maintenance and Avionics services even more accessible to our customers. This means easier access to detailed capabilities, facility information and most importantly - access to the right people, at the right location, right when you need them.

We are building an open communication, no run-around approach that allows you to be confident in your decision to choose West Star Aviation at every level, and we're just getting started.

To learn how to Connect With Experience, visit www.weststaraviation.com



AVIONICS

INTERIOR



PAINT



weststaraviation.com

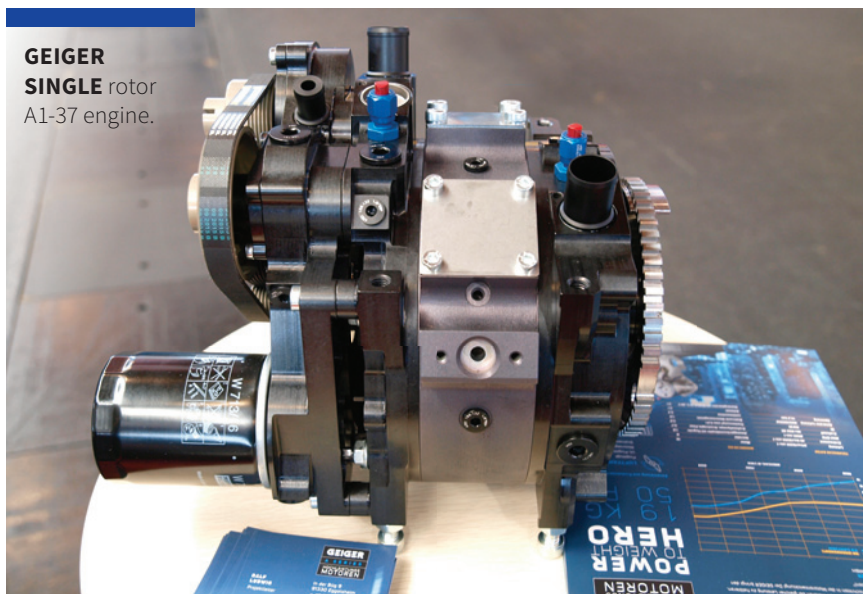
WEST STAR
AVIATION
CONNECT WITH EXPERIENCE™

FALCON
CITATION
GULFSTREAM
LEARJET

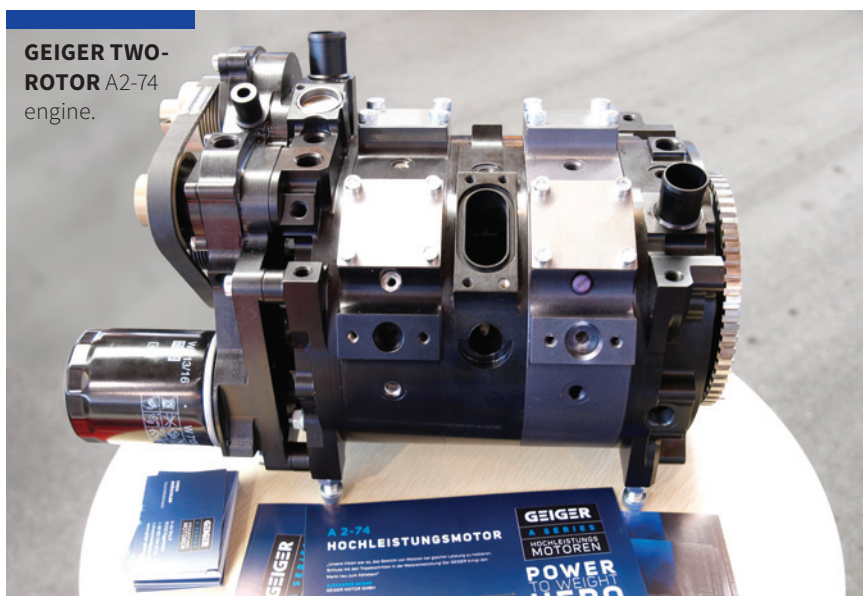
HAWKER
CHALLENGER
GLOBAL EXPRESS
EMBRAER

KING AIR
CONQUEST
PIAGGIO
OTHER

**GEIGER
SINGLE rotor**
A1-37 engine.



**GEIGER TWO-
ROTOR** A2-74
engine.



use in some niches. Geiger Motors is confident to be able to make it better. Now Geiger is increasing the pace launching a third Wankel powerplant which consists of two engines coupled by a gearbox with a single shaft output — a valid reason for *AMT* and its European correspondent to visit the manufacturer.

AVIATION AND WANKEL, NOT THE BEST PAIRING

In the last decades several new, Wankel-cycle engines, were developed for aviation

use. Often, too often, those rotary piston engines never entered a serial production or disappeared fast and are now rarely available for purchase. There were several serious attempts in this field like Mistral from Switzerland as a certified engine and many others (noncertified) that derived either from Mazda automotive core or a few others, mainly in Europe, based on the ancient Sachs (motorcycle) engine.

The Wankel engine could be the ideal choice for aeronautic use, being very compact, simple, lightweight, having a high

power-to-weight ratio, and smooth operation. Many designs suffered some common problems. Most relevant were thermal problems: cooling of rotating pistons was difficult and usually a not well-solved task. Those engines suffered problems with sealing surfaces on the rotor perimeter and on sidewalls, resulting in high oil and fuel consumption. Many manufacturers lacked sufficient funding, plus were not able to manufacture parts with tight tolerances, especially in smallest series.

Geiger is promising betterment on the precision parts manufacturing side. The German Geiger Motor GmbH sees its chance. Geiger is established as a competent supplier of parts to the automotive industry and is an expert in complex compo-

A direct fuel injection system will allow the engines to run on Mogas, diesel, or kerosene.

nents production for manufacturers like BMW, Mercedes, and others. Geiger can count on about 100 highly skilled workers, at two manufacturing sites in Germany in Upper Franconia with a huge machines park. Among them are cutting-edge, CNC controlled machines, along with other milling and precision grinding machines to assure economical production even in small production runs.

Geiger, established in 1967, started in 2009 with the development and production of engines. The result is the rotary piston, Wankel four-stroke engine which consists of a low number of parts not having the intake/exhaust valves and drives. The wish to develop such an engine is understandable knowing that from the beginning Wolfgang Bayer was involved in the engine development. He has worked



The MRO Lab[®]

Adaptive Innovations

As an Airline MRO, Air France Industries KLM Engineering & Maintenance has developed a unique portfolio of know-how and engineering capabilities reflected in its development of a wide range of value-adding innovations.

"The MRO Lab" is the program where all the innovations developed by AFI KLM E&M and its network of affiliates converge. Specially tailored to the challenges of aircraft maintenance, the innovations are the fruit of continuous development aimed at satisfying the requirements of airline operating performance.

The know-how deriving from mastery of these technologies benefits AFI KLM E&M clients by generating scale effects and optimizing fleet performance.

for several decades on the development of rotary piston engines, even at Fichtel & Sachs. Having invested much in the development process and having disposal cutting edge machines capable of production of tight-tolerances components, Geiger is confident it will overcome the problems typical to Wankel engines in the past.

Two new Wankel engines presented by Geiger in 2016 are the single rotor A1-37 and a two-rotor A2-74.

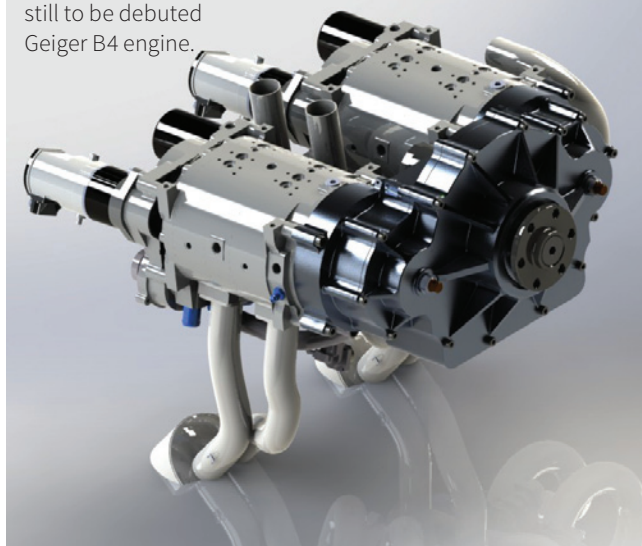
At Geiger the 1, 2, and 4 stand for number of rotors (rotating pistons) and the following number 37, 74, and 150 stand for the engine maximum power in kw. The A2/100-hp weighs dry — with a heavier planetary gearbox 121 pounds (55 kg) and wet approximately 132 pounds (60 kg).

DOUBLING THE TWIN, B4 POWERPLANT IS COMING

The newest, still to be debuted, engine called B4-150 is Geiger's masterpiece. It consists of two A2, twin piston units — which

THE NEWEST

still to be debuted
Geiger B4 engine.



drive through a clutch, a gearbox with a single output shaft. This uncommon two-engine solution with a single prop or power flange was chosen on purpose to power an aircraft or a helicopter giving the aircraft an unreached redundancy. The weight of the complete 200-hp unit is 352 pounds (160 kg) wet.

MODULAR DESIGN

All Geiger Wankel engines use the same (rotating) piston and the same epitrochoid-shaped housing/stator, with the resulting unit displacement volume of 305 cc. This unit develops 50 hp at 8,000 rpm. The basic difference is the number of pistons used; that's why the engines are basically the same and just adding a segment, with low weight increase, the output power is being doubled.

PROPRIETARY GEARBOXES

The planetary gearbox weighing 20 pounds (9 kg) for the A2-100-hp engine was too heavy for the A1-50-hp engine (it would fit on that engine, too) so Alexander Geiger developed a belt-driven unit weighing only 6.6 pounds (3 kg).

As all Wankel engines, even this two rotor engine developed full power at high rpm, in this case around 8,000 rpm.

MODERN ENGINEERING SOLUTIONS

All three engines are equipped with an electronic control unit (ECU) fuel injection and electronic ignition. The fuel injection nozzles are located very close to the engine intake port. We say "port" because there are no valves on Wankel engines — so we can speak almost about a direct fuel injection. Now a single injector solution per rotor is used; the next batch will use two injectors per combustion chamber.

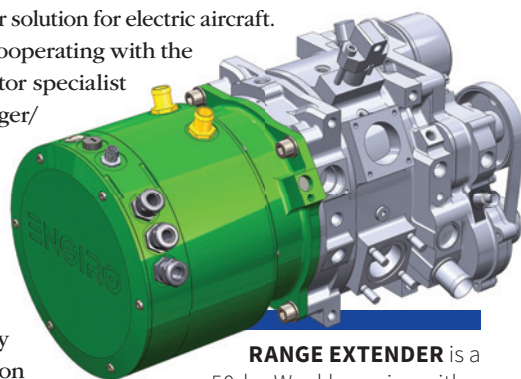
DIESEL WANKEL AS A GAME-CHANGER

Geiger is now developing versions with a direct (combustion chamber) fuel injection. In this case the engines will be able to run not only with Mogas (ROZ95), but the engines could then also be fueled with diesel or kerosene. This will give Geiger the access to the drones and military market which is going toward single fuel use. In this moment this is a highly confidential matter and engines running on dyno have reached an "almost serial ripeness" according to Geiger. The power output of this spark-plug ignited diesel fuel engine is lower than of gasoline engines but this disadvantage has been considerably lowered.

GEIGER RANGE EXTENDER ON THE RISE

Geiger debuted at Aero 2017 in Germany a new engine/generator solution for electric aircraft.

Geiger is here cooperating with the German generator specialist Engiro. The Geiger/Engiro 30-kw unit will be a perfect add-on for electrically driven aircraft which can stay airborne for only a limited time on now limited battery capacity.



RANGE EXTENDER is a 50-hp Wankel engine with a 30-kw generator (in green) mounted.

THE IMPROVED DURABILITY

The durability of Wankel engines was in the past not really the best. CEO Alexander Geiger is assuring that his engines will be significantly more durable than existing rotary engines. In his opinion better and more accurate manufacturing methods, new materials/coatings, better cooling, and lubrication are guaran-



GARMIN G5000



CUSTOM PAINT AND INTERIOR



AUTHORIZED MAINTENANCE

**LEADING GARMIN G5000 SOLUTIONS, REDEFINED PAINT AND INTERIOR,
AUTHORIZED SERVICE CENTER MAINTENANCE.**

At Elliott Aviation, we are leaders in Beechjet 400A/Hawker 400XP services. As the world-wide leader in Garmin G5000 installations, we have done more G5000 installations than all other dealers in the world, combined! We also lead the industry in custom paint and interior with our exclusive weight-savings 400E program. As an authorized service center for the 400A/400XP, we can handle your maintenance, accessories parts needs and more! At Elliott Aviation, you'll land a better experience...

because of our experience.



GARMIN

MOLINE

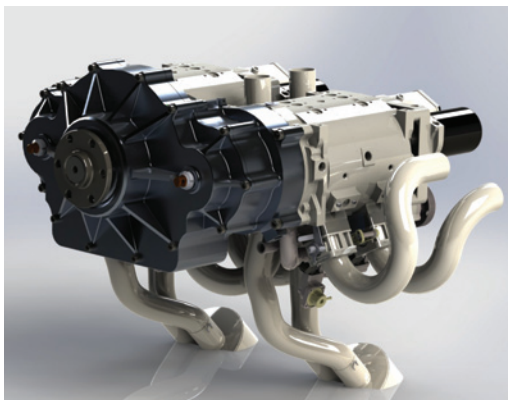
DES MOINES

MINNEAPOLIS

800.447.6711

ELLIOTT
AVIATION

ElliottAviation.com



GEIGER TWIN 2 A2 74 engine.

tors for a much longer durability. Geiger engines are cooled at the engine perimeter with water. This was not really an issue on other liquid cooled-Wankel engines; the problem was a cooling of the rotating pis-

ton which is enclosed in the hot engine. The rotor was in the past often insufficiently cooled by air as a coolant and lubricated with the addition of oil drops. In this point Geiger engines are different. Geiger uses two oil circuits and two oil pumps. On a pressure side there is a constant oil flow (over 2 gal./min.) in liquid form (not evaporated oil drops) to cool and lubricate the rotor internally.

This oil circuit has a dedicated feeding oil-pump and an oil cooler. The warm oil is transported by a scavenging pump to the oil tank which is located just aft the engine, inside the space cage created by the engine (adapter) mount. This all-aluminum structure is bringing the Geiger engine in a much more forward

location because it is 20 to 40 pounds lighter than other four-stroke engines. This engine adapter is being designed to fit the Rotax 912 engine mount. All engine moving parts (approximately 70 percent less than in conventional piston engines) together with the central drive shaft use ball bearings for easier maintenance. The rotor seals have been improved with new materials and coatings. According to Geiger the TBO should be at least 1,000 hours and will further rise.

FUEL/OIL CONSUMPTION

In the past the fuel and oil consumption of Wankel cycle engines was pretty high; today this has dropped with a use of electronic fuel injection to "normal" levels, according to Geiger. The 100-hp engine burns 4 to 5.3 gallons (15 - 20

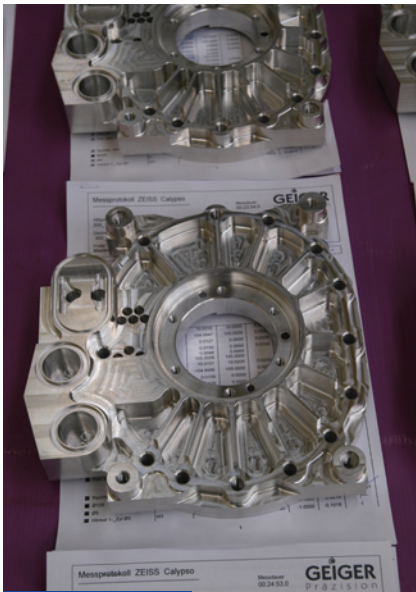
A collage of images related to the EBACE 2017 event. The top left shows two men in business suits talking. The middle left shows a busy exhibition hall with people and displays. The bottom left shows a large aircraft on a tarmac. The right side of the collage features the EBACE logo and event details.

EBACE

22 - 24 MAY 2017 | GENEVA

Join European business leaders, government officials, manufacturers, flight department personnel and all those involved in business aviation for the **European Business Aviation Convention & Exhibition (EBACE2017)**. Visit the website to learn more and register today.

REGISTER TODAY
www.ebace.aero



GEIGER ENGINE production parts.

liters) fuel per hour. Geiger speaks of “consumption similar to that of the de-facto industry standard, Rotax 912 ULS engine.” This will occur once extremely high oil consumption has been lowered to under 0.1 U.S. quart per hour of operation. Fuel consumption depends on the used propeller and actual engine load so the above values are not precise figures.

BENCH AND FIELD TESTING

The two-rotor Geiger A2-74 engine is installed in a European UL, a Flight Design CT (almost identical to a U.S. Light Sport Aircraft version). Both engines are continuously running on a Geiger dyno 24/7 and already went airborne; the 50-hp engine on board a Fresh Breeze weight shifted trike, and the 100PS engine aboard a Flight Design CT.

PRICING

The price of the smaller, 50-hp engine will be \$7,400 (6,900 Euro); the bigger, 100-hp will cost \$12,800 (11,900 Euro), all prices VAT excluded. Engines can be individually configured but normally will be delivered complete, ready to be installed, with electric, oil, and fuel systems. The first batch of 100 engines is in production and the delivery of the first engines from

a serial production is scheduled for next few months. The distribution network is still being built and Geiger Motors is looking for interested distributors. Geiger’s

intention is to serve OEMs, and local distributors will serve local markets. **AMT**

For more information visit www.geiger-motor.de.

Hawkeye® V2 Videoscopes

Fast, Reliable, Affordable, Visual Inspection!

90° Prism & Close-Focus tips available!



VIDEO BORESCOPIES

In stock, ready for overnight delivery!

Hawkeye® V2 Video Borescopes are fully portable, finely constructed, and deliver clear, bright high resolution photos and video! The 5" LCD monitor allows comfortable viewing, and intuitive, easy-to-use controls provide photo and video capture at the touch of a button! V2's have a wide, 4-way articulation range, and are small, lightweight, and priced starting at only \$8995. V2's are available in both 4 and 6 mm diameters. Optional 90° Prism and Close-Focus adapter tips.

Visit us at:

AVIATION WEEK
MRO
AMERICAS

Booth #801 • Orlando, FL
April 25 - 27, 2017

Gradient Lens Corporation®

**TRY
BEFORE
YOU BUY!**
(US ONLY)

gradientlens.com

800.536.0790

Made in USA



AviationPros.com/company/10136580



Keep your aircraft operating at peak performance with unmatched technical expertise. On your schedule. On your terms.

Learn more at service.txtav.com.

©2017 Textron Aviation Inc. All rights reserved.

BUILT WITHOUT COMPROMISE. MAINTAIN IT THAT WAY.



Beechcraft



Hawker

TEXTRON AVIATION



RAISING THE STANDARDS

ATEC, PRIVATE SECTOR DOING THEIR PART TO TRAIN AVIATION MAINTENANCE STUDENTS

By Steve Staedler

IF YOU WERE AN AIRCRAFT TECHNICIAN working during World War II, you would have needed to know how to service pressure carburetors, which were an important component of the fuel systems found on many aircraft flying over the European and Pacific theaters.

If you're a student learning to become an aircraft technician today, and enrolled in a Part 147 certified school, the curriculum will mandate you learn the principles of pressure carburetors. The problem is, you'll likely never see a pressure carburetor in your career. So why do you need to learn it?

That question has been raised more and more in the past few years. The Part 147 curriculum to become a certified aircraft mechanic covers areas that, like pressure carburetors, aren't applicable to today's aircraft.

"Part 147 dictates curriculum requirements that haven't been updated in 50

years, so our schools are teaching some antiquated subjects that aren't meeting the current needs of industry," says Crystal Maguire, executive director, Aviation Technician Education Council (ATEC) (www.atec-amt.org).

ATEC has made updating these curriculum standards a top priority, but they're not alone in working for this cause. The private sector aviation companies, through industry events like the Aerospace Maintenance Competition Presented by Snap-on, are sharing their knowledge and resources to retain more students in the aviation industry, and better equip them with the skills needed to contribute in the early stages of their careers.

ATEC

Founded in 1961, ATEC's mission is to promote and support aviation maintenance technician education to meet the aerospace industry's workforce needs. The council is operated by a board of directors with resumes that reach deep within all facets of education and aviation maintenance.

The idea of updating the FAA-mandated curriculum taught in all Part 147 schools throughout the United States isn't exactly new, as various efforts have been made for the past two decades. What's differ-

COUNTERCLOCKWISE: FROM top, student teams compete at the Aerospace Maintenance Competition in 2016. The 2017 event will be held April 25-27 in Orlando. Redstone College works with the industry to provide its students with the tools and equipment they need to excel in aircraft maintenance careers.

SNAP-ON, REDSTONE COLLEGE

GLOBALPARTS
AERO SERVICES

We Have
Your Solution
BOTTLED



Factory trained technicians

**Quick turn hydro-static
test services**

**Exclusive factory authorized
repair and overhaul facility for
recertification and testing**

**Customer unit repairs or
in-stock availability for same day
exchange to meet your needs**

**1.316.733.9240
repairs@globalparts.aero
www.globalparts.aero**

**Come see us at
NBAA MMC Conference 2017
Booth #512**

AviationPros.com/company/10451249

ent this time around is that all parties (schools, airlines, MROs, etc.) are on the same page and using their collective strength to elicit change.

“The schools want to create candidates that actually meet the employers’ needs; regulatory requirements make that challenging,” Maguire says. “Employers are

putting new hires through months of training to ensure they have the skills and knowledge required to perform assigned tasks.”

While updating regulation that governs technical school curriculum is a move that needs to happen, could it lead to added costs that schools must absorb when obtaining the new equipment related to those updates?

“I think everyone is in favor of updates (to the curriculum), but when you start making changes and updates like that, you start talking about expense,” says James Howard, airframe structures instructor at George T. Baker Aviation Technical College, a Part 147 school in Miami that is operated by the Miami-Dade

In a 2016 survey of Part 147 schools, the top issues facing schools were unavailable or inaccessible government funding, followed by limited access to training equipment.

Public School System. The program currently comprises about 1,000 high school and adult students studying for careers in aviation. “It comes down to the FAA, the school board, and others getting together to decide what needs to be done and what can be done.”

Howard says securing aircraft for students to train on can be a costly expenditure, and any upgrades to the course work may necessitate schools getting their hands on an aircraft.

“It’s very expensive to get aircraft, and the airlines don’t give them to us like they used to,” he says, adding that his school is fortunate to have a Boeing 737 and a McDonnell Douglas MD-82 for training.

Howard isn’t alone in his concerns about budgets and the availability of



Business Aircraft Consumables, inc.

What's on your workbench?

- Abrasives
- Adhesives
- Bulbs
- Chemicals
- Hydraulic Fluid
- Lubricants
- Oil
- Paint
- Sealants
- Shop Supplies

1-888-239-6625
Internat'l 1-815-356-5191

www.BAC-online.com

AviationPros.com/company/10134024

Exchange or **OVERHAUL** Wheels & Brakes

Units available for immediate
exchange or overhaul.



**Disassembly, Inspection,
Overhaul and Return to Service**

**In-House Non-Destructive
Testing (NDT)**

**1900 • Beechjet • Cessna
Challenger • Falcon • Hawker
Jetstream • King Air • Learjet
Premier • SAAB**

**1.316.733.9240
repairs@globalparts.aero
www.globalparts.aero**

**Come see us at
NBAA MMC Conference 2017
Booth #512**

AviationPros.com/company/10451249



equipment. In a 2016 survey to evaluate key industry trends of Part 147 schools, the most concerning issues facing these schools were unavailable or inaccessible government funding, followed by limited access to training equipment (survey results were based on responses from 47 of the 178 Part 147 schools operating in the United States).

Terry Dunkin, an instructor at Indian Hills Community College in Ottumwa, IA, agrees that the curriculum needs to be reviewed and updated, but is worried the revisions might go too far and eliminate tasking that, in his opinion, may need to stay.

For example, he says that welding is being considered for removal from the Part 147 teachings, and being replaced with a limited section on welding inspection — a move that may be short-sighted.

"If you really don't know how a weld is made, do you really know what you're looking at when inspecting a weld, because a weld can look good and still not really be sound," he says. "I'm cautious on some things that may get eliminated because the technician is still responsible for engine mounts, and other structures that are welded. There are still tasks that

require the technicians to determine if that part is airworthy or not."

Dunkin acknowledges that it's going to be hard to please everyone in the new Part 147 curriculum. The opinions of those with general aviation backgrounds, like Dunkin, are likely going to differ from those with commercial aviation experience, on the issue of the relative importance of various curriculum elements.

"It's time for the curriculum to be looked at, but my concern is not to go about it half-heartedly and start chopping things that could be an issue. But where that line is, it's pretty hard to say," he says.

INDUSTRY EXPERTISE

Arming students with skills, experiences, and certifications not only prepares them for success, but ensures that aviation maintenance jobs are filled by the best and brightest. In recent years, the private sector has stepped up to do its part to help train and certify the next generation of technicians.

Snap-on, for example, has developed an education program to certify students on the proper use of tools and equipment for the aviation industry. Snap-on partners with well over 300 technical

Snap-on partners with well over 300 technical schools and community colleges to facilitate the certification training on the proper use of tools and equipment.

schools and community colleges, including many Part 147 schools, to facilitate the certification training. These certifications usually involve 16 to 24 hours of instruction, and are weaved into the school's aviation maintenance curriculum. The certifications provide conformity and an across-the-board standard for the partnering colleges and schools to teach in-depth instruction on tool use, theory, and application.

Electrical Measurement (multimeter), Torque (mechanical and electronic), and the two newest courses, Structural

and Sheet Metal Repair, and Precision Electrical Termination, which are debuting in select Part 147 schools later this year, are four applicable aviation-focused certifications offered through Snap-on's education program. The Precision Electrical Termination certification is a joint partnership between Snap-on and Daniels Manufacturing Corp..

Partnerships between the private sector and education institutions benefit everyone involved. From the schools' standpoint, it allows them to offer more highly specialized training on tools, equipment,

and related disciplines, making them more attractive to prospective students. This collaboration helps create academic programs tailored to the current needs of the aviation industry — the more skills and certifications students can pick up in school, the more prepared they'll be for success when entering the workforce. This is the real benefit to students. When they apply for a job within the aviation industry, having these added skills on their resumes (on top of their degrees), makes them much more desirable candidates to fill the positions.

Schools such as Wichita Area Technical College in Wichita, KS; Pima Community College in Tucson, AZ; Teterboro School of Aeronautics in Teterboro, NJ; and Wayne Community College in Goldsboro, NC, are just some of the schools partner-



Reliable De-Ice Boot Source



Ice Shield De-icing Systems offers...

- Part for Part Replacement
- Easy Installation
- Technical Support
- 48-hour Guarantee Delivery

Ice Shield is a *Faster, Better, Smarter* way to protect your aircraft from icing.

For more information please visit www.iceshield.com or 800.767.6899



AviationPros.com/company/10133965

STRUCTURAL REPAIR

Put Your Trust in
Our Experts



GlobalParts Aero Structures offers the maintenance, repair and overhaul of extensive airframe structures. Structures capabilities encompass everything from manufacturing and engineering, to paint code matching and quality control for leading edges, inlets, ailerons, access doors, radomes and more.

1.316.733.9240
repairs@globalparts.aero
www.globalparts.aero

Come see us at
NBAA MMC Conference 2017
Booth #512

AviationPros.com/company/10451249



Rubbing shoulders with seasoned industry professionals is a great way for students to network and get themselves in front of potential employers. The Aerospace Maintenance Competition is one such venue.

ing with Snap-on and offering certifications. Snap-on also supports the Northrop Rice Foundation by annually funding five tool scholarships of \$4,000 each.

NETWORKING EVENTS

Rubbing shoulders with seasoned industry professionals is a great way for students to network and get themselves in front of potential employers. The Aerospace Maintenance Competition Presented by Snap-on is one such venue.

Held during the MRO Americas Convention, April 25-27, in Orlando, the AMC (www.aerospacecompetition.com) is a one-of-a-kind event that honors the skills and functions performed by certified aircraft technicians around the world.

The competition is also open to students enrolled in either FAA, EASA, CASA, or equivalently authorized schools, and military personnel who are involved in aircraft and spacecraft maintenance. Teams test their skills by competing in more than 20 tasks. This

year, 16 colleges are fielding 21 teams in the AMC; 54 total teams have entered.

Maguire says events like the AMC are a great opportunity for aviation students to network and secure employment within the industry. According to a recent ATEC survey, only 60 percent of aviation students test for their A&P license right out of school. Additionally, 25 percent of students graduating from an A&P school are choosing a career outside of aviation maintenance.

The answer lies in defining a clear career path for students to apply their skills and advance into aviation. The key to making this happen is continuing to foster strong relationships between schools and local employers, and advocating involvement in the AMC and other events that

bring schools and students together with industry, Maguire says.

"The best advice is for people to get involved with their local schools; if you want to have the high-quality supply of students, you have to be part of the process," she says. "It's hard for schools to do it on their own. They need the direction, they need the equipment, and they need the monetary support. It's a global issue that can be solved locally." **AMT**



STEVE STAEHLER is a senior account executive at LePoidevin Marketing, a Brookfield, WI-based business-to-business marketing firm that specializes in the tooling and aerospace industries. Steve has been covering aeronautical maintenance

for nearly 10 years; is a former newspaper reporter and retired master sergeant from the U.S. Air Force Reserve, where he worked maintenance and public affairs. He can be reached at steve@lepoidevinmarketing.com; (262) 754-9550; or www.lepoidevinmarketing.com.



HOW TO RECRUIT AND RETAIN NEW EMPLOYEES IN THE MRO WORLD

By ServiceElements, Christine Hill

©ISTOCKPHOTO.COM/DANLEAP

THE AVIATION INDUSTRY LIKE MANY other industries, and maybe even more than most, is changing at a rate that is hard to fathom, let alone trying to stay ahead of the change. We find this is especially true when it comes to dealing with people and understanding the differing needs of the generations in the workplace. There is a generation of experienced maintenance technician professionals that is aging out of the workforce over the next few years.

The aircraft maintenance job opportunities are expected to see a 6 percent growth in the next decade according to U.S. statistics. This means solid opportunities for graduating mechanics specializing in avionics, sheet metal, and composites. But it will be an increasing challenge for

organizations and leadership to fill these positions with employees that have all the characteristics that are essential for a strong team and culture: dependability, leadership qualities, and core skills (human interaction, communication, and team players).

There is a new generation already in the workforce with a whole different set of expectations and guiding motivations. Leaders, supervisors, and managers are feeling the pinch of trying to understand, manage, and motivate this new generation of workers while trying to meet increasing demands placed on them by the marketplace to get things done faster, cheaper, and better than ever before.

One of the challenges we are hearing

from leadership and hiring managers is that typical new job applicants are not as technically skilled as they were even 10 years ago. A&P school training is limited, and modern technology changes faster than it can be taught. It is more difficult to find professionals with the exact technical abilities for the job description. Even job descriptions for maintenance technicians are not what they were in the past. Most organizations, whether they are a small maintenance shop or a large OEM or MRO, are tasked with doing more, faster, and with less resources than ever before. So, individuals and departments have a wider scope of job responsibilities within their typical work environment.

SKYSCAPES® GENERAL AVIATION BASECOAT

HIGH GLOSS FINISH DELIVERS MAXIMUM APPEARANCE AND PRODUCTIVITY



Ideal for exterior painting on general aviation and helicopters, Sherwin-Williams Aerospace Coatings presents the SKYscapes® General Aviation (GA) Basecoat 855 Series – SG, SGE, SGM and SGP Colors.

It is designed to deliver the maximum in appearance and productivity by delivering a consistent and colorful solid, mica or metallic finish.

SKYscapes GA Basecoat features fast dry times (approximately 60 – 90 minute Dry-to-touch time), that lead to improved productivity, an easy 6 to 1 to 2 mixing ratio and excellent flow and leveling. After clearcoat, it provides a high gloss finish that can be easily cleaned, buffed and repaired.

AIRCRAFT OWNERS DEMAND ON-TIME DELIVERY

This SKYscapes GA basecoat-clearcoat system can reduce paint-process time to help meet customer demand for aircraft turnaround. That's because the SKYscapes system cures at ambient temperature in half the time of most single-stage systems.

Professional aircraft painters now have the option of which Clearcoat to use with one of two Sherwin-Williams SKYscapes systems: the new General Aviation Clearcoat - CM0850CC1 for increased speed; or the existing SKYscapes Clearcoat - CM0850180 - for improved chemical and fluid resistance.

SKYSCAPES GA BASECOAT ADVANTAGES:

- Quick drying; Allows for multiple color livery applications per day
- For small general aviation aircraft and helicopters requiring expedited production times
- Available in a solid, mica or metallic finish

- One double track coat application for most colors
- No baking required; dries quickly at ambient temperatures
- Apply additional colors without mechanically sanding
- Excellent opacity at low film thickness
- Excellent flow and leveling
- Easy to keep clean, maintain and repair

For information on the new clearcoat or the entire SKYscapes General Aviation Basecoat or other Sherwin-Williams Aerospace Coatings, call 888-888-5593 or visit swaerospace.com.



SKYscapes®



AIRCRAFT
COATINGS
THAT
PROTECT
AND
REFLECT

You expect your aircraft's finish to be durable and great looking. Nothing less will do.

You expect it to be protected against punishing weather, extreme temperatures, corrosion exposure and aggressive chemical and cleaning materials.

Your plane also needs to reflect and promote your brand – crisp colors, sharp Distinctness of Image – whether it's an airline livery, a corporate jet or your own personal aircraft. You can trust Sherwin-Williams Aerospace Coatings for an impression that lasts. Year after year.



SHERWIN-WILLIAMS
Aerospace Coatings

swaerospace.com/reflect

HOW DO WE HIRE, MOTIVATE, AND RETAIN OUR TEAMS IN THIS NEW ENVIRONMENT?

What should be the important questions to ask and things to look for to build and maintain a culture of service to each other and to our customers that will be competitive, safe, and a place that we can be proud of? The assumption we will make is that you already have an engaged and motivated team. This is an important pre-requisite to hiring and maintaining the best young technical professionals. Open communication, along with engaged and empowered team members that motivate and inspire each other is a necessary component to being able to hire new technical professionals ... and be able to keep them.

The culture of your organization is something that new hires will need to assimilate into. How do you find people that are a good fit for your culture? There are some professional recruiting companies in the aviation industry (like API and JPI) that do a great job screening aviation professionals, so that is a good place to start.

Hiring people for personality is more relevant than hiring for experience. If the person has the right attitude, there are ways to get them up to speed on the technical requirements of the job. If the person does not have the right attitude, no amount of training, coaching, or mentoring is going to make the person fit in and work out. There are many personality tests that are useful when hiring new team members. There are also questions and techniques that can be used to try to discover the attitude/personality of a person interviewing for the job at hand. Some people are very well skilled at interviewing. They can make themselves look very good in the initial interviewing process — beware!

ASK THE INTERVIEWEE SITUATIONAL QUESTIONS

Ask the interviewee situational questions, where he/she has to describe circumstances that they dealt with to resolve a situation. This will give some insight into how they might react in stressful situations or situations that the job might require. Here are a few examples:

1. “Give me an example of when you took action when those around you were waiting for someone to tell them what to do.”
2. “Describe a situation when you intervened to help recover a customer service issue.”
3. “Tell me about a time when a customer was not happy with something you did and you turned the situation around.”

These types of behavioral questions will tell you more about the person and how they would handle a situation.

TRY A SIMULATION OR ROLE-PLAY

One tool that we recommend using when trying to ascertain the type of person who is applying to serve in your company is simulation, or role-play. Simulators have long been used in aviation to train professionals on technical skills. Simulation is also a useful tool for working through people or company culture issues. Give a potential new hire a couple scenarios that have been difficult situations in your work environment. Ask how they would deal with them. Here are a couple examples:

1. You have recently been promoted to Manager of Maintenance Services. Jerry, a good friend of yours, had also applied for the job. Jerry is well liked among his coworkers, and he is also very customer oriented. Now, you are Jerry's manager. Over the last month, Jerry has been coming to work late, and you have a feeling he has been creating a negative mood among others on your team. Jerry is a valuable team member, and he has a lot of influence with other coworkers. What would you do?
2. A customer/owner scheduled a flight prior to the aircraft going into inspection. There was an unexpected repair. The part was not in stock and needed to be ordered. This delayed the release from maintenance, and the aircraft was not available for the flight. The owner demanded to go as scheduled and advised maintenance to finish the repair after the flight. What would you do?

By giving the potential new hire some real-life scenarios, it gives you a glimpse into what his/her thought process and moral compass are when making decisions. Does it fit with your organizational culture? Take your time in deciding even when under pressure to hire quickly. The people that you bring onto your team are vital to the continuation of the organization and the well-being of the team. If you have a good thing going on — you need to guard it with a vengeance. Training young maintenance technicians to troubleshoot on a specific type of equipment will be easier when you have the type of attitude/personality that fits your organization's culture.

This topic was lightly tapped into today. There are many guidelines and techniques for how to effectively hire the new generation. ServiceElements works with large and small organizations to develop and fine-tune their organizational cultures. Please feel free to contact us if you need additional assistance with understanding the behavioral piece of building/maintaining your service culture. **AMT**



CHRISTINE HILL, executive vice president and co-founder of ServiceElements, has been in teaching, facilitating, and coaching for 30+ years. She has a Master's in psychology/education from Northern Arizona University and is passionate about helping organizations, teams, and individuals with development of human interaction skills.



INNOVATIVE SOLUTIONS



ENGINEERING BETTER OPTIONS

From parts to components to higher order assembly repairs,
Wencor has coverage in over 30 ATA chapters.

Visit us at **MRO AMERICAS** - Booth #**5218**

For more information please contact us at **678-490-0140** | www.wencorgroup.com

The Power Equipment side of the Techtronic Industries (Milwaukee, AEG and Ryobi) had an “exceptional year” with sales growth of 12.6% to US\$4.5 billion, accounting for 81.6% of total sales with an increase in operating profit of 13.4% to US\$430 million.

Market analysts forecast the global hand tools market to grow at a CAGR of **3.8%** during the period 2017-2021.

www.researchandmarkets.com

Mark A. Yoder has been promoted to director of sales, Channellock for North America, and Ken C. Burchill now will serve as account manager.



TOOL STORAGE

Organize and Revolutionize How You Work with Tools

Grypshon LLC

Thanks to the Grypmat, tool users can focus on their work without having to worry about runaway screws or misplaced hardware. Due to its unique polymer-silicone blend, the Grypmat's grip can hold tools at extreme angles (up to 70 degrees) on a variety of work surfaces, making it the ultimate companion for working on aircraft wing, engines and fuselage — simply anywhere tools are used. The Grypmat is resistant to all types of chemicals, such as Skydrol, MEK, JP8, hydraulic fluid, etc. The Grypmat Original is currently available on the website. The three new Grypmat sizes are available for preorder on Indiegogo.



For more information visit
www.grypshon.com



PAINTS

Sherwin-Williams Adds 38 Colors

Sherwin-Williams Aerospace Coatings

Featuring 38 new colors, Jet Flex ELITE Polyurethane Enamel from Sherwin-Williams Aerospace Coatings provides an extensive color palette for interior aircraft cabins. Colors like Foggy Forest, Stormy Sea, Steamy Latte, Silvery Moon, Sunset Blush, Coastal Breeze, and Golden Radiance, provide interior airline designers with a choice from the latest bright whites and neutral colors to warm hue effects. These coatings create a subtle glow with highlights and colored shadows. Recommended for interior applications and apply easily to plastic, metal and composite surfaces. Based off Boeing qualified technology (BMS 10-83), it meets the most stringent requirements for stain and abrasion resistance as well as the FAR/JAR 25.853 regulations for burn, smoke and heat release.



SHERWIN-WILLIAMS
Aerospace Coatings

For more information visit www.swaerospace.com,
call (888) 888-5593 (NA) or (316) 733-7576 (Intl).



Aircraft Maintenance Technology continues its legacy for providing information on key concerns of the industry—acquiring new talent and career development.

 The Industry forecast predicts hundreds of thousands of aircraft technicians will be required to maintain aircraft over the next 20 years.

Knowledge is Power: Introducing the New! Career Development eNewsletter

The *AMT* Career Development bi-monthly eNewsletter will focus on the latest news, technology, training, and best practices to ensure aviation has the technicians it needs for the future, delivered right to your inbox! To receive the new Career Development eNewsletter, refer to the subscription information below.

Subscribe to *AMT's* Career Development eNewsletter
Visit: AviationPros.com/reg/newsletter



Get there quicker,
scan me.

AviationPros.com Education & Training Channel

With aircraft technology evolving faster than academia can keep pace, *Aircraft Maintenance Technology* now offers a special section of our website, *AviationPros.com*, focused on education and training. The Education & Training Channel includes news, articles, training opportunities and association scholarship availability, including *AMT's* IA Refresher Training seminars.

Keep up to date on the latest education information and training opportunities
Visit: AviationPros.com/education-training



Get there quicker,
scan me.

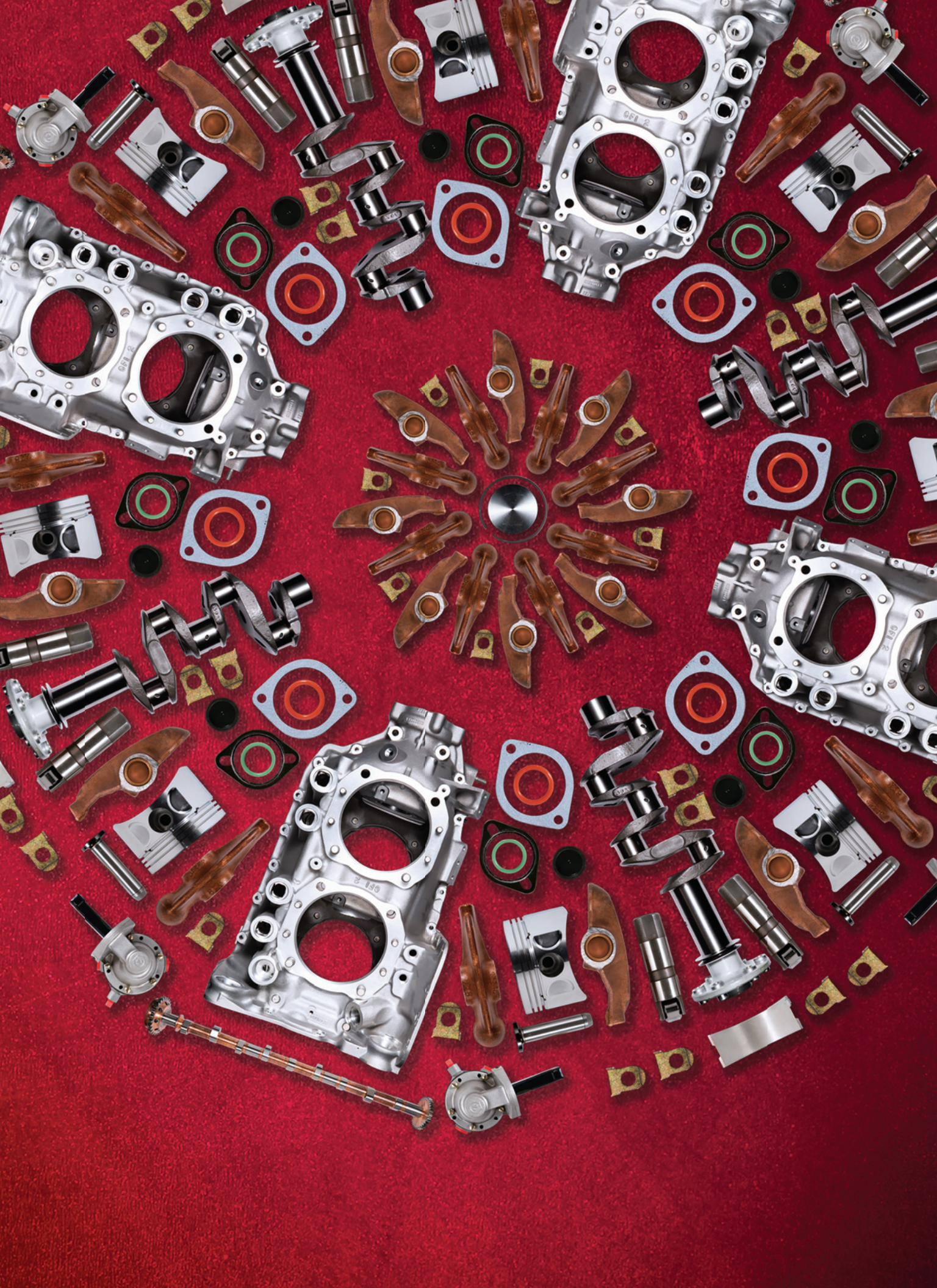
WITHOUT GENUINE LYCOMING PARTS, IS IT EVEN A LYCOMING ENGINE?

CHOOSE INNOVATION, NOT IMITATION.

That's a question we ask ourselves here in the shop, where we've been making genuine Lycoming factory parts for piston engines since 1929. We engineer our parts for a precise fit, with exceptional wear characteristics that extend their life and time to TBO. It's our commitment to innovation that gives Lycoming parts—and, thus, Lycoming engines—their reputation for durability. Because an engine is the sum of its parts, and genuine Lycoming parts make all the difference. Contact an authorized Lycoming distributor to purchase genuine Lycoming parts.

LycomingParts.com/amt





AAR'S AIRFRAME MRO NETWORK ADDS NEW LOCATION



By Ronald Donner

Collaboration between private and government entities results in a purpose-built MRO facility in the central United States with a key benefit — an aviation maintenance technician school right next door

**AIRCRAFT
MAINTENANCE** work
is ramping up at the
AAR Rockford, IL, MRO
facility.
AAR CORP



Last December *AMT* attended the grand opening ceremony for AAR's newest airframe MRO facility located on the Chicago Rockford International Airport (RFD) in northern Illinois. The two massive side-by-side hangars were impressive. The 238,000-square-foot facility consists of two 10-story hangars each measuring 300 feet by 300 feet with common areas between them for offices, tool and equipment rooms, work control centers, and employee break rooms. The hangars are capable of holding the largest wide-body airliners.

Aircraft maintenance work is ramping up and AAR is currently conducting work for a tier-one airline and, previous to its arrival, completed work for a large cargo carrier. Additionally it has a line of work scheduled for the next several months.

At the time of the grand opening there was a core group of around a dozen employees assigned to the new facility, and at the time this article was written that number was up to about 50.

THE ROCKFORD APPEAL

Needless to say there's a lot of excitement and proud people associated with this facility. During the opening ceremony, David Storch, AAR's chairman, president and chief executive officer, remarked, "I'd be very disappointed if, at the end of the day, this was not a premier maintenance operation. The possibilities of being here in Rockford, I think, far outweigh the benefits we have elsewhere around the country."

Wayne Jamroz is AAR's general manager of the new Rockford facility and proudly commented for this article, "The city, businesses, and people of Rockford have built one of the finest MRO facilities in the country. The experience thus far has been nothing short of amazing. We understand the attention that goes along with this, as well as the responsibility that has been bestowed upon us

to make this facility as successful and supportive to the community as we can. We are working day in and day out to capture the right work and to build our reputation here as the premier wide-body maintenance facility in the country and hopefully the world. We are putting together a world class team in an effort to achieve these goals. As I have said to our new employees, *this is the beginning of something Great!*"

There are a few reasons that made Rockford an ideal location for AAR to open its newest MRO. Rockford has a history of aerospace connections and companies located there, and building the new MRO has reinforced the area's connection with the aviation industry. Troy Jonas, vice president of MRO Services, says, "The airport authority, along with state and local government, was instrumental in working with us and building a state-of-the-art facility in this area not far from Chicago." AAR's headquarters is located near Chicago.

WORK AND WORKFORCE PROJECTIONS

When asked about the plans for work at the new location Jonas describes a potential blend of narrow and wide-body aircraft heavy checks. "We are focused on wide-body aircraft, however, with the large capacity available to us, we could also add in several narrow-body aircraft along with wide-body aircraft." He goes on to say, "The facility can accommodate two Boeing 747s, eight Boeing 737-800s, or four Boeing 787s. The station can even hangar the new double-deck, wide-body, four-engine Airbus A380. We expect at full capacity to see 750,000 to 1 million man-hours of work per year."

When asked about AAR's projections for heavy maintenance work over the next five to 10 years Jonas says, "AAR anticipates low single-digit growth within North America and high single-digit growth outside the United States, particularly



in Asia. We anticipate a mix of U.S.-based and foreign carriers, and we do expect some wide-body work to shift back into the U.S. from overseas. With the largest and leading network of MRO facilities in

the U.S., AAR is well-positioned to meet this increased demand with American workers."

Jonas closes by saying, "We feel good about the opportunities we are seeing

to bring in additional customers to the Rockford facility."

Greg Dellinger, director of talent for AAR states, "This is a brand new facility designed for next generation aircraft. Any aircraft maintenance professional would want their resume to show they spent time here." Hiring of course is directly tied to maintenance inputs, but the goal is to have between 300 and 500 employees at this facility in three to five years. With multiple locations in its MRO network, AAR has the ability to shift interested employees from one location to another.

A UNIQUE BUILDING

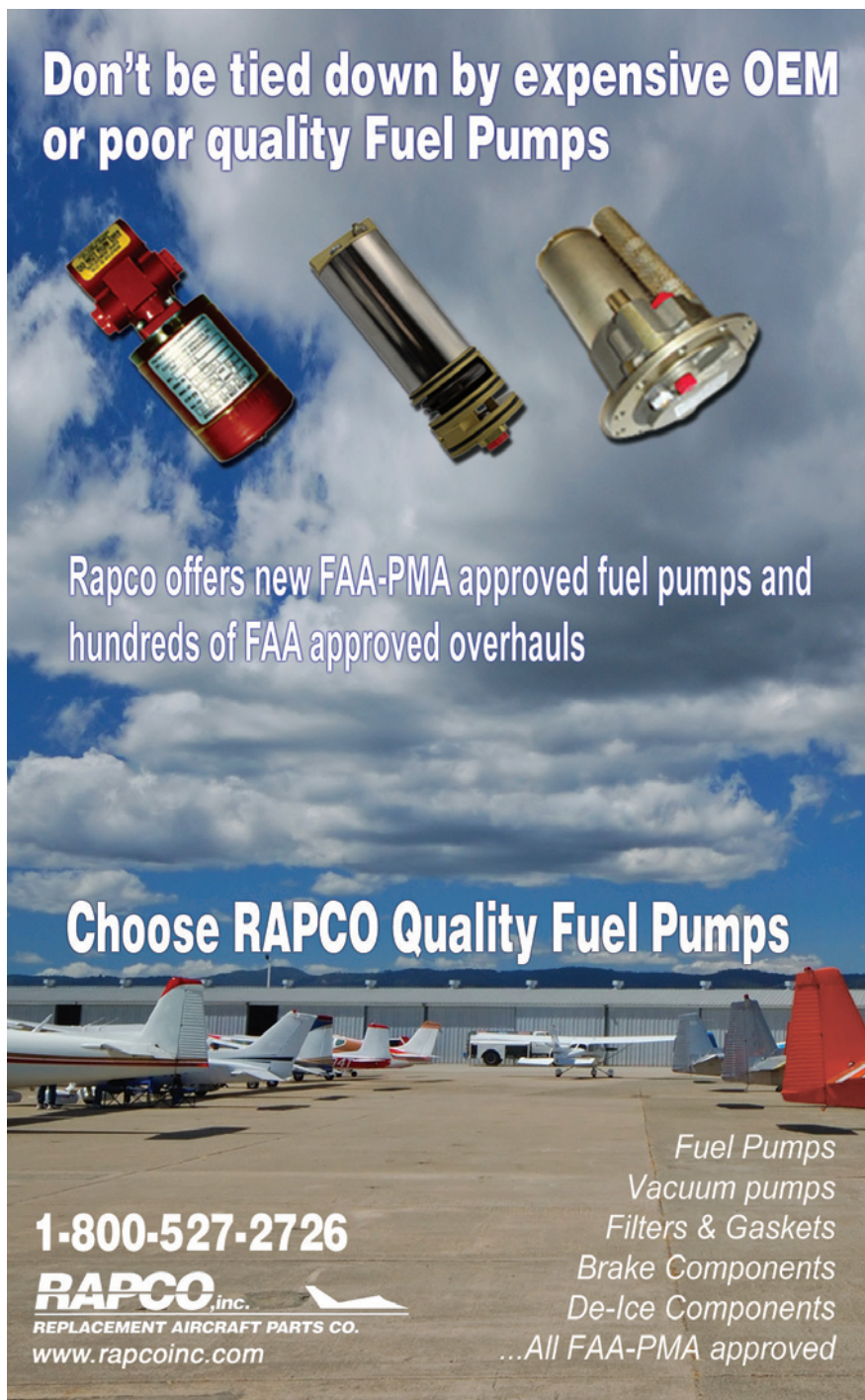
Rubb Building Systems was selected to build the facility. The steel truss framework is clad with 2-inch thick insulated fabric which has some unique properties. Sean Hickey with Rubb says, "Our PVC-coated, polyester-based membrane, used to clad the hangar roofs, has certain fire safety advantages. It meets NFPA 701 and ASTM E-84 for flame retardancy. This essentially means that if a fire is to occur, the membrane will not propagate flames."

Hickey goes on to explain that if a fire does occur, the fabric in that area will "self-vent," allowing the interior of the structure to remain cool enough for firefighters to perform their duties, and the structural frame never gets hot enough for the steel to be damaged.

Because of the self-venting and compliance with the NFPA and ASTM standards, the fire safety code for hangars, NFPA 409, was revised in 2011 to look favorably on membrane clad hangars. Membrane clad hangars fall into Group IV classification, meaning they can have an unlimited fire area and only need a foam protection system. Most conventional buildings are limited in fire area and require both sprinklers and foam.

The membrane roof also has other advantages over conventional building materials in terms of faster initial construction, lower lifetime maintenance, and being more energy efficient.

The hangar doors are just as interesting. The ASSA ABLOY Entrance Systems



Don't be tied down by expensive OEM or poor quality Fuel Pumps

Rapco offers new FAA-PMA approved fuel pumps and hundreds of FAA approved overhauls

Choose RAPCO Quality Fuel Pumps

1-800-527-2726

RAPCO, inc.
REPLACEMENT AIRCRAFT PARTS CO.
www.rapcoinc.com

Fuel Pumps
Vacuum pumps
Filters & Gaskets
Brake Components
De-Ice Components
...All FAA-PMA approved

AviationPros.com/company/10134838

THE EDUCATION CONNECTION

The Rock Valley College (RVC) Aviation Maintenance Technician program has been located on the RFD airport for decades. It was similar to many AMT programs around the country; located in a small older building with an equally small enrollment. One of the key realizations for RFD to be able to attract a large world-class MRO was the ability for the area to provide a pipeline of talent. Part of the MRO project was to also build a new larger school and to have it adjacent to the MRO.

Mark Adolphson, academic chair aviation technology, says, "A few years ago we would take in about 40 new students per year.

The first year of the new facility we started 120 new students." He goes on to explain the close location allows for easy and frequent student tours and AAR has donated its first large component, an APU, to the school as a training aid.

Greg Dellinger says, "AAR now has a pipeline of freshly minted aircraft maintenance talent right across the street — another part of the secret sauce of AAR RFD." Every graduating student from RVC with

their FAA certificate will be offered an opportunity to interview for a position at AAR RFD. AAR has

already begun hiring students into different jobs, including support technicians/mechanic helpers.



USAVS-J-4-1500

360° ARTICULATING ECONOMY VIDEOSCOPE

3.8MM DIAMETER • 1500MM LENGTH
JOYSTICK-CONTROLLED 360° ARTICULATION
INTERCHANGEABLE, DOUBLE TUNGSTEN ALLOY BRAIDED
INSERTION TUBE
HIGH-INTENSITY LED ILLUMINATION
LARGE DEPTH OF FIELD & WIDE VIEWING ANGLE
EXCELLENT IMAGE PROCESSING TECHNOLOGY
REAL-TIME VIDEO OUTPUT
RECHARGEABLE LITHIUM BATTERY
HEAVY DUTY CARRYING CASE

\$7995⁰⁰

3.5" SONY HD
DISPLAY SCREEN

360°
ARTICULATION

STURDY & DURABLE
LOW/HIGH TEMP RESISTANT
WATERPROOF
DROP RESISTANT

JOYSTICK
CONTROL



931-362-3304

sales@USABorescopes.com

www.USABorescopes.com

AviationPros.com/company/12091501



ASSA ABLOY ENTRANCE SYSTEMS

Megadoor is the modern alternative to the older traditional bottom rolling doors. The AAR team first utilized Megadoors on another massive hangar they leased from the Chennault Airport in Louisiana.

Pierre Varlamoff with ASSA ABLOY Entrance Systems says, "One of the goals when designing a cost-effective and efficient hangar facility is to maximize operational flexibility while minimizing the hangar square footage and volume. Since, Megadoors lift vertically, the door system can be shaped to the aircraft mix, and they do not require the massive door pockets and track system of conventional bottom rolling doors, saving thousands of square feet of room."

Varlamoff says, "The door is comprised of horizontal aluminum beams that are skinned on the interior and exterior with a PVC-coated polyester fabric which envelopes the side guides. Our unique seals provide exceptionally low air infiltration rates dramatically reducing energy loss in the cold Rockford winters. The translucent white fabric of the door allows natural light into the hangar providing a safer, happier, and more productive work environment for the aircraft technicians." **AMT**

QUALITY BUILDINGS YOU CAN TRUST



Proven durable quality for over 30 years!

Innovative custom designed
MRO and Cargo Hangars



RUBB

BUILDING SYSTEMS

excellence in engineering

Email: info@rubbusa.com | Tel: 1-800-289-7822
www.rubbusa.com

Engineered and built with integrity in Maine, USA



AviationPros.com/company/10132364

Add class to your career

Advanced composite engineers and technicians are in high demand. We offer accelerated learning and active training courses in engineering, manufacturing and repair of composites. Our 5-day courses can provide the applicable skills needed to advance your career.

Learn More, Grow More, Earn More

www.abaris.com



ABARIS
TRAINING

+1 (775) 827-6568 • training@abaris.com

AviationPros.com/company/10133727



**SHREVEPORT
AIRPORT
AUTHORITY**

FOR LEASE

WIDE-BODY HANGAR



- 152,000 square foot facility
- 100,000+ square feet of clear span hangar capable of handling variety of narrow & wide-body aircraft
- 24,000 square foot warehouse facility
- 24,000 square feet of office, shops area
- Parking for 350+ vehicles
- 100+ certified A&P mechanics seeking to remain at SHV

MAINTENANCE HANGAR



- Built as a regional airline maintenance facility
- 29,280 square-foot facility with open hangar space to accommodate a regional jet-type aircraft
- Two-story office area, storage facilities, overhead cranes and workshop areas

SHREVEPORT REGIONAL AIRPORT (SHV) INFORMATION

- 24-Hour control tower
- 24/7 onsite security
- ARFF Station
- U.S. Customs on site
- 200+ annual days with sunshine
- Airlines: Allegiant, American, Delta, GLO, and United
- Air Cargo: FedEx, UPS, Empire Airlines, Integrated Airline Services
- Easy access to I-20, I-49 & I-220
- Enterprise Zone
- Southern University A&P School
- **TWO RUNWAYS:**
14/32 - 8351 feet long, ILS CAT I, II
6/24 - 6,202 feet long

CONTACT US

HENRY THOMPSON

henry.thompson@shreveportla.gov

318-673-5370

BILL COOKSEY

william.cooksey@shreveportla.gov

FlyShreveport.com

HOT SPOTS

AMIDST LUKEWARM PASSENGER TO FREIGHTER CONVERSION MARKET



The passenger aircraft to freighter conversion isn't quite what it used to be

By Jerome Greer Chandler

The passenger aircraft to freighter conversion isn't quite what it used to be. "Many people have been predicting a rebound ... for several years now," says John F. Smiley III, manager of aviation competitive & market intelligence for CAVOK, a division of Oliver Wyman. "It just hasn't come through."

Smiley says there are a couple of key reasons: newer passenger aircraft

come replete "with a lot of belly cargo room," and formerly red-hot "express carriers are under a lot of heavy competition from rail and ground transportation." This leads the aviation consultancy to forecast 300 to 400 passenger to freight conversions over the next 10 years. Smiley says that number reflects the reality of the market "for all size" conversions.



MARKET DEBATE: SIZE AND SCOPE

Mike Andrews begs to disagree somewhat with CAVOK's assessment, predicting "a bit better than 400" aircraft according to PEMCO World Air Services' director of cargo conversions. PEMCO specializes in reconfiguring Boeing 737-300s and -400s for cargo customers. It's reworked more than 150 of the ubiquitous twin-engine

aircraft since the conversion program was launched back in 1991.

Boeing is busy just now with preparations to roll out its first 737-800BCF (Boeing Converted Freighter) soon, with the first conversion set for re-delivery in the fourth quarter of 2017 to the customer. In all, Boeing predicts a total demand for 1,440 converted freighters over the next 20 years — 1,040 standard-body aircraft and 400 wide-bodies.

Seen in aggregate, the conversion market is percolating along. It's just not steamy hot anymore. "Our market is not slow," asserts PEMCO's Andrews. "We've had one of the better years we've had in the last few years. We'll convert 10 to 15 this year."

Boeing says so far it's received as many as 60 orders for its 737-800BCF from eight customers. A significant slice of those

-800s are bound for China, where they're being converted.

The company set up its first line at Boeing Shanghai, says Kurt Kraft, Boeing's vice president of freighter conversions. "We're going to add two additional lines at STAECO in Jinan." He calls both facilities experienced MRO sites. "We've got a great deal of confidence in these guys. It's a great place to build the airplane and they're very good at what they do.

"The beauty is there's a tremendous amount of demand right now for this [-800] airplane in China," says Kraft. "This allows us to do these conversions close to the customer, so they can stay close to their airplanes during the conversion process."

By the numbers, the Boeing World Air Cargo Forecast projects world air cargo will grow "4.2 percent over the next 20

Putting the best future imaginable on wing.

At Pratt & Whitney, we keep you flying. Our Customer Training team is dedicated to advancing jet engine knowledge and maintenance techniques. From standard courses to customized solutions, whether instructor-led or on the web, we provide an innovative learning experience to support your maintenance, engine performance and fleet management needs. Backed by a global network that supports you anytime, anywhere. Pratt & Whitney. Learn more at www.pwcustomertraining.com.

A United Technologies Company Connect with us

AviationPros.com/company/10134793



working a Boeing 737 passenger to freighter conversion.

CAVOK's Smiley puts these numbers in perspective: "The middle class [in China] is the size of the entire U.S. population. So as that middle class continues to increase their spending that will drive a lot of growth."

Drill deeper into that growth and route sectors emerge, some requiring different types of aircraft. In its latest

- A 1.9 percent air cargo growth worldwide;
- Plus 6.5 percent growth from Asia to North America;
- Plus 6.5 percent growth from Europe to Asia;
- A modest plus 1.3 percent intra-Asia;
- Moderate 1.8 percent growth from Europe to North America;
- A plus 2.5 percent rise in intra-North America cargo traffic;
- A plus 4.9 percent hike in domestic China air cargo;



-



April 24-27, 2017
Orlando, FL

- A plus 0.6 percent increase in Latin America-Europe air cargo;
- A fall off of 4.1 percent from Latin America to North America;
- A gain of 0.6 percent between Africa and Europe;
- A 4.1 percent decrease between South Asia and Europe;
- An 11.1 percent rise between the Middle East and Europe;
- A growth of 5.0 percent in Intra Europe air cargo.

Among aircraft handling short to mid-range missions are Boeing's 737-300 and -400s. PEMCO specializes in these conversions.

Boeing says its 737-300SF carry up to 19 metric tons of cargo, sport as many as 10 pallet positions, and can fly as many as 1,600 nautical miles nonstop. Contrast those capabilities with the 737-800BCF which can haul up to 23.9 metric tons of air cargo on routes of up to 1,995 nautical miles. The -800BCF boasts 12 pallet positions.

Boeing predicts a total demand for 1,440 converted freighters over the next 20 years — 1,040 standard-body aircraft and 400 wide-bodies.

The battle between older 737-300s and -400s on one hand and newer 737-700s and -800s on the other is being closely watched. Smiley says, "What [operators] look at is the total cost of operation. So, you can operate the 737-300 and 737-400 — even though they cost more per hour to [fly], the acquisition cost of getting that aircraft and the conversion cost may make it beneficial vs. a new 737-700 or -800, because of the lower utilization."

OK, but just how much of this operational advantage is due to the current cost of jet fuel? It's not dirt cheap,

but it's still sane. Smiley says, "[We] did an analysis of this a few years ago and we determined that for narrow-body aircraft fuel has to be about US\$2.00 per gallon before the new generation of narrow-bodies become more efficient ... Fuel has just now crept back up to about US \$1.50. It's still got a ways to go."

PEMCO's Andrews says the older-generation airframes his company converts average between 35,000



INSIDE PEMCO'S hangar at Tampa Florida. PEMCO

and 45,000 cycles when they roll into the hangar. The No. 1 driver among his customers is aircraft acquisition cost, coupled with the consideration of "What they've got to put back in the aircraft so that it will fly another 10 years."

The market for passenger to freighter conversion is firmly focused on the 737 family, with the -800 the most attractive conversion candidate just now. Smiley says the Seven-Threes are supplemented by other conversions: some of the remaining 757s and 767s as well as the first batch of A320s coming off

Key System Capabilities:

- Inventory and Materials Management
- Work Order System
- Flight Operations & Aircraft Records
- Imaging & Multimedia
- Tooling, Training & Publications Management
- Tablet, PDA & Smartphone Interface
- Enterprise Accounting (GAAP/IFRS Compliant)

AviationPros.com/company/10134757

HEICO®
REPAIR GROUP

RUNNING



PENTAGON 2000SQL™
SOFTWARE EMPOWERING THE ENTERPRISE

ONE SYSTEM

ONE SOLUTION

ONE TIME

WWW.PENTAGON2000.COM

COMMERCIAL MRO

passenger operations. Even relatively venerable MD-80s are getting the conversion treatment. Aeronautical Engineers Inc. (AEI) is transforming a third MD-80 series twinjet to an MD-83SF freighter.

The twinjet is capable of accommodating a dozen main deck containers or pallets and will be used by Everts Air Cargo to meet seasonal demand in Alaska as well as on-demand business in North America.



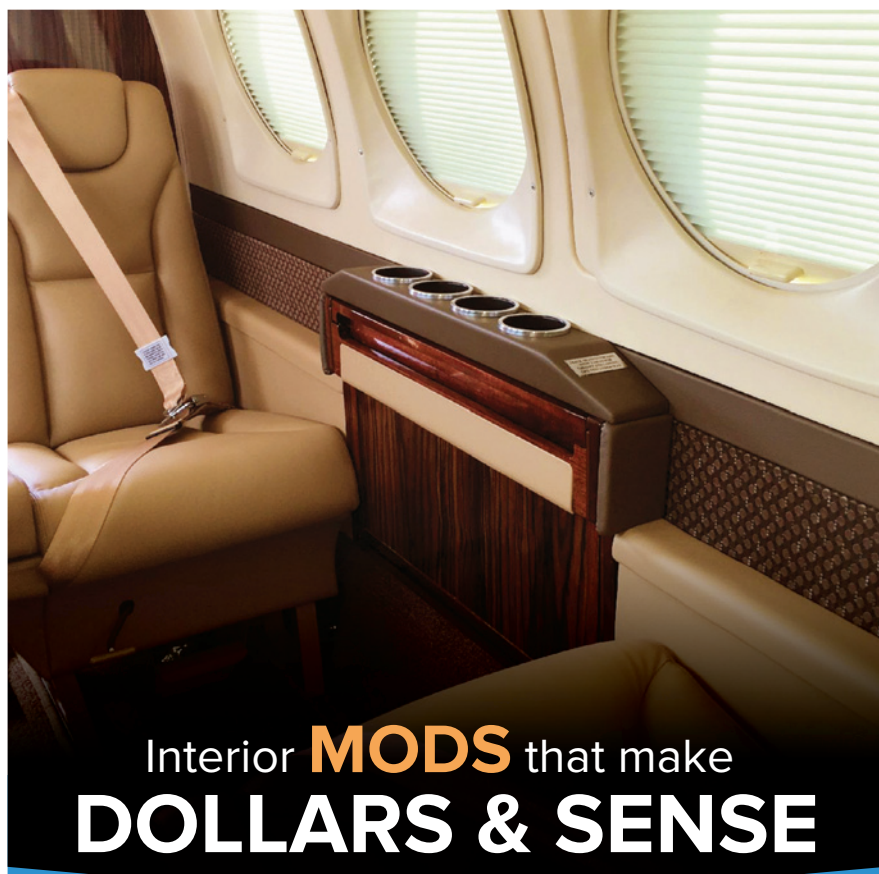
Currently focusing on 737-300 and -400 contracts, PEMCO's Andrews envisions working on 737NG aircraft as well, as they trickle out of passenger operations.

SEALING THE DEAL

When an aircraft rolls into PEMCO to ready itself for its second life here's what happens. Technicians open the whole machine up and strip out the interior. That preps the airplane for a preliminary inspection to identify any structural cracks or damage. Then comes reinforcement of the main deck floor and installation of the cockpit 9g barrier. Finally it's time to set the door. Everyone interviewed by *AMT* for this article agrees that fitting the forward port side cargo door is the biggest technical challenge faced by technicians, no matter what the aircraft type.

One reason is that the door and the fuselage each flex independently of the other. "We reinforce that area to make sure it doesn't flex as much as the rest of the aircraft," says Andrews. "It's pretty much rigid in that area ... It's designed to flex, but not as much as the entire aircraft."

Before work begins, of course, the conversion shop has to possess the appropriate STC. Smiley says it takes three to four months to complete the converting of a 737-series aircraft and



Interior MODS that make DOLLARS & SENSE

Make your legacy King Air 90 or 200 AvFabulous! Developed by the aviation experts at AvFab, the AvFabulous approach allows you to mix and match budget-conscious mods to upgrade your cockpit and cabin. You get enhanced design, improved functionality and comfort to enjoy today, while increasing your aircraft's resale value for tomorrow.

- Arm Ledge Table System • Aft Jump Seat Kit • Pleated Window Shades
- Lateral Tracking Seat Bases • Clear View Hidden Headrests
- Furniture Updates • Crew & Passenger Seat Repair

Your aircraft is an investment. Add comfort. Add value. AvFabulous.



(660) 885-8317 / www.AvFab.com

AviationPros.com/company/10133920



RENDERING OF Boeing's first 737-800BCF planned for induction later this year.
BOEING

runs — depending on the model of the jet — between \$US 2.5 million and \$3.5 million.

Expect 737-800 re-makes to have a nice run in the foreseeable future, this even as work continues to repurpose older

airframes. “I’m pretty sure we hit the ‘sweet spot,’” on this particular aircraft says Boeing’s Kraft. “It’s going to be a great airplane for our customers” — not to mention a mainstay in the passenger to freighter conversion market.” **AMT**



JEROME GREER CHANDLER is a two-time winner in the Aerospace Journalist of the Year competition’s Best Maintenance Submission category; he won in 2000 and 2008. His best-seller ‘Fire and Rain’ chronicles

the wind shear crash of Delta Flight 191 at DFW. Chandler’s passion for aviation safety is more than professional. It’s personal. Two of his relatives have perished on commercial airliners, one of them in the infamous Braniff Electra crash of 1959.

**Custom
designed
fall protection
equipment to
protect your
most valuable
investment.**



**JETechnology
Solutions Inc.**

Contact us today: (888) 510-0389
www.jsiaircraftmaintenancestands.com

AviationPros.com/company/12235134

FORECASTING PARTS SUPPLY DEMAND



PATTONAIR STOCK room

Meeting ever-increasing customer expectations requires robust forecasting and inventory solutions

By Michelle Carter

Over the last few years the growth in commercial aviation and demand for new ranges of aircraft have also created concerns about capacity constraints in the supply chain as well as the ability of maintenance, repair, and overhaul (MRO) organizations to meet their customers' ever higher expectations for quality and delivery.

At the same time airlines and aircraft operators have become leaner and are demanding higher quality and reliability, conscious that every hour their aircraft are grounded, revenue is lost. Rolls-Royce's newly launched Zero Defects program reflects these changes in the market. It draws on the company's heritage of striving for perfection in everything they do and demands this mind-set from its suppliers if they want to continue to be part of

the Rolls-Royce supply chain. Customers are also increasingly focused on sustainability, which has led to higher emphasis on maintaining existing assets and enabling repair loops, to maximise in-service life rather than replacing with new.

For parts suppliers and supply chain providers, the commercial drivers are to manage inventory and the associated working capital while meeting both manufacturing and MRO capacity. Accurately forecasting and meeting a customer's demand for parts at the right time and in the right place is a key area they have to address if a Zero Defects service is to be achieved. Forecasting also has to take into account the contrasting demand profiles of manufacturing, which is predictable, and MROs and the aftermarket, which is more unpredictable and thus has a different set of challenges to delivery of high levels of off-the-shelf availability.

A PwC report "Spares forecasting — a commercial aviation perspective on value chain maturity and best practices" conducted in 2011 identified two key drivers for improving demand forecasting: the need for more effective collaboration and sharing of information (e.g. fleet data, engineering change orders, part reliability, service bulletins, etc.) across the supply chain; and the aggregation of software enabling capabilities to ensure best practice for bills of materials (BOMs), in the spares planning process.

IMAGES COURTESY
OF PATTONAIR

DEVELOPING THE TEAM

Around the same time as this report was published, Pattonair, a global leader in supply chain solutions for C class parts, recognized it needed to invest in developing its forecasting and inventory management capability and developed a global team of specialists dedicated to forecasting, planning, and inventory activities, to work closely with each of the customers. The 25 plus strong team comprises highly skilled forecasting managers, demand planners, senior data analysts and inventory analysts. Headquartered in Derby, UK, with facilities around the world, Pattonair provides end-to-end supply chain solutions tailored specifically to each customer's requirements.

THE SYSTEM

The next step was to create a suite of bespoke systems, tools, and techniques. The available off the shelf inventory management systems were geared to the repetitive patterns of production by OEMs and were unsuitable for wider deviations and unpredictable inventory demands of aftermarket and MROs.

The technology strategy was to take an off-the-shelf supply chain management system and tailor it to meet the specific business needs of its OEM and MRO customers. Standard tools that came with the system were enhanced to mirror the best in class alternatives, proven through the use of its more manual bespoke systems such as the forecasting and inventory management tool; this was replaced and then extensively customised to become Pattonair's patented 'Akrivis Approach' forecasting and inventory management service.

This chimed with PwC's finding on best practice. A collaborative approach to planning and information sharing was introduced,

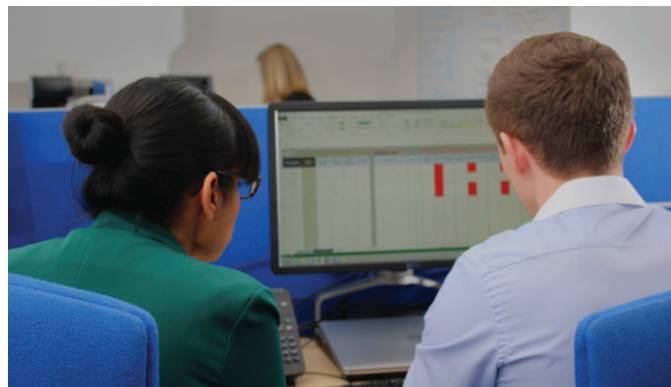
amalgamating consistent internal and external data into 'Akrivis.' This allows multiple data sets to be compared and contrasted, such as supplier lead times, customers' historic forecasts, and their demand profiles of actual consumption, along with identification of unusual demand, seasonal items, and market intelligence. 'Akrivis' delivers a constantly updated and real-time demand forecast for each customer and its accuracy has been a key factor in the company now achieving 99 percent on-time delivery, the highest in the industry.

Another important factor is to align the forecasting tool to each customer's way of operating so it synchronises with their individual ordering patterns and planning processes. This knowledge combined with their data inputs informs their forecasts.

NEXT STEPS

Depending on the maintenance program the MRO cannot always be sure which parts need repair or replacing until the aircraft is inspected therefore demand forecasting for MROs continues to be a challenge for the customer and the parts suppliers. Enhancing forecasting for this area has become a priority for Pattonair as it has seen a significant shift from five years ago when OEMs accounted for approximately 85 to 90 percent of global forecasted accounts to its current portfolio where spares, MRO, development, repair and AR&O solutions account for 25 percent of forecast accounts and this continues to grow. From all these accounts 52 percent of part lines have the potential to be unscheduled demand that is not managed through a specific customer schedule, forecast, or engine bill of material build programme.

In this market sector, utilising enhanced forecasting systems and



methods alone is insufficient to meet the demands from today's customers for off-the-shelf availability of unscheduled parts. Highly technical safety stock modelling and parts replenishment solutions, taking account of demand patterns, service levels, supply lead times, and part criticality, is also required. For example, safety stock and other methods of inventory modelling is supported through continuous demand and inventory data analysis, interpretation, and high levels of master data accuracy in areas as stock integrity, forecast part scope, bill of material accuracy, and systems static data accuracy. Using this approach, alongside "Right First Time" principles, Pattonair is improving inventory safety stock modelling and stock replenishment and systemising and integrating this with its Akrivis forecasting as the next stage in its maturity journey.

CONCLUSION

The key principles needed to achieve effective forecasting and supply chain management are a Zero Defects culture underpinned by 'Right First Time' initiatives. To achieve the better delivery times and quality standards customers expect requires robust systems to meet scheduled and unscheduled demand and a specialist team of people with a collaborative ethos to sharing information. **AMT**

ONE BEST

practice is to align the forecasting tool to each customer's way of operating.



MICHELLE CARTER is forecasting, planning & inventory director at Pattonair. She joined Pattonair in 2012. Her background has been predominantly defence and aerospace. Former roles included programme planning manager at Airbus and supply chain manager, Land Platforms at BAE Systems. She has a MS degree in supply chain management from Cranfield University. For more information on Pattonair visit www.pattonair.com.

HOMEGROWN HUMAN FACTORS TRAINING: NO FAA SPEAKER REQUIRED

Use the FAA human factors websites in combination with your experience, creativity, and personal knowledge of organizational requirements and culture to create the most relevant training

By Dr. Bill Johnson

THE AUTHOR HAS DELIVERED A LOT OF HUMAN factors training in the United States and worldwide. This article is motivated by some of his observations of the industry-developed maintenance human factors training. It is “good-news” story.

“WE ARE STARTING/MODIFYING OUR HF TRAINING”

Nearly every week I receive an email that starts with a statement that the writer is developing or modifying their maintenance HF training. Often the request is accompanied by an invitation for me, or a colleague from the FAA, Civil Aerospace Medical Institute, or an FAA Airworthiness Inspector to come and speak to your maintenance workforce. Of course, we are flattered by the invitation to visit your organization, to see your maintenance or manufacturing force at work, and then to deliver a portion or all of your training. If only we had the time and other resources we would be delighted to accept such invitations. We are increasingly convinced that we offer a better alternative which is our website (www.humanfactorsinfo.com or www.mxfatigue.com) in combination with your experience, creativity, and personal knowledge of organizational requirements and culture.

OUR INVITATION COUNTEROFFER

I have been responding to the invitations by directing you to our website. Once I get you to our FAA website I steer you to the training HF materials, the Maintenance Human Factors Training Presentation System, the Fatigue Awareness Training, and the fatigue movie titled “Grounded.” All of these materials are in usable format and “open source” (code word for free). The Maintenance Human Factors Presentation System is generic legacy HF training. Most users choose to supplement the generic train-

ing with discussions about safety culture, voluntary reporting, and other current topics that are organizationally relevant.

When I suggest these sites I often ask for examples of the training that they’ve developed. In many cases I get to see the products that are derived from those websites and other places. I am usually positively impressed. You have the ability to select the information, graphics, and media that work for you. It is especially excellent when you add pictures from your workplace and use data from your safety management system or recent safety-related events. Just last week I asked a respondent for permission to use some of the ideas and graphics that he added to the FAA and CASA materials. I went from being the trainer to being the student. Thank you for that!

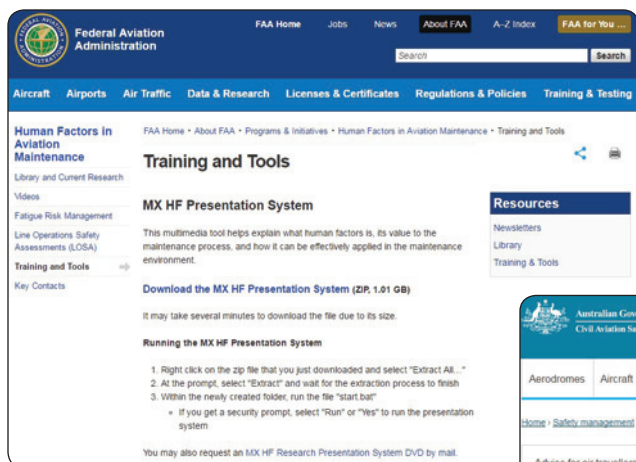
WHY YOU SHOULD BE THE HF TRAINING DEVELOPER OR TRAINER

Adult learning is called “Andragogy.” It refers to the training and education practices for adults/mature learners. Most adults, especially aviation maintenance technicians are very practical about what they want to learn and how to learn it most efficiently. Most adult learners seek immediate relevancy. For example, “tell me about good sleep habits and not about sleep theory,” “show me the fuel system and how to troubleshoot a pump failure or how to service a filter rather than how fuel is refined.” Since you know the workplace and organizational challenges you can ensure training that is relevant. You know what is important for your workers.

Because you can zoom on specific issues your training can be efficient and, more likely, effective. Since you know the general background of the students you are able to tailor the information to their knowledge and experience level.



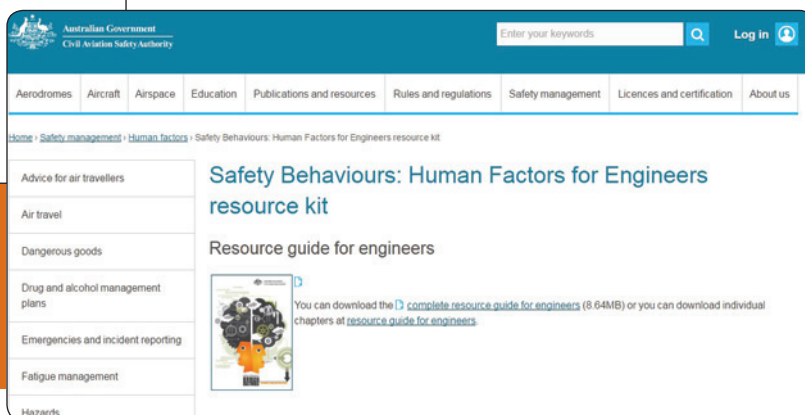
DR. WILLIAM B. JOHNSON is the FAA Chief Scientific and Technical Advisor for Human Factors in Aircraft Maintenance Systems. His comments are based on nearly 50 years of combined experience as a pilot/mechanic, an airline engineering and MRO consultant, a professor, and an FAA scientific executive.



FAA

ABOVE: FAA human factors training website remains relevant.

RIGHT: HUMAN factors training from CASA Australia.



CASA

If you, or a colleague, develop and know the human factors training materials it is easier to schedule training, as a formal class or even in short amounts at a shift meeting. You can ensure that recurrent HF training is precisely targeted at your workers.

TRAIN THE TRAINER

It is important that you or your human factors trainer know some of the fundamentals of being a trainer. Just because you are a great aviation maintenance technician or maintenance supervisor does not qualify you as a human factors trainer. People always ask me “What are the qualifications of good maintenance human factors trainer?” The answer is never straight-forward. At a minimum they must be enthusiastic, have had some formal HF training, and know something about the aviation maintenance environment. That list of this author's suggestions does not use the words certificate holder or college graduate. While an AMT certificate, maintenance work experience, and college training may be helpful the credential list should not make that a requirement.

A WORD ABOUT TRAINING PROVIDERS

It would be remiss not to mention outside contract training providers. This author confesses a positive bias for external human factors and other training providers, having spent many years in that role prior to FAA. External providers have a broad view of the HF topic and yet they see many specific maintenance training organizations

per year. They have many examples of maintenance challenges. External providers have the resources to train their trainers and always provide new materials matched to regulations and local requirements. They get in, get out, and get paid. There is much to be said about the efficiency of a consultant. Each organization must decide what works best for them.

MORE ADVICE WANTED?

Loads of new maintenance human factors training development and delivery advice is on its way, with 2017 publication dates. During 2016 FAA accepted many excellent public comments on the proposed replacement for Advisory Circular AC 120-72 formally called Maintenance Resource Management Training. The public input, as always, added high value to the final document. That AC will be replaced with a new focus, mostly a way to direct readers to many sites and sources for HF training materials.

The newly revised Air Transport Association (now A4A) ATA Spec 104 Guide for Maintenance Training Development is another resource. Spec 104 is the product of the A4A Maintenance Training Committee and represents the work of many airlines from all of the Americas. It is an excellent substitute for any textbook on maintenance training development and delivery. It will be available, for sale, from the Airlines for America website (airlines.org) and is a must for all airline training departments. **AMT**

SWISS REFLEETS

For any airline, the introduction of a new aircraft type is a major event, involving cost, a learning curve, and the adjustment to new operating realities; read how SWISS did it



By Ronald Kuhlmann

For any airline, the introduction of a new aircraft type is a major event, involving cost, a learning curve, and the adjustment to new operating realities. Swiss International Airlines (SWISS) has significantly increased that equation by bringing two new types into the fleet simultaneously, with preparations and planning ratcheted up accordingly.

The airline began operations April 1, 2002 following Swissair's (SR) demise at midnight on March 31st. The new Swiss national carrier was created using the corporate structure of the former Swissair associate airline, Crossair (LX). The newly established carrier created a fleet from its own existing aircraft and a portion of the now-idle Swissair aircraft. That meant former Swissair MD-11s and A330-200s for the long-haul routes, and assorted members

of the A320 family, Avros (BAe RJ-100s), Saab 2000s, and ERJ-145s were available for European services. In 2005, SWISS was purchased by Lufthansa and is now part of the Lufthansa Group, though it maintains a separate management structure.

Swissair had also operated its own maintenance facility, which also did a large volume of third-party maintenance work. Cognizant of the potential that could be tapped by making the operation more independent, in 1997 Swissair spun off SR Technics as a separate company within the Swissair Group. When Swissair failed, SR Technics was transferred to new owners, who began to expand its operation across the globe. Despite this reordering of the Swiss aviation scene, SWISS continues to use SR Technics as its primary partner.



The MD-11, for which Swissair had been a launch customer, was used initially, but was not an ideal choice and beginning in June 2003, SWISS began to replace them with A340-300s, creating a fleet that peaked at 15 aircraft. The A330-200s were also replaced with A330-300s, which provided more seats at a similar operating cost. In Europe, the regional jets and turboprops disappeared, the A320 group was tweaked and the Avros soldiered on.

THE SEARCH FOR A REPLACEMENT — WITH LONDON CITY CAPABILITY

But these Avros had accumulated quite a few cycles — one was over 20 years old. They were also an older technology and were somewhat fuel thirsty; yet they remained because they had a vital

capability — the ability to operate from London's City Airport (LCY). Nonetheless, the search for a replacement was undertaken and, after considerable research SWISS and the Lufthansa Group opted for the still-in-development Bombardier C Series (CS100). The aircraft offered the necessary range/payload requirements and, most importantly, could operate from LCY.

The commitment to the C Series has had some challenging moments as the aircraft fell far behind schedule and financing wore thin. The folks at SWISS were candid in their worries as to whether or not the aircraft would a) ever come to be and b) live up to promised specifications. Yet now, as the number of aircraft in service continues to grow, the wait and the investment appear to have been vindicated.

THE FIRST commercial flight of the C series ferried Star Alliance CEOs and journalists from Dublin to Zurich. SWISS



THE PAST, an Avro, and the future, a B77W pass in Zurich.

SWISS

THE WHYS AND HOWS OF THE TRANSITION

I spoke with Martin Apsel-von zur Gathen, head of network management at SWISS, who detailed the ways in which the transition was being handled and what the expected benefits were for SWISS. The Lufthansa Group has most recently aligned its network management among the four hubs, Frankfurt, Munich, Zurich, and Vienna. Long-haul planning is performed in “virtual teams” consisting of a planner from each hub, whose task is to align their network offer with the goals of the group as a whole. By doing so, competitive advantage is optimized. Taking San Francisco, my home airport as an example, Lufthansa operates an A380 in the early afternoon to Frankfurt and a late evening A340-600 to Munich while either a SWISS A340-300 or B-777-300ER leaves early evening for Zurich. This is supplemented for much of the year with twice-daily flights by joint venture partner United, operating an afternoon and evening flight to Frankfurt. Ideally, a Star Alliance flyer should be able to connect anywhere in the world by utilizing this buffet of choices.

When asked why SWISS chose the Boeing 777-300ER (77W) rather than the cutting edge technology of the 787 or A350 series, Martin explains that the airline began by searching for a 300+ seat aircraft that met the payload and range performance required by SWISS. Along with passenger considerations, SWISS continues to generate significant revenue from cargo, and therefore any aircraft chosen needed to meet full payload requirements over the airline's longest routes. Both the 787-9 and A350-1000 would have been payload restricted on some routes over a portion of the year and the A340-600, while meeting the airline's needs, was a technological step backwards. The new 77X was too long a wait and therefore the 77W hit the sweet spot in terms of requirements — and it was readily available within the desired timespan.

In terms of available seat cost, the 77W will offer a 20 to 25 percent reduction in comparison with the A340-300, with most of that reduction found in fuel cost and maintenance. It also allows SWISS to grow its capacity on prime routes by boosting seats from 219 on the A340-300 to 340 on the 77W (55 percent)

without adding additional aircraft. Efficiency is further boosted by the fact that SWISS has one of the world's highest utilization rates for its long haul aircraft — about 18 hours per day.

SOME A340-300S WILL REMAIN

But the 77W is not a one-to-one replacement for the A340. Currently, there are 10 77Ws to be added: six are currently in the fleet, while four will be added in 2017/18, clearly short of the 15 A340-300s recently operated. SWISS will continue to operate the A340 for the foreseeable future as some of the aircraft are relatively new and will continue to fill the needs for intercontinental routes with lower seat demand. The airline's six leased A340s will be the first to leave the fleet. Three of the owned aircraft will be transferred to Edelweiss Air, a Swiss/Lufthansa Group subsidiary which operates scheduled seasonal services to 40 worldwide destinations.

C SERIES PLUSSES

At the other end of the spectrum is the CS100, designated to replace the RJ100 fleet on European routes. Aircraft were to be integrated at the rate of approximately one per month through 2018 and the Avro fleet was to be reduced in a similar fashion. However, unforeseen delays in the delivery of the aircraft's Pratt & Whitney PW1524G engines has meant that aircraft are arriving at a slower rate than anticipated.

The airline has 30 units on order and the first 10 will be the CS100 model (125 seats) with aircraft 11-25 being the larger CS300 (145 seats). The final configuration of the last five will be determined at a later stage based on market conditions and demand.

Unit cost reduction from the ARJs is anticipated to be around 25 percent and 10 to 15 percent with respect to the A320 fleet. The trip cost is seen to be about 15 percent below that of the ARJs and 10 to 15 percent below that of the A320. The C Series aircraft will offer both Business and Economy service but will not have fixed compartments. For Business Class, two of the five seats per row will be unoccupied.

Having flown the aircraft in a Bombardier configuration, I found the seating to be comfortable in a standard five abreast configuration with windows much larger than those found on aircraft of a similar size. The engines provide ample power and the aircraft surprisingly has transoceanic range. All of this is done with significant reductions of NOX and CO2 as well as having a greatly reduced noise footprint — a vital factor for operations in noise-conscious Europe.

MORE CREW AS WELL

And then there is the human component, crew. In the case of the B77W, a cadre of 220 cockpit personnel is being trained to fly the aircraft. Candidates for training are accepted from all aircraft types currently operated. In order to give trainees as many cycles as possible, the 77Ws are being deployed on numerous European

FLEET LX (WITHOUT EDELWEISS AIR)

Aircraft	12/31/16	12/31/17	12/31/18
B773	6	8	10
A340	9	7	6
A333	14	14	14
A321	9	9	9
A320	22	19	19
A319	5	4	0
ARJ	7	0	0
C Series	9	23	30
Wet lease E90	4	4	4
Wet lease F100	4	0	0
Wet lease Q400	4	4	4

segments, allowing more opportunities for those transitioning. For the summer of 2016, the new planes were deployed on regular scheduled services to Hong Kong, Bangkok, and Los Angeles with San Francisco, Sao Paulo, and Singapore brought online as additional aircraft arrive. Tokyo, Johannesburg, and Beijing will remain, for the near term, A340-300 destinations.

The increased passenger numbers will also increase the demand for cabin staff. The airline is currently seeking up to 800 new applicants for cabin crew positions as well as the additional cockpit crew.

In terms of the existing European fleet there are 10 A320-neo and five A321-neos on order that are intended as replacements for existing aircraft of the same type. The wet leased F100s, operated by Helvetic, will be replaced by E90s operated by the same

MILLENNIUM HL SERIES

STARTER
GENERATOR
BRUSHES



HELPING YOU CARRY A HEAVY LOAD.

Miraj Corporation is pleased to introduce the **Millennium HL Series** starter generator brushes. An extension of our industry leading Millennium Series Long Life brush program, these brushes offer improved life and performance under the most demanding load conditions and operating environments, the **Millennium HL Series** - new brushes for a new generation.



345 Route 17,
Hasbrouck Heights, NJ 07604
201-288-8877 • Fax: 201-288-7356
email: mirajcorp@aol.com
www.mirajcorp.com

AviationPros.com/company/10134654

CHECK OUT OUR WEBSTORE **wagaero.com**

YOUR ONE-STOP REPAIR STATION

FAA CERTIFIED REPAIR STATION #A14R244N

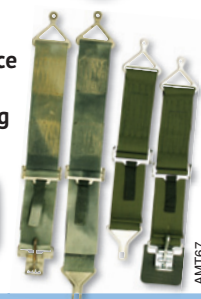
A Division of the
Wag-Aero Group

Aero Fabricators



ENGINE MOUNT, EXHAUST SYSTEM, SEAT BELT & HARNESS REPAIRS

- Fast Service, Most Models Repairable
- Economically Priced
- Full A.D. & Service Bulletin Compliance
- One-Year Unlimited Hours Warranty
- FFA Approved Non-Destructive Testing
- Dealer Program Available



1.800.558.6868 EXT 149

AviationPros.com/company/10135134

carrier and the Q400s, operated by partner Austrian Airlines, will continue to augment the fleet for short-haul, low-density destinations. With the growing fleet of the C Series aircraft, the A319 aircraft will be eliminated. At the end of 2016, the SWISS operated European fleet numbered 64, growing to 66 (including wet leased aircraft) by the end of 2018.

EXPANDED MAINTENANCE PROGRAM

While all line-maintenance tasks up to A-checks continue to be performed by SWISS Technics, a division of the airline, all other checks, as well as base maintenance, are contracted with SR Technics. However, with an expanded workload for SWISS Technics, they have leased hangar space from SR Technics — three bays for short haul aircraft and four for long haul.

The SWISS Technics staff, along with all other departments in the airline, was challenged by the simultaneous integration of two new fleet types. However, the entire process was achieved with no major complications.

Part of the transition has included new training and upgrading of skills for roughly 300 employees and engineers. In addition,

roughly 100 new staff will be added to SWISS Technics to handle the growing fleet.

NEWER, BETTER, LOWER COST

This is a huge undertaking for a mid-sized airline. Within about three years 39 aircraft will be replaced with models new to the fleet, completely revamping the European and ultra-long haul services. When the transition is fully implemented, SWISS will have more capacity, lower costs, and one of the youngest fleets in Europe. Though many think of chocolate when Switzerland is mentioned, the equally famous Swiss reputation for excellence and precision will doubtless continue to make the transition flawless. **AMT**



RON KUHLMANN has spent his entire life in the aviation industry. Beginning with a 30-year career at Swissair, he moved to an aviation consulting firm which eventually was absorbed by Unisys Transportation. He has written for numerous aviation publications and has been a speaker at industry events, including being the keynote speaker for Lufthansa Systems' global meeting in Berlin.

ServiceElements™

People are your company's most important assets.

Professional Development Programs:

- Management and Leadership
- Supervisory and Lead
- Customer Service
- Organizational Resource Management
- Sales and Marketing
- Project Management
- Human Factors
- Communications
- Team work
- Phone Etiquette
- and many more...

www.ServiceElements.com

480-538-0123

ARSA LEGISLATIVE DAY & SYMPOSIUM: WHAT WE LEARNED

There's always plenty to learn when maintenance professionals gather; now it's time to turn these lessons into action and make the flying world a little better before we see each other again

EACH YEAR THE AERONAUTICAL REPAIR STATION Association (ARSA) brings the maintenance world to the capital of the United States. ARSA obviously focuses hard on providing the personal access and practical information that ARSA members and allies need. This year, participants got time with the FAA, EASA, ANAC, and ICAO as well as the U.S. Department of Commerce, Small Business Administration, and elected officials and staffers from the 115th Congress. They also got exclusive access to market analysis, best practices for recruitment, and resources for small business success.

In the end, we hope our attendees leave a little smarter, but hosting a substantive event is a great opportunity for ARSA's team to learn as well. By listening to the questions of members and reviewing information shared during panel discussions and breakouts, we help enhance our own understanding. Then we turn that new insight around for the benefit of maintenance professionals.

A few lessons from 2017:

LEGISLATIVE DAY

Registrants for ARSA's Legislative Day always get careful instruction for engaging their members of Congress. "To prepare for the event," we tell them, "it's very important that you schedule meetings with your elected officials." As a result, repair station representatives meet with senators, representatives, and staffers in order to personalize aircraft maintenance and talk about how Washington can best serve the men and woman who perform it.

This year, we learned the value of broadly defining "your elected officials." Rather than thinking small and reaching out to the senators and representative for a single facility, the most-effective members sent requests to congressmen from every state and district with any connection to the business, including other locations or the residence of employees.

The "footprint" of a company, from the sense of impactful legislative constituency, is broader than we might think.

THINKING BEYOND THE NAA

ARSA's impact with aviation regulators is unquestioned. For three decades, the association has built its reputation as the go-to source for compliance and advocacy. As such, the agenda is always heavy with regulators. Personal engagement with representatives from international NAAs and even the globally chartered ICAO is what gets many participants to the symposium in the first place.

After this year's always-popular "opening salvos" on maintenance and certification, the day wrapped with an hour-long discussion on trade, international development, and small business resources. Panelists from the U.S. Department of Commerce and the Small Business Administration discussed the range of government support for industry.

ANNUAL MEETING & BREAKOUT SESSIONS

Before attendees could catch flights home — or enjoy a chilly weekend in the D.C. area — they had their choice of breakout sessions: Three different panels covering military business, international certification, and engaging the executive branch. Industry panelists were joined by regulators and advocates to cover what repair stations should be doing and what they should be on the lookout for to succeed in 2017.

Friday breakouts reinforced the fact that success in the current political and regulatory environment will require a diversified effort. Whether it's a business bolstering services for a different customer base (perhaps a new military contract), expanding into new markets by obtaining and maintaining international approvals, or expanding engagement in Washington.

There's always plenty to learn when maintenance professionals gather; now it's time to turn these lessons into action, and to make the flying world a little better before we see each other again.

Catch up on these lessons and more by visiting ARSA.org/symposium. **AMT**



BRETT LEVANTO is vice president of operations of Obadal, Filler, MacLeod & Klein, P.L.C. managing firm and client communications in conjunction with regulatory and legislative policy initiatives. He provides strategic and logistical support for the Aeronautical Repair Station Association.

IT CONTINUES TO EVOLVE

ATP CEO Charles Picasso reflects on the industry and ATP's role

By Ronald Donner



CHARLES PICASSO

AIRCRAFT TECHNICAL
PUBLISHERS

HOW MANY OF YOU RECALL THE DAYS when we would open a hard copy manual, or page through a parts catalog with dirty finger prints? I do. As time flew by, paper manuals gave way to microfiche, which gave way to PDF manuals on a computer, which gave way to ... well we all know the story.

Information Technology (IT) moves at a rapid pace and maintenance data can be accessed in the cloud at any time, from most any location, on most any device.

Aircraft Technical Publishers (ATP) is one company with a long history of leveraging IT to help the industry evolve by transforming the way maintainers access and manage maintenance-related content.

Over the past year and a half, I've had the pleasure of getting to know the new CEO Charles Picasso. Charles has extensive experience as an executive who has led global enterprise software, internet

services, and business information service providers.

Recently I asked Charles a few questions regarding the maintenance information business.

AMT: Charles, thanks for taking time out of your busy schedule. I'd like to begin by asking if you would give our readers a brief history lesson on ATP. I believe ATP started in the early 1970s as a provider of basic maintenance libraries for the general aviation maintenance shops — correct?

CP: That's right. ATP was founded to help maintenance providers and owner/operators manage the flood of constantly changing technical, operating, and regulatory content. We've leveraged that technology to help the industry evolve more efficiently. Today, our unified cloud solution helps seamlessly manage all of their

end-to-end maintenance processes from maintenance and compliance tracking, to diagnostics, troubleshooting, and fault detection to inventory management. And because we've cultivated close relationships with our customers — as well as aircraft manufacturers and regulatory agencies worldwide — we're positioned at the hub of this unique constellation of collaborative partnerships.

AMT: And today, ATP provides complete aircraft maintenance information solutions to virtually all segments of the industry. Can you describe some of them?

CP: Our goal is to help our customers work smarter and faster through IT, whether general, business, or commercial aviation. In recent years, ATP has invested a lot into creating this unified cloud platform to interconnect data, workflows, and pro-

cesses, which in turn, creates a tremendous amount of industry value in terms of productivity, cost savings, speed, and aircraft utilizations, as well as improved safety and compliance. Our new vision broadens our traditional focus from content management to become a services-oriented company that delivers “smart content” services through an integrated platform.

AMT: ATP has moved into providing maintenance information to the airline and large MRO segments, also correct?

CP: That’s correct. We’re looking to leverage our unique market position as well as our cloud platform, which enables unified process management to create information service solutions that span both general and commercial aviation. In the MRO space, we’re focusing on integrated troubleshooting and fault detection solutions that help them accelerate return to service and boost aircraft availability while cutting AOG risk.

AMT: What do you see as the largest changes over the past say decade regarding maintenance documentation and information?

CP: The industry has seen increasing regulations and requirements to boost safety and efficiency, which of course, drives the need for better information management and compliance tracking. And we’re continuing to see greater complexity in all areas from the variety of aircraft being manufactured to the increasing sophistication and interdependence of the components and systems. The result is maintenance technicians and owner/operators have to juggle all of these interdependent and changing pieces of the puzzle and make them fit together to keep aircraft safe and in compliance. That’s why a cloud solution is ideal for helping them manage all of this in an integrated fashion.

AMT: Are your customers demanding more information services these days and if so what are they asking for?

CP: I think so. Customer expectations are formed from their experiences with

service providers in other industries. For example, consumers see how their bank, cell phone, and cable companies have leveraged IT to make their lives easier. Naturally they ask, why can’t our industry be as efficient in delivering the right information to me at the right time whenever I need it? One example is accessibility. People rely on their phones and tablets to read books and conduct business, so we’ve invested a lot to make it easier for them to have anywhere, anytime access. Our new mobile app allows them to get content on any mobile device, including the ability to easily share or store publications on their devices even if they’re on a remote mountain without internet access.

AMT: Since you came on board, I’ve seen a few strategic business moves such as the collaboration with WebManuals in Sweden and the acquisition of Case Bank Technologies in Canada. Let’s begin with WebManuals. How does this relationship work, what synergies are realized, and how does this benefit the industry and your subscribers?

CP: WebManuals specializes in operating manuals and has developed a cloud and web-based application that helps streamline the ability to author, distribute, and update that content. So yes, we have been strategic in looking at other industry players that have complementary solutions and are similar in that they’re also innovators who are looking to leverage IT as a game changer versus simply making incremental improvements. Instead of reinventing the wheel, it makes sense to partner with them so that we can realize synergies by connecting all of this data together since a lot of this information is related and interdependent.

As for CaseBank Technologies, this was an ideal strategic fit in many ways. Troubleshooting and fault detection is a very specialized competency and they’ve developed a tremendous amount of specialized software and expertise to do it better than anyone else. Basically, CaseBank developed a sophisticated hybrid reasoning engine with patented algorithms that accel-

erates the process of pinpointing problems and guides technicians through the quickest path to resolving them. And since ATP’s core competencies are around managing maintenance-related content and we share the same target audience, we realized early on that we could drive a lot of additional value by integrating these complementary solutions together, which we’re currently in the process of doing today.

AMT: Charles, can you share with our readers your vision of where maintenance information and the direction your company is moving?

CP: We’ve come a long way in a short amount of time, but there’s still a lot of work to do to realize our vision of unified process management. We’re constantly looking past the horizon by imagining new ways of making life easier for aircraft maintenance providers. There are still a lot of opportunities to create value by fully integrating technical documentation into the entire maintenance process, which boosts not only productivity and flight availability, but also the safety efforts of the industry as a whole. As I mentioned earlier, ATP is in a unique position as the hub connecting all of the players. We have deep relationships with manufacturers and are uniquely able to integrate all of this maintenance-related information under one roof — everything from maintenance and parts histories, maintenance forecasting, operations manuals, troubleshooting, and fault detection.

To give you a preview of things to come — we’re currently in the process of streamlining all of this further through customized smart content. In the near future, you’ll be able to input a specific tail number and we’ll provide all of the relevant information for your specific engine, airframe and so on, including all of the related documentation on troubleshooting, compliance, operating manuals and so on. We’re proud and excited to help the industry evolve by interconnecting data, processes, and workflows to help the people on the front lines do their jobs better, faster, and more accurately. **AMT**

LESSONS UNLEARNED SERIES: PHONING IT IN

Phoning it in is when one pretends to put their best foot forward; follow the case of the 2013 National Airlines Flight 102 crash in Afghanistan

By Stephen Carbone

In Nebraska, I coached my son's soccer team. There was this one kid on my team who moved like the living dead from those Zombie movies. The ball would fall in his zone and he'd move his arms as if running, while his legs operated at continent-drifting speed. I'm watching this comedy routine, thinking, 'Does he honestly think me, the parents, and the other team are that stupid?'

That's called: Phoning It In. It's when one does not put their best foot forward; the lack of effort reflecting a failure of intent. I know he was a kid, didn't want to be there; probably played to please Mom or Dad. But he still let the team down with his total lack of effort.

The world of aviation safety depends on the full exertion put forth by safety specialists; their diligence assures industry that we will learn from our mistakes; the industry will be that much safer. Indifferent responses to tragedy diminish us all; it cheapens what all aviators work hard to maintain: Safety.

The 2013 National Airlines flight 102 crash in Bagram, Afghanistan, was a catastrophic end to a normal flight. Everyone has seen the 747's last moments: it appears to hang on its engines before nosing over, then pancaking in. This accident represents a chance at salvation, a teaching moment. Each tragedy, an opportunity to prevent repetition, but only ... only ... if the correct lessons are learned.

To begin with, this accident happened while flying a military charter, the type of contracted flights that have been going on for decades. This is important: The Department of Defense (DoD) audits the airlines it contracts to annually; they verify the operator's cargo loading procedures are up to

DoD's standards for the equipment and personnel being moved. They must do this. Why? Because air operators don't normally transport multiple 18-ton Cougar vehicles and 12-ton Mine-Resistant Ambush-Protected all-terrain vehicles. Some military equipment exceeds the normal dimensions of an 88-inch by 125-inch cookie sheet pallet. This is not an excuse; it speaks directly to the DoD's responsibility in this matter. And the air carrier's, in this case: National's.

According to the National Transportation Safety Board (NTSB) archives, the investigators dispatched to Bagram had a limited combined knowledge of the

The investigators' unfamiliarity with air cargo meant that little was accomplished in reconciling the probable cause or writing constructive recommendations.

types of air carrier issues they would be facing. The investigator-in-charge (IIC) was a general aviation accident investigator; he had inadequate air cargo industry and DoD knowledge, forcing him to rely heavily on the other on-site investigators.

The NTSB's decision to dispatch investigators unfamiliar with air cargo and military charter procedures is disturbing; the Board missed an opportunity to fix major problems by not having a working knowledge of how. The investigators' unfamiliarity with air cargo meant that little was accomplished in reconciling the probable cause or writing constructive recommendations about air carrier operations.



STEPHEN CARBONE is an avid writer of aviation fiction; his first novel *Jet Blast* has appealed to mechanics, pilots, air traffic controllers, etc. by giving accurate depictions of the accident investigation process. A former airline mechanic, he has been involved in many aspects of commercial aviation and went on to investigate major aviation accidents for the NTSB. A member of ISASI, Stephen holds a Master's degree in systems safety from ERAU. His weekly blog can be found at: <http://jetblast.tateauthor.com>

The probable cause started correctly, finding National's cargo loading procedures insufficient. However, instead of pursuing contributing factors, the NTSB deflected blame to the Federal Aviation Administration (FAA), claiming the FAA provided inadequate oversight of National's military 'special cargo' procedures. Why didn't the FAA do surveillance? The State Department doesn't allow the FAA to conduct surveillance inside war zones.

The recommendations began with A-15-13: Rewrite or revise Advisory Circular (AC) 120-85: Air Cargo Operations. Pushing this recommendation first demonstrates the NTSB's confusion with what an AC does. Although Advisory Circulars are considered guidance, they are advisory — not regulatory. ACs are normally employed during the air carrier's certification phase, prior to approving/accepting their programs, procedures or limitations. Furthermore, operators are not required to follow an AC if their plan is better.

The NTSB deflected blame to the FAA, claiming the FAA provided inadequate oversight of National's military 'special cargo' procedures.

Five other recommendations proved ineffective, as well. A-15-14 proposed creating job specifications for an uncertificated position: Cargo Load Master (CLM). A CLM, or any job title resembling this, is a position defined by, e.g. the air carrier's operations manual, which, if they run charters, has already been approved. A-15-16 and A-15-18 suggested beefing up guidance, amounting to using stronger language.

A-15-15 was a productive recommendation: Revising FAA Order 1800.560 to review all air operators' weight and balance manual procedures. However, A-15-15 ignored the DoD's involvement in the auditing process, thus overlooking a major contributor to this accident.

A-15-17 demonstrated the Board's inexperience. The NTSB recommended providing initial and recurrent training for "Principal inspectors who have oversight responsibilities for air carrier cargo handling operations ...". A principal — whether operations, avionics, or maintenance — has already received training before they take the position; cargo handling procedures are part of any certificate course, whether a passenger or cargo air carrier.

Recurrent training is a broad term. All aircraft, e.g. general aviation, Part 135, or Part 121, carries cargo in some form, so oversight of these operators is the best form of recurrent training. Certifying operators is involved; the FAA cannot revoke certification without just cause.

What about the FAA; how would they comply with such a recommendation? All air carrier and repair station FAA principals receive certification training; it takes them through the whole

certification process; instruction supplemented with regulations and guidance. The FAA Academy does teach an Air Cargo course; it is a familiarization (FAM) course — not certification.

Cargo air carrier certification is no different than passenger air carrier certification, whether Part 121 or 135; the only difference is how one uses the seat tracks.

Another point: Air cargo is an operations-intensive industry. Airworthiness's part is limited to manufacturing, modification, and maintenance of the aircraft and cargo components. Operations deals with everything and everyone else; from training to loading to scheduling, Operations controls every aspect of the air carrier's cargo movements. Without understanding this, the NTSB is putting all principals in the same boat.

This accident investigation was phoned in from the start. The DoD will hopefully learn from these mistakes to prevent another accident. The NTSB had an opportunity to make good solid changes; it instead settled for an incomplete report, wasting a chance to make right a curable problem. This investigation let the entire aviation industry down. **AMT**



Use It Anywhere



www.grypshon.com

AviationPros.com/company/12274364



TOM ROBINSON RECEIVES TAYLOR AWARD

Tom Robinson received the Charles Taylor Award for 50 years of accident-free aircraft maintenance recently at an IA renewal Seminar in Portland, OR.

He started at Aviation High School in 1966, New York City where he received his Powerplant certificate. From there he served in the U.S. Navy as an Aviation Machinist Mate. After honorable discharge he attended Northrop Institute of Technology and received his Airframe certificate.

He worked in general aviation for two years in Southern California. Then moving on to work at AiResearch Aviation LAX on the Jetstar conversion crew. He then joined Garrett's Flight department and enjoyed several years there. Moving on to the Great Pacific Northwest as a maintenance supervisor for PacifiCorp Trans Inc. He then went to Las Vegas as chief of maintenance for Harrah's Entertainment. He returned to the Northwest as a regional sales manager for Penta Aviation Services. Next he joined Midwest Aviation as a maintenance supervisor and spent several years based in Portland, Omaha, and Reno. Currently he is flight department manager and chief of aircraft maintenance at Barrett Business Services Inc. at Portland International Airport.

RESOURCE GUIDES

MACHIDA
BORESCOPIES - VIDEOSCOPIES - ENGINE KITS
PRATT & WHITNEY CANADA APPROVED KITS
GOOD FOR USE IN ALL ENGINE MODELS
OVER 40 YEARS OF INDUSTRY KNOWLEDGE

PROUDLY MANUFACTURED & ASSEMBLED IN THE U.S.A.

WWW.MACHIDA SCOPE.COM
40 Ramland Road Orangeburg NY 10962
1-800-431-5420 - 1-845-365-0600

AviationPros.com/company/10134601

ALBERTH AVIATION
TOOLS & EQUIPMENT DESIGNED BY MECHANICS FOR MECHANICS

GSE Manufacturer

Tire Inflation Cage
Larger size now available

Bottled Water Cart
Guaranteed Clean Water

Select Tooling

- Spanner Sockets
- Oxygen Fill Adapter
- Jack Adapters
- Fuel Pipe Wrenches
- Tooling for Falcon, Gulfstream and more

Aircraft Spare Parts

- AOG service 24/7 since 1996
- Certified parts outright/exchange
- Sell us your surplus inventory

Manufacturer of Specialty Maintenance Tooling & GSE

20 years

www.AlberthAviation.com
832-934-0055

AviationPros.com/company/10016971

PENTAGON 2000SQL™
SOFTWARE EMPOWERING THE ENTERPRISE

MRO SOFTWARE SOLUTIONS

1-800-643-1806

WWW.PENTAGON2000.COM

AviationPros.com/company/10134757

EDUCATION & TRAINING

Sheet Metal Working Solutions

ERCO jaw assembly rebuilding, shrink and stretch parts, springs and clips kits.

Air Power Hammer for making compound shapes for aircraft fab and repairs.

We specialize in hands-on Training
20 years as an industry instructor.
Boeing-approved instruction.
Consultations. Problem-solving.

TM Technologies 530-292-3506
www.tinmantech.com

FACILITIES/FACILITIES MAINTENANCE



SANTA FE AEROSPACE

- Avionic/Accessory/Instrument Shop
- Bench Test Panels
- Commercial & Military Elec GSE
- Exacting to OEM Specs.
- Send us your CMM schematics for quote
- As seen on cover of Avionics Magazine
- World-Wide Shipping
- Mil-Spec Components
- Affordable / Economical
- Formerly FAA/EASA Approved Part 145

www.avionictesters.com Tel (505) 473-7366

TOOLS & EQUIPMENT

COLUMBUS 100 TON
10096-35



THINGS FOR AIRCRAFT SUPPORT, INC.
www.thingsforaircraftsupport.com
john@things4acft.com

503-630-2804

ADVERTISERS' INDEX

AAR Corp	5	Pentagon 2000	
Abaris Training	42	Software Inc. . .	46-47, 64
Air France Industries	17	Pratt & Whitney	
Alberth Aviation	64	Aftermarket	12-13
AvFab	48	Pratt & Whitney	
B/E Aerospace	28	Support	45
Business Aircraft		Rapco	40
Consumables	26	Rubb Building Systems. .	42
EBACE 2017	20	Sherwin-Williams	
Elliott Aviation	19	Aerospace Coatings . .	31
Flightdocs	7, 68	Shreveport Airport	
Global Parts.	25, 27, 29, 67	Authority	43
Gradient Lens	21	Snap-on Tools Corp	2
Grypshon	63	Textron Aviation	22-23
JETechnology		TRU Simulation	
Solutions Inc.	49	+ Training Inc.	9
Lycoming	36-37	USA Borescopes	41
Machida	64	Wag-Aero	57
Miraj Corp	57	Wencor Group	33
NBAA Maintenance		West Star Aviation	15
Conference	11		



Boost Productivity and Tool
Inventory Control with
**The CUSTOM Tool
Drawer Organizer**

Find Out How it Works by Visiting:
www.ToolLodge.com



**ALBERTH
AVIATION**
Select Tooling

832-934-0055 • www.AlberthAviation.com

**We can
take your
advertising
to new heights**

For more information call
800-547-7377

AIRCRAFT/ENGINE PARTS



Chosen for value and service

New Surplus Aircraft Parts

25% to 85% off!

Cessna, Piper, Continental,
Lycoming, and Many others!

www.preferredairparts.com

800-433-0814 or 330-698-0280

ENGINE SAFETY AND PROPER MAINTENANCE

A common theme in the accidents reviewed by the General Aviation Joint Steering Committee is the importance of proper maintenance, training of mechanics, and adherence to instructions and procedures



PETE BUNCE is president and CEO of the General Aviation Manufacturers Association (GAMA), which represents more than 85 of the world's leading manufacturers of general aviation airplanes and rotorcraft, engines, avionics, components, and related services. GAMA's members also operate repair stations, FBOs, pilot and maintenance training facilities and manage fleets of aircraft. For more info: www.gama.aero.

YOU MIGHT HAVE HEARD ABOUT THE RECENT advances in reducing the fatal accident rate in general aviation (GA). Preliminary data for 2016 indicates that it's the first year on record with a rate below one fatal accidents per 100,000 hours flown.

The joint work between the Federal Aviation Administration (FAA) and industry under the General Aviation Joint Steering Committee (GAJSC) has focused on mitigating the risk of loss of control accidents. The work has touched on aircraft design standards, the ability to cost-effectively install safety-enhancing equipment, modernizing pilot training standards, and providing pilots with data-driven educational programs.

Loss of control remains the cause behind the largest share of GA accidents, at over 40 percent throughout the past decade. Our focus remains reducing the risk of loss of control. Over the past two years, industry has also worked with the FAA to look at one of the other large areas of fatal accidents: power plant failures. The accident analysis — conducted by a group of government, industry, and academic subject matter experts — about engine failures resulted in 10 so-called “safety enhancements” (SEs) that have been added to the FAA/Industry GA Safety Plan.

Our work involves pilot training and education as well as some new technology opportunities to enhance safety if the engine fails during critical phases of flight. A common theme in the accidents reviewed by the GAJSC is also the importance of proper maintenance, training of mechanics, and adherence to instructions and procedures. I'm taking the opportunity to highlight here three of the enhancements that are now being implemented.

First, SE-47 focuses on improved guidance to maintenance professionals and improved training for the community about the accident analysis results. The FAA is implementing this recommendation as part of its modernization of the existing airframe and power plant testing standards that involves shifting the existing “PTS” into the Airmen Certification Standards structure.

This was done for pilot training over the past few years as well. This modernization will ensure new maintenance professionals are trained to relevant standards and understand practical risk management considerations.

Second, SE-49 focuses on outreach and education. The FAA is taking the lead on this work as part of its FAA Safety Team program, and a number of associations are partaking and using the results of the engine accident analysis in their member educational programs. When you attend seminars over the next year, expect to see emphasis placed on proper torquing techniques and the importance of checking critical parts, both of which emerged in the accident data as common issues.

Third, SE-45 asks industry members to ensure they have a process for returning an aircraft to service after work has been done or the aircraft has been out of operation for a long time. Several fatal accidents involved aircraft being flown with known deficiencies and, in some cases, being flown while maintenance was still underway. The simplest step you can take as a mechanic is to ensure an aircraft in maintenance is clearly identified as “undergoing maintenance” in a way that's visible to a pilot. Place a sign on the propeller or in the cockpit while you're doing work. And, you should have a clear process between yourself and the owner or operator of the aircraft to track and identify the airworthiness status of an aircraft. The pilot and aircraft owner naturally have an important role in ensuring that they know the status of the aircraft before going flying.

We are starting to see a measurable improvement in the GA accident rate after a decade of mostly flat numbers. In my view, safety is not achieved through new cumbersome regulations, but by all members of the aviation community actively working toward the same goal — ongoing improvement of the safety of our industry.

You can find more about the work of the GAJSC, including the result of the engine failure accident analysis, by visiting www.GAJSC.org. **AMT**

GLOBALPARTS

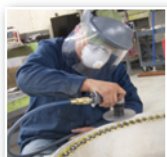
AERO STRUCTURES

INLET REPAIR

PUT YOUR TRUST IN OUR EXPERTS



Come see us at:
NBAA Maintenance Management
Conference • May 2-4
West Palm Beach, FL • Booth #512



At GlobalParts Aero Structures we bring together experience and quality with an extensive range of inlet capabilities that enable us to repair and replace D-rings, Frames and Barrel or Outer skins so that they look and perform as good as new. From cracks and corrosion – to chaffing, metal fatigue or F.O.D, our experts utilize specialized FAA-Approved repair and replacement processes to resolve virtually any inlet issue with industry-leading results.

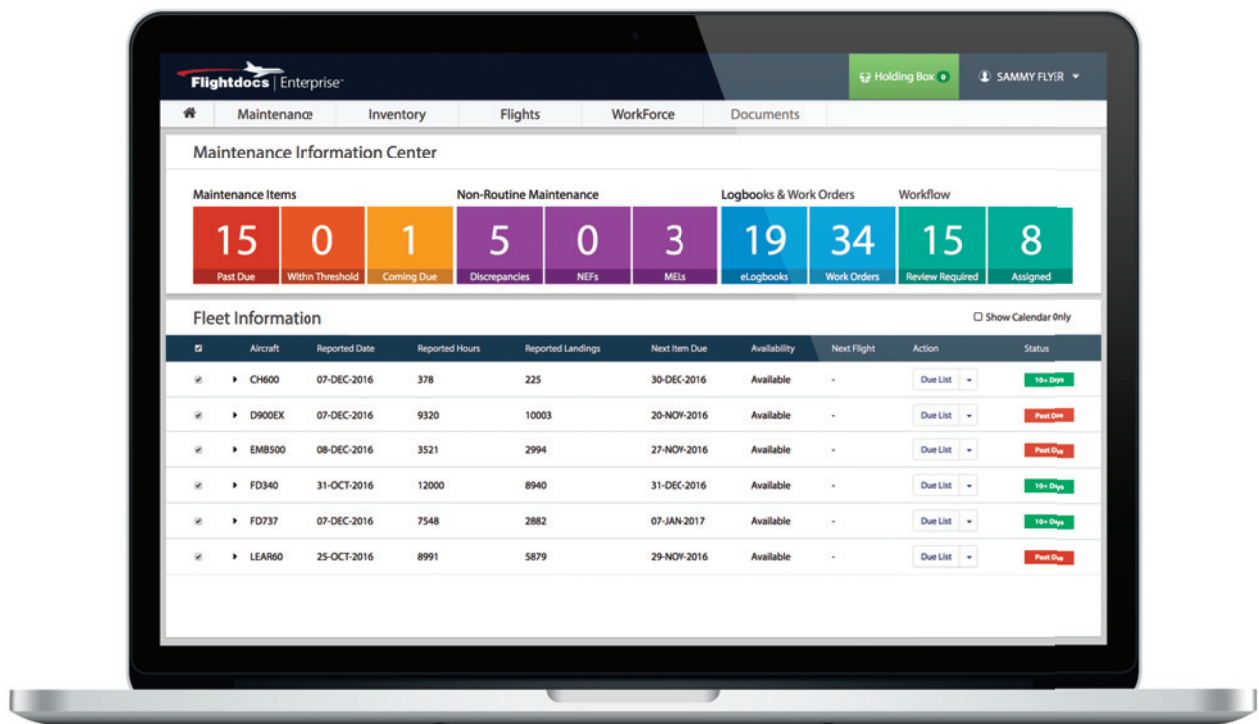


WWW.GLOBALPARTS.AERO / 1.316.733.9240 / REPAIRS@GLOBALPARTS.AERO

Designated Supplier for Bombardier Learjet 20, 30, & 50 Series Aircraft Support



Complete Aircraft Maintenance Management



Fully Integrated Maintenance & Inventory Tracking

- Streamlined Paperless Workflow
- Comprehensive Fleet Management
- Enhanced Work Orders Module
- Custom Equipment Management
- Mobile-First Development Focus
- Extensive Developer API

NBAA
MAINTENANCE
CONFERENCE
MAY 2-4, 2017
BOOTH 821



DESIGNED, BUILT AND SUPPORTED IN THE USA

1-800-747-4560 • WWW.FLIGHTDOCS.COM