AVIATION MAINTENANCE
avm-mag.com
Most Read MRO Publication in the World

THAILAND'S FERVENT EFFORTS TO BECOME ASIA'S MRO EPICENTER

MISSION POSSIBLE

July 2019

BORESCOPES
YOUR EYES INSIDE THE AIRCRAFT AND ENGINE, BORESCOPES GO HIGH TECH AND DIGITAL

TRI-PACER PERFECTION
A METICULOUS RESTORATION PROJECT YEILDS A BEAUTY

FABRICATING PARTS
WHAT IS ALLOWED? SHEDDING LIGHT ON THIS TRICKY QUESTION

Your parts have a destination

We know the way

Aviation Logistics Network

Do you have an urgent transportation challenge?

We're here for you 24 hours a day 365 days a year

ROYAL AERONAUTICAL SOCIETY
CORPORATE PARTNER

Contact us now on

24/7/365 AOG Hotline:
00 8000 264 8326

www.aln.aero

CONTENTS

Most Read MRO publication in the World

JULY 2019 VOL 38 ISSUE 4

DEPARTMENTS

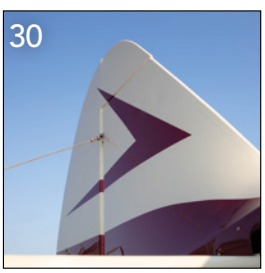
COVER STORY

14

Mission Possible

Thailand is on a mission to become an aerospace and MRO hotspot in Asia. They are offering businesses tax incentives, special visas and easy setup in one of their business estates.

On the cover: Thai Technical, the maintenance arm of Thai Airways, completed this A380's C-check in 50 days.



CATEGORIES

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

Aviation Maintenance (ISNN 1090-221X) is published bi-monthly by Aerospace & Security Media Ltd, 21362 Sparrow Place Potomac Falls, VA 20165. Application to mail at Periodicals postage paid at Dulles, VA and additional mailing offices. POSTMASTER send address changes to Aviation Maintenance 21362 Sparrow Place Potomac Falls, VA 20165. The editor welcomes articles, engineering and technical reports, new product information and other industry news. All editorial inquiries should be directed to Aviation Maintenance; Email: news@avmain-mag.com. Subscriptions: Free to qualified individuals involved in the aircraft maintenance industry. All other prepaid subscriptions, see www.avmain-mag.com.

AVIATION MAINTENANCE
avm-mag.com

+44 (0)20 3892 3050
+1 (920) 214 0140

EDITORIAL
Editor-in-Chief
Joy Finnegan
jfinnegan@avm-mag.com

Contributing Editors
Charlotte Adams
James Careless
Jason Dickstein
John Goglia
David Jensen
Douglas Nelms
Dale Smith
David Schober

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

East Coast Sales
Paul McPherson,
pmcpherson@aerospace-media.com

West Coast & Classified Sales
Danny Faupel
dfaupel@avm-mag.com

International Sales
Jina Lawrence
jinalawrence@avm-mag.com

DESIGN/PRODUCTION
Splash Creative
creative@splash.uk.com

SUBSCRIPTIONS
Paula Calderon
pcalderon@aerospace-media.com
+34 91 623 7969

CLIENT SERVICES
Administration
Maria Hernanz Reyes
maria@asi-mag.com

LIST RENTAL
Statistics
Jen Felling
felling@statlistics.com

REPRINT PARTNER
The YGS Group
717 505 9701 x100

US Publisher
Paul McPherson
ASI Publications Ltd

US Publishing Office Address:
21362 Sparrow Place
Potomac Falls
Virginia 20165

AEROSPACE & SECURITY MEDIA
www.aerospace-media.com

ASI publications ltd
www.aerospace-media.com

Aerospace & Security Media
is a trading arm of ASI Publications Ltd

ASI Publications Ltd
"Rydal"
1 Coyners Avenue
Southport
PR8 4SZ
UK

abroadbent@aerospace-media.com

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

UK Company registration no 5999781
UK VAT no GB227106044

There We Grow Again

BY JOY FINNEGAN
EDITOR-IN-CHIEF

Aviation Maintenance's parent company, Aerospace & Security Media holds an annual conference and exhibition and it is growing. This event started out as The Avionics Show covering all the latest avionics developments in the industry.

As connectivity in aviation became paramount to customer satisfaction and on time efficiency in the airline industry, this track was added to the event and the name changed to Aviation Electronics Europe. Last year, we added a track on aerospace testing, and again, wanting to reflect the larger areas of focus for the event and hint at more to come, we changed the name again to Aerospace Tech Week.

In 2020 we will double the conference to a total of six tracks. In addition to the already successful avionics, connectivity and testing, the three new tracks will include MRO IT, flight operations IT and Future Airborne Capabilities Environment, also known as FACE. We are very excited about these sectors of aviation and are reviewing abstracts submitted by subject matter experts from across the globe to determine our speaker line up and topics now.

To support these ideas and stay up to date on developments in these areas, in conjunction with the conference, we are launching a new, quarterly publication, ***Aerospace Tech Review***. We will cover these six topics, Avionics, Connectivity, MRO IT, Flight Operations IT, Aerospace Testing and FACE (and more) to help you stay in the know about these rapidly advancing technologies and areas. Our first issue will be in the fall. If you or your company does work in any of these areas, please send press releases, story ideas and interview opportunities to me at jfinnegan@avm-mag.com. I would love to hear more about your company and consider including them in the inaugural issue.

When first looking at these six subjects, they may seem diverse. But the truth is, nothing stands alone in our aviation world. Everything is interconnected. Think of String Theory in aviation! Silos in business are not good. And through the years, airlines, operators and flight departments have seen how one siloed area can wreak havoc on another when one doesn't know or understand what the other is doing. Lack of communication and synergy can lead to melt downs of phenomenal proportions. I'm sure you have seen this in your career at some point.

What Aerospace & Security Media hopes to do at Aerospace Tech Week, and within the pages of Aerospace Tech Review, is bring these interconnected areas together to bust down those silos. The event and publication will create a learning environment for all in aircraft operations to understand how the technological, IT, operations, avionics and connectivity of today can help create a more efficient, and therefore profitable, business environment.

With this in mind, Aerospace Tech Week aims to bring these areas together to help give a holistic view of the operation and maintenance of aircraft. Different departments that work together on projects can benefit from sharing information and asking questions and we are giving them a venue and opportunity to do so. The takeaways will be streamlining workflow and complementing each area of an operation rather than duplicating efforts.

For example, two of new areas we will be focusing on at the conference this year will be MRO IT and flight operations IT. In the past, these two areas might not have thought a lot about what the other was doing or why (siloed). But today, these two areas must work hand in glove, side-by-side to accomplish their shared goal of an on time and profitable airline. Connectivity is creating the environment to allow both areas to communicate and cooperate. Where is the connectivity operating through – the latest avionics on board the aircraft. What is coming next? Future Airborne Capability Environment…I think you can see where we are heading. All of these things working together in harmony to achieve the best possible result.

Airlines can't afford to spend their days putting out proverbial fires. Gone are the days of after action reports. In today's market, we must be prepared for what is coming before it happens. Say hello to predictive analytics. This tool is being enabled and brought into greater functionality daily. We are only seeing the tip of the iceberg with the incredible amounts of data that a current generation aircraft can produce.

I can't wait to see the developments of big data and predictive analytics ahead. It's a sea change and we are in the middle of it. Think of the days (not that long ago) before smart phones. Now, we can't imagine ourselves without them and the convenience, connectivity and efficiency they bring to our lives. That's where we are with aviation technology and aircraft operations right now. Please join us in Toulouse, France on March 18 and 19, 2020. Together, let's break down those silos and build a new way of thinking for the future of aerospace technology. For more information go to www.aerospacetechweek.com. AVM

IBERIA MAINTENANCE

We make our customers

Fly Safe

Fly on Time

Fly@Low Cost

Feel Innovation

Commercial Direction
Madrid-Barajas Airport. La Muñoza.
Edif. Motores. 1ª planta. Ala Izquierda
28042 Madrid. Spain

maintenance@iberia.es
Ph: +34 91 587 4827
Marketing: MROMarketing@iberia.es
iberiamaintenance.com

Textron Opens Maintenance Data Hub

Textron Aviation has opened a new Aircraft Maintenance Data Hub for owners and operators of Beechcraft, Cessna and Hawker aircraft. The company says the new data hub will offer a more comprehensive record of all aircraft maintenance performed on Textron Aviation products by working with multiple industry tracking system providers.

"It's important to our customers that they have a clear understanding and record of work done on their aircraft," said Kriya Shortt, Textron Aviation senior vice president, Global Customer Support. "This new data hub will offer customers more choices in their tracking system and a comprehensive picture of maintenance records across all their Textron Aviation products."

Textron Aviation named CAMP, Flightdocs, SierraTrax and Traxxall as recommended providers of aircraft maintenance tracking for the new data hub. While previously exclusive to CAMP, customers now have the flexibility to select the recommended provider that best fits their needs.

The data hub will be a new feature in the Textron Aviation Customer Portal. Textron says their customers will benefit from receiving a one-year free subscription from their choice of recommended provider for new and pre-owned aircraft purchased from Textron Aviation. It is expected to be available this summer.

Air Hong Kong and HAECO ITM Extend Inventory Technical Management Support Contract

HAECO announced recently that it has renewed its long-term contract with Air Hong Kong Limited (AHK) to provide inventory technical management support for the airline's Airbus A300-600 freighter fleet. The contract extension covers component MRO, repair management, component pooling, component engineering, consumable and expendable parts support services, and AOG support. AHK currently has a fleet of 10 Airbus A300-600F aircraft for its regional routes and the airline hopes the extension will continue to bolster AHK's strong fleet performance.

"We are very happy to be able to extend this agreement with AHK – a long-standing customer of both the HAECO Group and HAECO ITM. The HAECO Group has provided inventory technical management support for AHK since 2004, and HAECO ITM has worked with the airline since 2012, when the company was established," says Daniel Stromski, executive General manager of HAECO ITM. "This extension of co-operation with AHK is a testament to HAECO ITM's high operational performance and quality service. We will continue to support AHK with enhanced levels of service delivery for its A300-600F fleet, while working continuously on further improvements."

Delta Expands A220 Order Book and Delta TechOps Signs MOU for A220 Flight Hour Services

Delta and Airbus have agreed to expand Delta's Airbus A220 order book by five aircraft to a total of 95.

Delta now expects to take delivery of 45 A220-100s and 50 A220-300s during the next four years, with the first -300 variant expected in 2020 coming from Airbus's Mobile, Alabama final assembly line.

This summer, Delta began flying the A220 from its Seattle hub, and will offer as many as 74 daily departures from 10 airports this summer.

In a separate arrangement, Airbus and Delta have signed a non-binding memorandum of understanding for Delta TechOps to provide A220 component repair and material services for Airbus' A220 Flight Hour Services maintenance-by-the-hour program. This strategic partnership will allow Airbus to further enhance its successful Flight Hour Services program for the A220 by building on Delta Tech Ops' proven component repair and management capabilities and on Airbus' expertise in maintenance engineering, inventory management and innovative services solutions.

Embraer Launches Predictive Maintenance System IKON

Embraer has the launched IKON, a cloud system for capturing, storing and analyzing high volume data for the predictive maintenance of the E-Jets family. The new system is totally based on the Amazon Web Services (AWS) platform and was developed by Embraer, with the support of the suppliers AWS ProServe and Claranet, using Big Data and Analytics technologies to deliver 96 percent productivity gains in the aircraft analysis and data processing, the company says.

Embraer says the scalability, elasticity, durability and analysis helps their system deliver efficient management of processing and storage capacity, making possible for Embraer to optimize the data ingestion time of the E-Jets E2. Using AWS's set of analytics services, this new technology identifies data patterns, and is even able to pinpoint and solve potential aircraft issues before they occur. Embraer says the ability to perform predictive maintenance will help deliver new feature enhancements to the E2 and accelerate the delivery of improvements to previous models.

"Embraer constantly invests in new technologies. We see IKON as a totally agnostic tool that opens new horizons to deal with data and an evolution that recognizes possibilities for improvements, making us able to function as an aircraft health monitoring provider. Predictive maintenance translates into increased efficiency with reduced costs, higher aircraft competitiveness and availability," says Johann Bordais, president and CEO of Embraer Services & Support. In addition to this, the system is a step forward in the process of aeronautical industry digitalization. Embraer says their second-generation of commercial aircraft produces about 100GB of directly accessible information per year. As the result of an expedited routing and analysis system, this high volume of data is able to be transmitted for prompt action. With IKON, the automatic data collection went from 12 days to an immediate process, guaranteeing data is ready to be analyzed five minutes after its generation in the aircraft. The high volume of data and the demand for faster and more accurate decisions require technologies to capture, store and connect information across a network. At the time the plane lands, this data is automatically transferred to IKON via a module installed on the aircraft, called Wireless Server Unit (WSU).

Embraer Ground Server (EGS) uses AWS to automatically connect to the aircraft and handle flight data downloads. After landing, the transmission to the platform is completed in about five minutes. Next, it is transferred to the IKON data lake, allowing engineers to analyze this information. "IKON and EGS put into practice Big Data and Analytics concepts, which gives Embraer a huge advantage in offering unique services towards customers' needs", explains Andre Doro, chief information officer at Embraer. AWS is the provider of the entire cloud infrastructure, which offers security, agility, high processing power, analytical tools and cost management – a pay-per-use service, meaning that users only pay for what they use.

The AWS ProServe team, the company's professional services division, joined forces with Claranet on the design and implementation of the IKON project and worked to ensure the quality and best practices of data analysis, providing state-of-the-art architecture in terms of efficiency, data quality and scalability. "IKON is a really innovative project, combining the power of the cloud with advanced big data and analytics services, which makes complex data simple and easy to analyze in a short time," says Cleber Morais, country manager of AWS Brazil. "This project matches one of the most modern pillars of corporate applications: making processes based on data insights a crucial part of business planning, execution and evolution." IKON is now available in the customized support packages for each customer offered by Embraer Services & Support. These programs are part of a range of products developed to serve Embraer jets fleet around the world through the TechCare portfolio.

Rhissa Named Head of Pratt & Whitney Customer Service Center Europe at MTU Maintenance Berlin-Brandenburg

Pratt & Whitney announced that Ismael Rhissa has been appointed General Manager of the Pratt & Whitney Customer Service Centre (CSC), located in Berlin-Brandenburg, Germany, effective in July. He takes over this role from Carsten Behrens.

"Ismael has been a key part of the success of our aftermarket services. We are pleased that he has accepted this position and look forward to him bringing his extensive experience to continue growing our business and supporting our clients," says Satheeshkumar Kumarasingam, vice president of customer service at Pratt & Whitney.

Ismael joined Pratt & Whitney more than seven years ago in strategic planning and business development. In 2015, he took on the role of director of aftermarket services for Europe, Middle East and Africa. He holds a Master's degree in Business Administration and a post-graduate degree in Finance and Treasury. In his new position, he will join the MTU Maintenance site of Berlin-Brandenburg.

CSC is a 50-50 joint venture of MTU Maintenance Berlin-Brandenburg and Pratt & Whitney Canada. It engages in marketing and sales activities for several Pratt & Whitney engines, providing service and support for customers in Europe, Africa and the Middle East.

about people

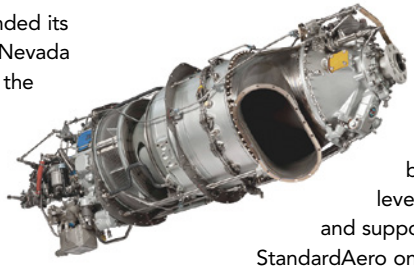
Global Aerospace Services Appoints BD Advisor

Philip LoGiurato , president, Global Aerospace Services announced Mike Neder has been appointed to the newly created position of business development advisor to the president. In this position Neder will be responsible for identifying and developing new business opportunities for Global's distribution, logistics and supply chain management staff and office/warehouse facility in Jacksonville, Fla."Mike has a long and distinguished career in the aerospace industry, specializing in business development with industry leaders such as BAE Systems (Tracor Aerospace), DAC International, ASIG, LLC and, now as business development consultant to Global," says LoGiurato. "We are thrilled that Mike has joined the Global team and will be able to help us achieve our growth goals."

SR Technics Appoints Sales Director

SR Technics appointed Abdel Farah as area sales director for the Asia, Australia and Indonesia market. Farah joined SR Technics in February 2015 and has more than 20 years of service in the aircraft maintenance repair & overhaul business. Farah will also serve as – managing director - SR Technics Australia. Farah held positions in business development, program- and customer relations. Prior to joining SR Technics, he was a business development manager for John Holland Aviation Services in Melbourne, Australia. His career started in 1996 in Abu Dhabi, U.A.E with Airbus (former European Aeronautics Defense and Space Company (EADS), he later joined Etihad Engineering (Former ADAT) whereby he managed the MRO sales and marketing activities related to Airframe and Component maintenance service in ME, Asia, Russia and Turkey regions. Farah holds a Bachelor degree in Aeronautical Engineering from Glasgow University and a Master of Science in Aviation Management from Griffith University, Brisbane, Australia.

StandardAero and Sierra Nevada Extend PT6A/PW100 Engine Support Agreement



StandardAero has extended its relationship with Sierra Nevada Corporation (SNC) with the signing of a five-year agreement covering maintenance, repair and overhaul (MRO) support for the Pratt & Whitney PT6A and PW100 turboprop engines. StandardAero will support SNC from its Designated Overhaul Facility (DOF) in Summerside, PE, Canada, and its other global locations.

SNC provides command, control, computers, communications and intelligence, surveillance and reconnaissance (C4ISR) solutions, with experience on over 200 different types of manned and unmanned platforms including the Beechcraft King Air and Cessna Caravan. SNC has also partnered with Embraer to offer the A-29 Super Tucano for U.S. Department of Defense and international requirements. In addition, SNC provides aircraft design, modification and support services for a range of platforms, including the Dornier 328, supported via its subsidiary 328 Support Services.

"SNC continues to be very pleased with the level and quality of service and support that we receive from StandardAero on all levels, and we look forward to continuing our relationship in the future," says James Livingston, senior procurement manager at Sierra Nevada.

"StandardAero is extremely pleased to further extend its close relationship with SNC through this five-year engine MRO support agreement," said Jason Johnson, vice president – Global Sales & Marketing for StandardAero Airlines & Fleets. "SNC is one of our most valued customers on the PT6A and PW100 engine families, and we are delighted to be able to support the company's diverse international activities with our global network of overhaul facilities and service centers. We look forward to extending our relationship with SNC to include auxiliary power unit (APU) support services in the near future."

AAR Awarded Four-Year MRO Contract with Royal Netherlands Air Force to Service CH-47 Chinook APU

AAR has been awarded a four-year contract by the Royal Netherlands Air Force (RNLAF) to perform maintenance, repair and overhaul of the Chinook APU for Logistics Center Woensdrecht (LCW).

AAR will service the Chinook fleet in its Component Repair facility in Amsterdam, where AAR has been supporting European Participating Air Forces (EPAF) for more than 30 years as a prime provider or subcontractor for repair management, component maintenance, supply chain and depot services.

"The RNLAF is pleased to have an MRO contract in place for their CH-47 APU's," said Lieutenant Colonel Remco Bastiaan, EMSD program manager Chinook. "The Chinook community is excited to have a trusted partner like AAR support the RNLAF to maintain and improve the availability of the Chinook fleet and looks forward to sustaining and expanding their valued relationship."

"AAR has been a proud and trusted partner of the Royal Netherlands Air Force on the F-16 platform for more than 25 years," said Eric Bron, AAR general manager of Component Repair. "This step expanding our MRO services to the CH-47 Chinook platform reflects our strong relationship, dedication to exceeding customer expectations and shared core values with the RNLAF. We deliver tailored services and capabilities based on commercial best practices and our customers' unique needs to produce the highest quality work and cost savings."

Rusada Unveils New Technical Publications Module for ENVISION

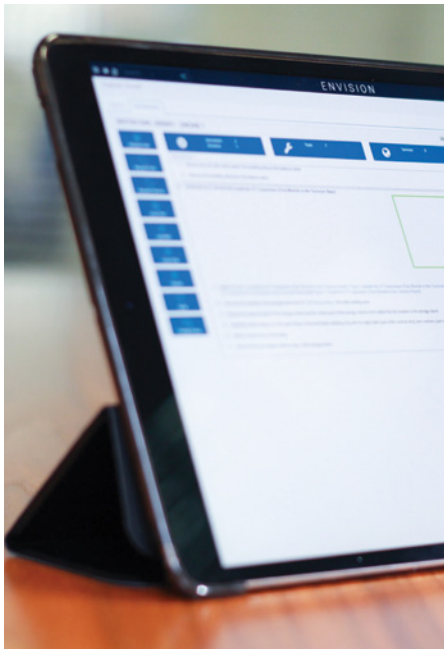
Rusada has revealed the newest module for its MRO and flight operations solution ENVISION. "Technical Publications" can be used by aircraft operators and MRO's to integrate their library of documents into their product, ENVISION, creating live, digital versions of these resources.

A feature of the module is the digitization of OEM manuals and maintenance programs, enabling the creation of a digital library of maintenance task cards. These task cards can be authored as users see fit, including the option to add custom validated fields and electronic sign-off. The information in these task cards is live, so when OEM's release revisions of their documents, the relevant data can be instantly updated, without the need to manually re-create or edit existing task cards.

In addition to this, by linking Technical Publications to ENVISION's Human Resources module, organizations can ensure that only users with the correct designations and approval stamps can sign-off maintenance activities, keeping them in compliance with aviation regulations.

Rusada predicts that this functionality could save countless hours of time and allow organizations to take the next step to a paperless MRO environment. As ENVISION is a web-based solution, Technical Publications can be used in the field on a tablet or smartphone.

"Many people in the industry have been asking us for this functionality. They've had enough of trying to manage these vital activities with paper documents, static spreadsheets or low functionality software," Julian Stourton, CEO at Rusada says. "I am therefore thrilled to be rolling out Technical Publications to the market. The functionality that we've developed will save our customers huge amounts of time and resource, while keeping them compliant. This is a fully developed and live solution that is ready to be implemented today."



about people

Berour Minarro Becomes ISTAT Certified Appraiser

IBA Group's Youcef Berour, who joined IBA in 2015 as an aviation analyst within the Commercial Aviation Intelligence (CAI) department responsible for aircraft appraisals, market studies, consultancy, research and publications, has now qualified as an International Society of Transport Aircraft Trading (ISTAT) Certified Appraiser. Choosing to become an ISTAT Certified Appraiser develops many personal skills says Berour Minarro. "Being part of a society with more than 5,000 members including airlines, banks and leasing companies certainly allows great access and insight into market intelligence which allows an appraiser to be well informed. Nowadays the ability to field an ISTAT Certified Appraiser is becoming a stated requirement, and IBA's expertise and services is in demand for increasingly complex projects. Ensuring an aircraft or fleet appraisal is provided by a credible source that abides by strict guidelines is comforting to lessors, airlines and banks alike."

Boyer is New Service Manager at Stertil-Koni

Heavy duty vehicle lift-maker, Stertil-Koni, has announced that Kevin Boyer has joined the company as service manager. In his new post, Boyer will provide technical support, troubleshooting assistance, vehicle lift installation supervision and vehicle lift use training to the company's distributors and their customers across North America. Prior to joining Stertil-Koni, Boyer served as a sales manager and technician at BOE Marine and RV in Stevensville, Maryland. There, he oversaw day-to-day operations, customer service, and sales. In his off time, Boyer races a "pure" or "street" stock Chevrolet Monte Carlo in Maryland, Virginia, and Pennsylvania. Boyer also enjoys fishing, camping, hiking, and hockey. He resides in Stevensville, MD.

Garmin Expands Availability of the Retrofit G1000 NXi

Garmin announced the addition of five aircraft eligible for its G1000 NXi integrated flight deck upgrade. Aircraft currently equipped with a WAAS G1000 integrated flight deck that are now eligible for the G1000 NXi include the Cessna 172/182/206 and Beechcraft Bonanza and Baron. The G1000 NXi includes capabilities such as wireless connectivity, SurfaceWatch and map overlay within the HSI. "Based on the success of the G1000 NXi upgrade programs that are available today, we're excited to deliver this upgrade to thousands of additional aircraft owners and operators," says Carl Wolf, Garmin vice president of aviation sales and marketing. "With the G1000 NXi, customers experience faster performance and find tremendous value in new features like wireless cockpit connectivity, visual approach guidance, SurfaceWatch, map HSI and more, all of which make this upgrade an absolute must-have in every aircraft."

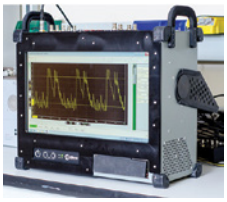
Aircraft that currently have a WAAS G1000 integrated flight deck that are now eligible for the G1000 NXi upgrade are the Cessna 172 R/S, Cessna 182T, Cessna 206H, Beechcraft Bonanza G36 and the Beechcraft Baron G58.

As part of the G1000 NXi upgrade for these aircraft, Flight Stream 510 and Connext technology enables Database Concierge, the wireless transfer of aviation databases from the Garmin Pilot app on a mobile device to the G1000 NXi integrated flight deck. Additional features enabled by the Flight Stream 510 include two-way flight plan transfer, the sharing of traffic, weather, GPS information, back-up attitude information and more, among the G1000 NXi and the Garmin Pilot, FltPlan Go and ForeFlight Mobile applications. The G1000 NXi also includes geographical map overlay within the horizontal situation indicator (HSI), visual approach guidance and more.

The G1000 NXi supports the display of various Automatic Dependent Surveillance-Broadcast (ADS-B) In benefits, including traffic and subscription-free Flight Information Service-Broadcast (FIS-B) weather. Other standard features include SurfaceWatch runway monitoring technology, which provides visual and aural cues to help prevent pilots from taking off or landing on a taxiway, on a runway that is too short, or on the wrong runway based on performance data entered during preflight. Visual and audible runway distance remaining annunciations are also available via SurfaceWatch. Additional features that are available as standard include animated NEXRAD weather radar imagery, Vertical Situation Display (VSD), IFR enroute charts, VFR sectionals and Visual Reporting Points (VRPs).

Upgrading to the G1000 NXi takes little aircraft down time and disruption of the panel because the displays preserve the same footprint and connectors, so panel and wiring modifications are minimized, says Garmin.

Mikros Announces Additional Navy Funding for ADEPT Program



Mikros Systems an advanced technology company specializing in electronic systems technology for advanced maintenance in military, industrial and commercial applications, announced it has received additional funding of almost $1.0 million to provide engineering, technical and logistics support for its ADEPT (Adaptive Diagnostic Electronic Portable Testset) maintenance workstation product. Mikros Systems has received over $2.5 million in U.S. Navy funding to support engineering and technical support of the ADEPT product line during the last twelve months.

ADEPT is deployed on U.S. Navy guided-missile cruisers and destroyers to assist sailors in maintaining and optimizing the performance of critical systems, including advanced radars such as the AN/SPY-1 phased array radar used by the Aegis combat system. Mikros Systems supports the 226 ADEPT systems currently deployed throughout the world from its Fort Washington, Pennsylvania and Largo, Florida facilities.

Day in. Day out.

CFM Services. Supporting your engine throughout its lifecycle.

At any point in time – from entry into service to mid-life and through maturity – we have the capability, resources and experience to deliver all of your engine service requirements. From customized programs to tailored transactions, we ensure your CFM engine is maintained to meet your needs and cost of ownership objectives. Wherever you are in the world, whatever day in your engine's life.

Expertise. Choice. Flexibility.

cfmaeroengines.com/services

CFM International is a 50/50 joint company between GE and Safran Aircraft Engines

Extraordinary together

cfm

Magnetic MRO Paints Estonian Flag Livery on airBaltic A220-300

Magnetic MRO has painted the Latvian airline, airBaltic's, new A220-300 aircraft into a unique one-off livery that features the colors of the Estonian national flag.

Due to the growing popularity of airBaltic's services in Estonia, the Latvian airline decided to paint one of its new Airbus A220-300 aircraft into the Estonian national flag colours at the Magnetic MRO facilities in Tallinn. airBaltic's Airbus A220-300 aircraft, registered as YL-CSJ, will now be carrying the colors of the Estonian flag and the name of its capital – Tallinn.

"As an Estonian MRO, we are very

proud of our work and we're sure the new livery will make every Estonian look into the sky to scan for this beautiful blue-black-white bird," Rihards Priedkalns, Magnetic MRO's Aircraft Paintshop manager says.

Priedkalns, added that Magnetic MRO is thankful and honored that airBaltic was chosen to perform the painting of the Estonian national flag colors on one of their newest aircraft.

To create this artwork, 15 professional painters worked for 1,000 hours. In total, 250 liters of primer, paint and lacquer were used to cover the aircraft, which constitutes the layer of 120 microns or 0.12 mm. The unique livery, depicting Latvia's flag colors on the fuselage was applied onto airBaltic's newest generation aircraft, A220-300.

ST Engineering's A321 P2F Conversion Solution Gains Traction

ST Engineering's A321 passenger-to-freighter (P2F) conversion program gained traction among operators and lessors looking for a viable P2F solution in the narrowbody category when its joint venture with Airbus, Elbe Flugzeugwerke (EFW), secured a Letter of Intent (LOI) for an A321 converted freighter from BBAM, a global leader in aircraft lease management. The LOI was signed in June 2019.

The A321 passenger aircraft will be inducted for conversion into a 14-pallet cargo configuration in mid-2020, and is scheduled for redelivery in end 2020. The order by BBAM follows a launch contract that was announced in 2018.

The A321 P2F conversion program was launched in 2015 together with the A320 P2F program, and is the result of a collaboration between ST Engineering, Airbus and EFW. ST Engineering is responsible for the engineering development phase, up to obtaining the Supplemental Type Certificate (STC) approval by the European Aviation Safety Agency (EASA) and U. S. Federal Aviation Administration. Airbus contributes to the program with OEM data and certification support. EFW leads the overall program, marketing and sales.

"As the first conversion solution to introduce a containerized lower deck in the segment of narrowbody freighters, the A321P2F has the potential to be the game changer for any hub and spoke operation, and to greatly help realise the projected global air cargo growth rate," Steve Zissis, president and CEO of BBAM, says. "For this reason, we made the decision to work with EFW to offer this conversion solution to our customers."

Dr. Andreas Sperl, CEO of EFW adds, "Given the track record we have in redelivering converted freighters with the support and resources from parent companies, ST Engineering and Airbus, we are confident in meeting BBAM's requirements for this first conversion, and we look forward to engaging them soon in the near future for follow-on conversion projects."

The A321P2F conversion program is the first in its size category to offer containerized loading in both the main deck (up to 14 container positions) and lower deck (up to 10 container positions). With a generous payload-range capability that can carry up to 27.9 metric tons over 2,300 nautical miles, the A321P2F is the ideal narrowbody freighter aircraft for express domestic and regional operations. Prototype conversion of the A321P2F will be completed by end of this year, while the STC is expected to be obtained in early 2020.

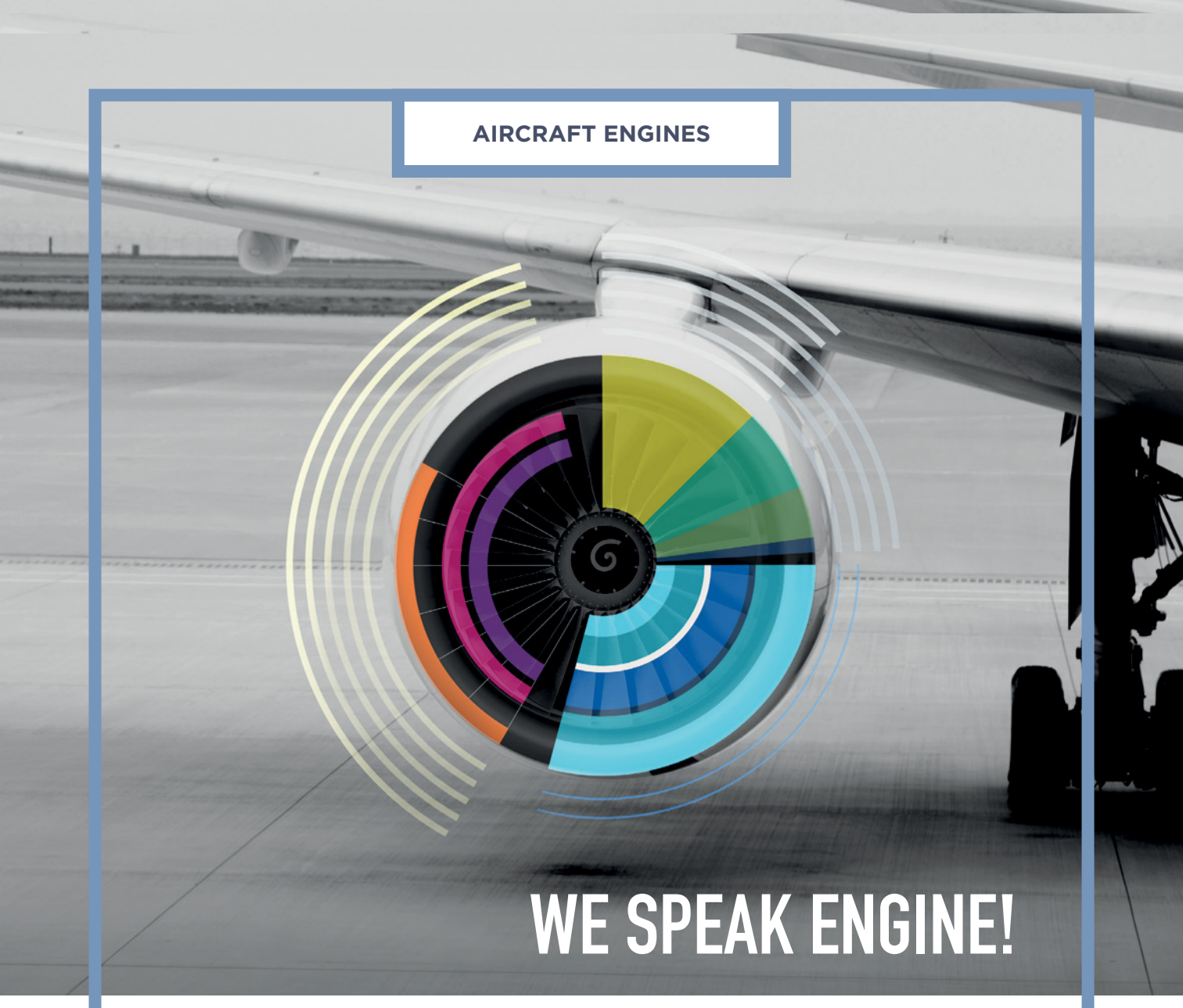
Other P2F solutions marketed by ST Engineering which uses the Airbus platform include the A330 that comes with two variants – the A330-200 and the larger A330-300. The first A330-200 and A330-300 converted freighter have been redelivered to launch customer EgyptAir Cargo and DHL Express respectively, while more units are currently undergoing conversion.

Boeing 787 Base Maintenance Contract Granted to Sabena technics

Spanish airline Air Europa has selected Sabena technics to perform base maintenance operations on two of their Boeing 787-8. For the past two years, Sabena technics has been providing Air Europa with airframe solutions for their fleet of A330s. Later this year, the French MRO will perform C-checks on the two Dreamliners in its Bordeaux facilities.

"Accompanying our valued customers in their development is our goal. This new opportunity that we have been given confirms Air Europa's confidence in our services and rewards the daily efforts of our highly qualified staff," said Philippe Rochet, CEO of Sabena technics.

"We have successfully proven the Sabena technics performance maintaining our A330 fleet and are delighted to expand our confidence to our growing B787 fleet," said Alberto Lines, Maintenance & Engineering director of Air Europa.



EngineLife® by Safran Aircraft Engines: from MRO to data intelligence, and more!

Who better than the maker of the CFM56* to capitalize on the huge amounts of data generated by today's engines? Safran Aircraft Engines transforms your flight data into directly applicable intelligence to enhance fleet management and cut your operating costs. And we know what we're talking about.

EngineLife®, we care for your engines the same way we build them.

**The CFM56 is a product of CFM International, a 50/50 joint company between Safran Aircraft Engines and GE.*

safran-aircraft-engines.com
: @SafranEngines
: Safran

SAFRAN

Thailand's government is offering enticing tax and visa incentives for companies to bring aerospace and MRO businesses to their country. They believe their location, labor costs, technical base and work ethics make it the ideal location for those looking to benefit from the coming Asian aviation boom.

Thailand Fixes Focus on AVIATION MRO AS KEY PART OF FUTURE

Story and Images by Joy Finnegan, Editor-in-Chief

When you think of Thailand, what comes to mind? Tropical paradise? Tuk Tuk rides through Bangkok? The ornate temples? Incredible beaches like Phuket and Pattaya? The amazing cuisine? The kind people? While the Thai government is happy to have those things pop up as positive associations, they are striving diligently to attain another clear association: a high tech business and manufacturing hub perfectly situated to take advantage of the coming market boom in Asia.

As has been forecast for years, the "center of gravity of air travel" is shifting to Asia. The fully mature market in the U. S. and Western Europe will not see much growth in the coming 10-20 years. But there will be huge growth in Asia in aviation. Thailand is pushing hard to encourage businesses to come there and set up shop to prepare for this eventuality. It does seem to be a brilliant plan as they are perfectly located to support the needs of Asia as this growth market comes into reality. Air travel is on the upswing in Asia, markets are more favorable for this type of growth and regulations are beginning to accommodate the pent up desire for more. There are more aircraft on order in Asia than currently in service according to IATA and Flight Global.

Specifically relevant is their desire to focus on aerospace and they have identified MRO as an area of great interest. By 2034, according to IATA, the Asia-Pacific region will account for 42 percent of global passenger traffic and will have added 1.8 billion passengers. Thailand sees itself capitalizing on those predictions by offering alluring business incentives to entice MROs to set up shop and prepare for this aviation boom market.

With its status as a tourism favorite – Bangkok was the most visited city in the world in 2018 with 20.05 million people traveling there – the Thai government wants to parlay that success and other forays in technology and manufacturing into further growth and development. With China to the north, India to the west and Japan to the east, all are easily reachable from Thailand making it perfectly located, the Thai government believes.

Avoiding the Middle Income Trap

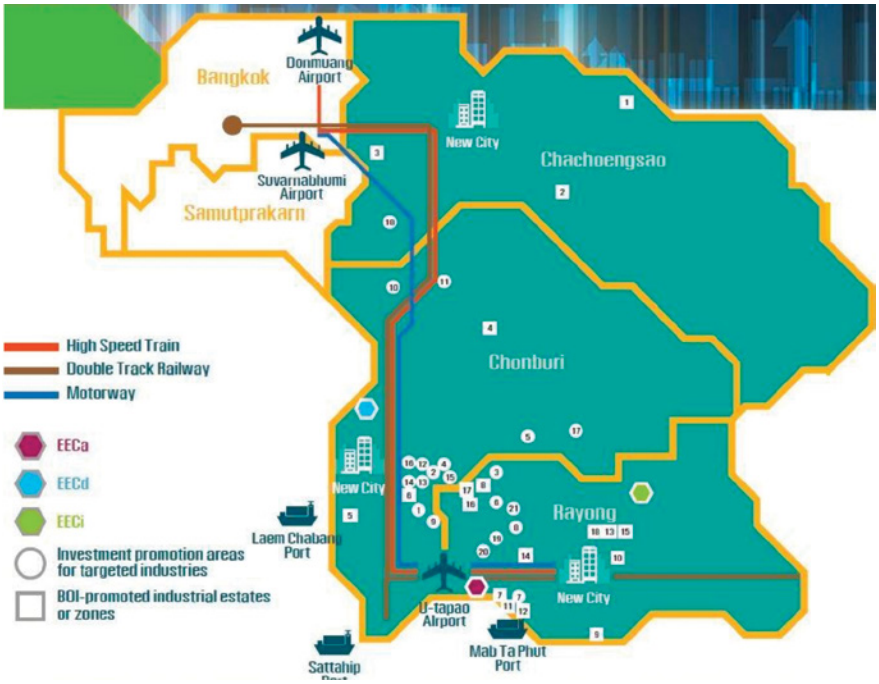
Developing countries that are experiencing growth and a positive, strong influx of money, can be victims of a theoretical economic development situation call the middle income trap. The middle income trap states that a country that attains a certain income (due to certain advantages – for example high rates of tourism) can get stuck at that level. The theory also says that countries that fall within these certain parameters can lose competitive edge in the export of manufactured goods because of rising wages but may be unable to keep up with more developed economies in the high-value-added market.

Thailand is such a country. And they are fervently trying to avoid the middle income trap by focusing on taking their successes to the next level. They are doing this by looking at sectors of business that can help drive their economy forward. Those businesses and industries include next generation automotive, biochemicals, biotechnology, electronics, automation and robotics, medicine and aerospace and specifically, MRO.

The country is determined to parlay their current booming economy to the next level. A major shift in thinking is being encouraged at all levels of the economy. They are working to improve education levels, increase research and development and to improve the environment for innovation. The country is urgently pushing to move from traditional thinking and unskilled labor to smart thinking and highly skilled labor.

Thailand first improved their agricultural sector. Then the country moved the focus to enhancing productivity in light industries and then on to improve labor and heavy machinery intensive production. Now, they are promoting startups, developing new technologies and providing high value services particularly as they relate to technology and innovation.

The Thai government has made it easy to bring and set up business in the country by creating a more streamlined system and offering incentives for foreign businesses. Thailand is a participant in many bilateral Free Trade Agreements (FTAs), as well as the ASEAN Free Trade Agreement (AFTA). "This allows businesses in Thailand to engage in virtually tariff-free trade with 17 different nations, including such major global economies as Australia, China, Japan, New Zealand, South Korea, and India," a Thai government brochure says.



Eastern Economic Corridor

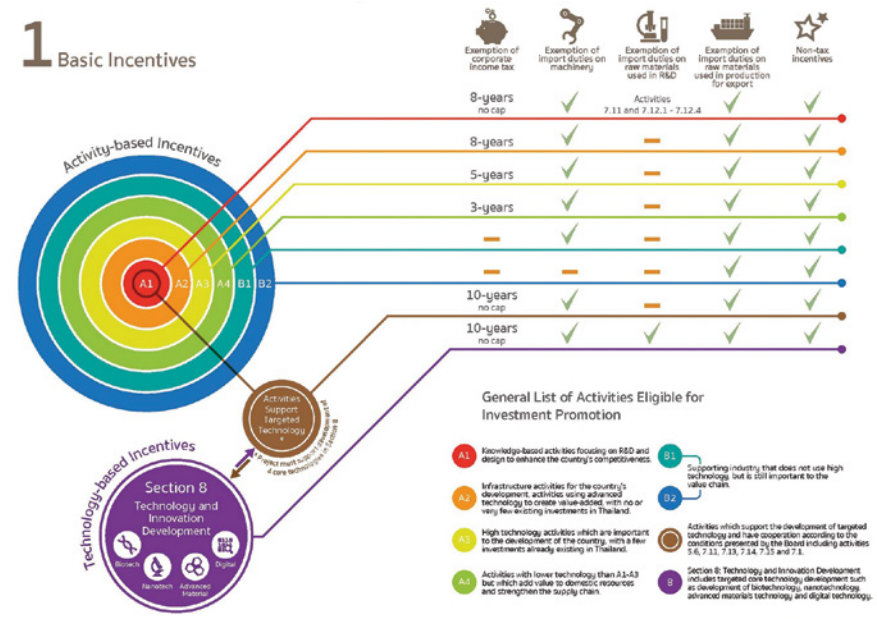
The country has developed a 20-year research and innovation strategy. Within that strategy, they have targeted aerospace and MRO as one of the keys to the plan, especially within their "Eastern Economic Corridor" or EEC, which is comprised of three provinces, Chachoengsao, Chonburi and Rayong. They are calling it a "growth hub" and this is where they hope to entice aerospace and MRO companies to come and build a launching pad for the coming Asian aviation tsunami.

Thailand has solid infrastructure already in place and plans for focused projects and investments during the next five years, especially in the EEC. The country is investing billions of dollars in the EEC. This trend is expected to continue, especially as companies begin to relocate in response to escalating US-China trade tensions.

There are three large airports in the EEC, Suvarnabhumi – the huge international airport near Bangkok; slightly northeast of there is Don Mueang Airport where they are currently increasing the capacity of the airport and runways; and a two-hour ride south of Bangkok is another large airport, U-Tapao, where a major expansion tailored to aviation and aerospace is beginning soon and Thai Technical already has facilities and is expanding as well. U-Tapao will add a second runway and redesign the airport space.

In addition to major investments in the three airports in the EEC, the Thai government and private investors plan on spending about $49.9 billion on upgrading or installing high speed rail and dual track rail, roads, hospitals, ports, city amenities and more.

A 92 hectare or 227 acre MRO hub with a dedicated apron for all hangars and additional aircraft parking areas is planned. Twelve Code F hangar bays



and additional workshop space is also in the works. All of this is combined with a bonded free trade zone and access to large industrial estates nearby.

Already There

This Thai EEC area already is or will be home to automobile and auto parts manufacturing, smart electronics manufacturing, and companies for robotics, biochemical, digital and tourism. But importantly, there is the aviation and logistics already in the area. Some companies have seen the area as a key to future success in Asia and have already made the commitment to set up shop there.

Recently, a group of journalists from publications around the world, including *Aviation Maintenance Magazine*, were invited to tour the EEC and see some of the existing companies that are in place.

CCS

CCS, founded in 1989, is a Thai-owned manufacturing company with 1000 employees, 12 acres and 22,000 square meters of space, that says they can build to print one off, small batch and mass production. The company touts being the first Thai-owned company with AS9100 (achieved in 2005) and NADCAP certifications. They are manufacturing aerospace components for Collins Aerospace, Meggitt, Moog Triumph, Eaton and Tier 2 and 3 aerospace customers. In addition, in March of 2019, they completed the Boeing audit for special processes (chromic acid anodizing, fluorescent penetrant inspection and magnetic particle inspection) and added Boeing approval to their arsenal. Ketan Pole, CEO says this is "a very proud mile stone for our company and the employees."

Pole says aerospace is only a quarter of their business now, but they are expecting to increase that rapidly, possibly doubling that amount in short order. CCS manufactured components are flying now and he highlighted sensing systems, nacelle, actuation, cargo, braking air management and interior

Ketan Pole, CEO of CCS says the company is well-positioned to accommodate the coming needs of the Asian aviation boom.

systems parts. They utilize an SAP ERP system won a seven-year contract to supply parts and assemblies worth $50 million for B777, B787, A320, A350, A220 and others.

Pole is bullish on aerospace saying he sees the growth of his company coming from that sector rather than the already mature automotive industry. He is ready for the growth saying when they win a contract, they can acquire any additional equipment much more quickly than most countries due to the proximity to the machine makers. "It might take six months for a company in the U. S. or Europe to get the machine. But here, I can have it in seven days!" He expects to add 30 CNC machines in the next two years. "We have grown 400 percent between 2012 and 2016 with no marketing – all business development is by reference and by performance," Pole says and stresses it has all been organic growth with no joint ventures and no parent company.

Looking ahead, Pole says they are targeting new processes that will be in demand soon such as zinc-nickel plating that is less harmful than cadmium plating, a process that could take the place of toxic and dangerous cadmium plating for landing gear parts. "We want to be the first Thai company to do this," Pole says.

Triumph Group

Next, we traveled to see the Triumph Group operation in Chonburi. There they have 13,500 employees and five buildings. At this facility in Thailand, Triumph is Boeing and Airbus approved and doing nacelle repair, wheels and brakes, radome repair, flight controls and accessories as well as component repair and overhaul. The company is also a producer of composites including acoustic engine liners.

Triumph says it considers their facility in Chonburi one of their most efficient. Fifty-seven percent of their business is commercial, 20 percent is military, 19 percent is business jet. "These are exciting times for us at Triumph, especially here in the Asia Pacific region," says, Gonzalo Salazar, vice president Asia Strategy at Triumph Group. "There will be a big demand for MRO and lots to do. Big years are coming ahead." Earlier this year Triumph partnered with Thailand's Civil Aviation Training Center to foster aviation talent development in the country. The partnership will lead to the development of aviation personnel to serve in the MRO industry.

Triumph says it considers their facility in Chonburi one of their most efficient.


Powered by TECHCARE
50
Listen. Learn.
Do. Repeat.
Thanks to your feedback, we're making good on our promises when we set up Embraer TechCare more than two years ago.
We've learned a lot from listening to our 1,700 customers. We followed their expert advice and made structural changes that have helped make our services better, support to be delivered faster and portfolio to be stronger. Those improvements, for example, resulted in the exceptionally smooth, mature service entry of our new E-Jets E2 commercial jets and KC-390 military transport.
Our team of 2,500 TechCare professionals likes hearing the good and, more importantly, the not-so-good. That's what makes us better. And everyone more competitive.
It's a process we never tire of repeating.
services.embraer.com
EMBRAER
CHALLENGE.
CREATE.
OUTPERFORM.

Early this year, TurbineAero purchased the APU piece part repair business from Triumph Group. It is currently still located within the facility but was in the process of transitioning to TurbineAero's 80,000 square foot facility nearby.

One of the advantages of their location, says Triumph, is the existence of a freezone with no duty or VAT. The best incentives for companies looking to set up shop exist within one of these free zones.

Amata Smart City

Private companies in Thailand are building what are touted as futuristic smart cities. These sites, like the Amata City Chonburi Industrial Estate where Triumph is located, are large – almost 11,000 acres within the Eastern Economic Corridor.

The goal for the area is connecting them transit and preparing with infrastructure. Within the Amata Industrial Estate at Chonburi, companies can lease land on which to build their own facility, lease a facility already built or they can purchase land, even foreign companies can own land 100 percent. They also say the government of Thailand will assist with visas for foreign workers and their spouses and families, easing the challenges some companies might see as barriers to bringing their business there. Within the estate, duty-free zones exist, as Triumph mentioned, which helps companies reduce tax burdens. These smart cities are also planned to be centrally located with shopping, healthcare and living facilities in close proximity for the future workers.

Airbus Helicopters is among the first MROs in Thailand and the only helicoopter MRO. Airbus Helicopter image.

Airbus Helicopters

Airbus Helicopters has taken a lead by establishing a service and support center for their helicopters in the EEC. The company has set up shop to support the military, para-public and corporate use helicopters in Thailand.

The Asia Pacific helicopter fleet is the third largest in the world behind North America and Europe. There are about 9400 helicopters in the Asia Pacific region. About 5100 are military and 4200 civilian. Airbus has 2000 helicopters in the region, including with the Thai Air Force.

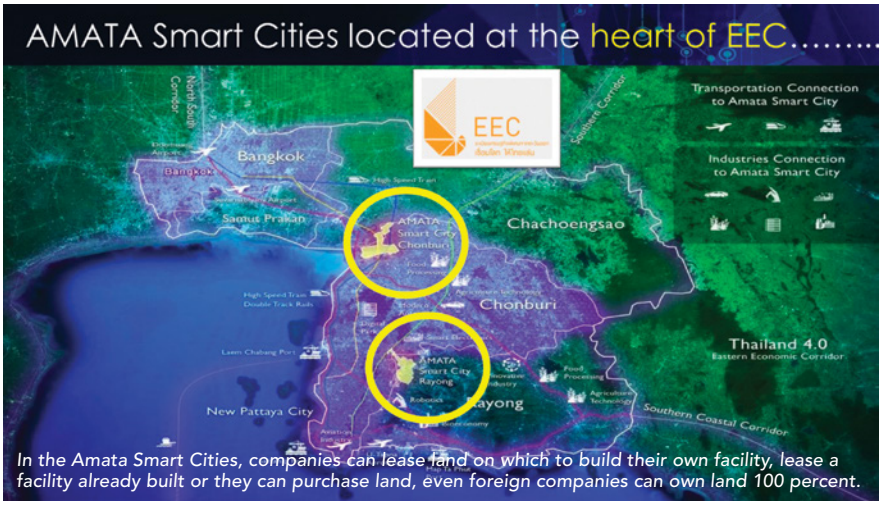
"Our duty is to support the recently delivered fleet," says Pierre Andre, head of sales, Southeast Asia and managing director, Thailand. "Since 2008, we have been the only helicopter MRO in Thailand. It is absolutely strategic to provide service at their doorstep," he stresses. Their capabilities include technical support, customized maintenance, logistics management, spares, tech pubs, etc.

Pierre Andre, head of sales, Southeast Asia and managing director, Thailand for Airbus Helicopters.

Senior Aerospace

Next, we were off to another industrial estate to see Senior Aerospace. One of the first things Senior's CEO, Simon Shale, told us is that Rolls Royce had just awarded the company "Most Improved Supplier of the Year" for 2018. Shale was also quick to predict the company's $100 million annual revenue would more than double by 2024.

Senior manufactures complex precision components such as blades for the V2500, Trent and LEAP engines, aluminum and



In the Amata Smart Cities, companies can lease land on which to build their own facility, lease a facility already built or they can purchase land, even foreign companies can own land 100 percent.

Senior's CEO, Simon Shale advises setting up shop in Thailand is a long game.

hard metal structure parts for the B787, A330 and A320, and aircraft seats. "Thailand has so much to offer. The support structure [for businesses to set up shop] to help you go through the process is second to none, one of the best in the world," Shale says. However, he says "It's a long game," cautioning that some won't get a return in quickly.

"We've invested $50 million in the facility. I spent a lot of money on safety. I'm audited once a week. You have to focus on the long term," he says.

Shale praised the Thai people and work ethic. "Thai people work hard and follow the rules. If you understand the culture, you can motivate them. They never give up and have passion for their work," Shale says.

U-Tapao and Thai Tech

U-Tapao Airport, located in the southern part of the EEC, is growing and the government of Thailand sees it as having huge potential. Together with Thai Airways and Airbus, they are betting on that huge potential. Thai Airways is investing $181 million into the airport infrastructure. They are also undertaking a major expansion of their MRO facilities there, pledging to spend about $114 million to upgrade and expand to be able to hold 12 narrow body or five wide body aircraft.

A joint venture between Thai Airways and Airbus was signed a year ago for this new facility. Their joint goal is the establish an advanced maintenance center capable of servicing the rapidly expanding Asia Pacific fleet which is set to triple during the next 20 years. The maintenance facility will offer heavy maintenance and line services for all widebody aircraft. They envision utilizing the latest digital technologies, advanced inspection techniques such as drones monitoring airframes, will have composite repair and other specialized shops and training.

Thai Technical, Deputy Director Catipod Keadmonkong celebrates their "Mission Impossible," the completion of an Airbus A380 C-check in 50 days.

Thai Airways flies the complete Airbus widebody family so the partnership seems inevitable. On the day of our visit to the hangar at U-Tapao, Thai Technical was celebrating what they called "Mission Impossible" the completion of an Airbus A380 C-check in 50 days, according to Catipod Keadmonkong, deputy director of Thai Technical. "The average time for this six-year check is 60 days. Our goal was 50 days and we achieved that," Keadmonkong says.

This expansion at U-Tapao has Thai Technical setting its sights on third party maintenance. Currently they have an 80/20 split with 80 percent being work on Thai Airways aircraft and 20 percent on other airlines. They will look to expand and add additional customers. The new hangars and shops will make this possible, as they were at capacity both at U-Tapao and Don Mueong.

Keadmonkong is eager to take the Thai Technical team into the future with, big data, paperless systems and drone inspections. They are looking at 3-D mock-ups using augmented and virtual reality training. He says they are ready to move from traditional maintenance to predictive and on to prescriptive maintenance and will be investing heavily in new technologies. "Using big data analytics you can control costs. We are looking at Skywise [the data-mining analysis tool from Airbus]," he says. These new facilities are planned to open in 2022.

It appears there has never been a better time to set up shop in preparation for the Asian aviation surge. Not everyone we spoke to was so optimistic. One business owner in particular did not think it was as easy as depicted to get deputy director deputy director the necessary permits for starting a business venture in Thailand. But, those thinking hard about the possibility and thinking the time is right, take note. When asked what types of MRO support businesses are needed to help their business, Thai Technnical's Songyot Tangtrakarn, chief production engineer, spoke up right away and said, "Landing gear overhaul shops are needed."AM

For more information about investing or setting up a business to Thailand, contact:
Thailand Board of Investment, New York Office
7 World Trade Center, 34th Floor, Suite F,
250 Greenwich Street, New York, New York 10007, U.S.A.
Tel: +1 (0) 212 422 9009 **Fax:** +1 (0) 212 422 9119
Email: nyc@boi.go.th **Website:** www.thinkasiainvestthailand.com

BORESCOPE WORLD:

New Products & Features

By Charlotte Adams

Borescopes are at least as important to engine health as endoscopes are to human health – probably much more so. The aviation gear is used daily to visually check engine innards for cracks and other damage. The scopes shine a light on turbine blades and other components to assess their condition without having to take an engine apart.

Today's high-definition, connected video borescopes are a far cry from rigid and fiber optic scopes. Who knows what the future holds?

Probably we will see more automation. "Imagine if the scope knew where it was going automatically," asks Frank Lafleur, senior product manager for Olympus. With Big Data it may perhaps become possible to teach a scope how to go into an engine and identify the things it sees. We're still many years away from having a scope do an inspection by itself, but there will be more and more inspection-assist features in coming years, he predicts.

Aviation borescopes come in all shapes and sizes, with a wide range of capabilities and price tags. At the high end are machines that can perform measurements to tiny dimensions with great accuracy and repeatability. Less pricey, mid-range scopes provide technicians most of what they need without overkill. Companies continue to add new products and features in this highly competitive market.

Video borescopes got to be dominant in aviation because of their high resolution and ability to show and capture images, says Doug Kindred, Gradient Lens president and chief scientist. You can do it with fiber optic scopes but it takes twice as long and you have to have a cart of equipment, including a separate camera and monitor.

Olympus

Olympus continues to evolve its top-of-the-line IPLEX NX, while adding a trio of products – the IPLEX GT, GX, and G Lite.

The GX, GT, and G Lite use scalar measurement as a standard feature, sizing objects in comparison to a reference defect, according to the company's web site. All three products are optionally upgradable to stereo measurement, using precise 3D coordinates, the company says.

All three servo-driven video scopes also feature TrueFeel technology, ensuring that the borescope doesn't lag or overshoot the target, Lafleur says. "What the thumb does is what the eye sees."

All the scopes have the same accuracy – up to 1,000th of an inch – but the NX is the most precise, or repeatable, in its measurements, he says. The NX also has added 3D modeling as an enhancement to its measurement technology. This allows users to do things like set a reference line on a complex surface like a turbine blade. Users can then rotate the line to see what they're inspecting from multiple angles, providing a sense of depth and making it easier to specify the exact location of measurement points, the company says. "It's like moving from painting a portrait to sculpting a bust," Lafleur says.

ViewTech

Right in the middle of the market is ViewTech Borescopes, formerly RF System Lab. ViewTech's new VJ-3 borescope offers improved lighting, image quality, and ruggedness, as well as rechargeable batteries, says Duncan White, director of sales and marketing.

The company has achieved ruggedness ratings per the International Electrotechnical Commission (IEC) standard relating to IP (ingress protection), or the ability to handle moisture and resist dust and debris. This means you can use the base unit with the screen and joystick in the rain and that it also won't allow dust inside, White says.

He says that ViewTech sells more borescopes in the U.S. and Canada, across a wide swath of industries, than anyone else. The company doesn't say exactly how many scopes that entails, but more than 100 are out in the field on demo a year.

Shown above is the Olympus IPLEX G Lite. Olympus image.

The 3.9mm-diameter insertion tube version of the VJ-3 is popular in aviation, White says. Four LEDs provide up to 6,000-lux illumination. And the VJ-3 has a 16-Gbyte SD card, which can store 10,000 photos or 8 hours of video, the company says. The 3.5-inch anti-glare LCD display monitor features 640x480 resolution. The company also moved from a stainless steel insertion tube to more durable tungsten braid. The 3.9mm probe comes in lengths of 1.5 and 3.0 meters.

The price is also right, White says. The VJ-3 comes in at a range of $9,000 to $15,000, about the same spot as previous incarnations and "at or below anybody with a comparable borescope." There is also a no-cost loaner program if a scope has been sent in for repairs.

Although commercial airlines require a borescope with measurement functionality, "we specifically left that off," he says. But the high-end scopes with measurement capability don't need to be used all the time, he says. Because ViewTech offers 80 percent or more of their functionality at a fraction of the cost, it makes sense to use the less expensive equipment as the workhorse for all the other things that need to be done to get more life out of the high-end equipment, he says.

A mechanic inspects an engine using the ViewTech VJ-3. The VJ-3 comes in at a very reasonable price range of $9,000 to $15,000. ViewTech Image.

ViewTech scopes are popular with general aviation engines such as the Pratt & Whitney PT6, White says. The equipment is also used to look at landing gear, avionics wiring, flap tracks, and radar domes, he says.

Mountain Air Cargo's engine shop uses VJ-3s for everything from 1,500-hour, hot section "sneak and peek" inspections to condition inspections, says Chris Roop, engine shop lead. He uses it to look at PW100

ViewTech scopes are popular for use with general aviation engines such as the Pratt & Whitney PT6. The equipment is also used to look at landing gear, avionics wiring, flap tracks and radomes. ViewTech image.

Visit us at
Le Bourget
June 17-23, 2019
Hall 2A,
Booth # C254

MTU Maintenance

We are your engine experts

Our people make the difference. We are passionate. We are dedicated. We marry engineering with intelligent creativity. And we never give up unless an optimal solution has been found. As the global market leader in customized solutions for aero engines, MTU Maintenance supports you with the right product across the lifecycle of your engine. From innovative maintenance, repair and overhaul (MRO) services, to integrated leasing and asset management.

Contact us and find your solution today.

www.mtu.de/en

The Olympus IPLEX GX/GT with gearbox. Olympus says this model has interchangeable insertion tubes and light sources and an 8-inch touch screen. Olympus image.

engines in the carrier's ATR fleet. Measurement capability would make the job easier but it's not a necessity for everything, he says. "You scale everything out, use your noodle, and apply mathematics to it."

The VJ-3s are user-friendly, he says, with the light source built into one unit so you don't have to have a heavy battery-pack light source hanging around your neck when you're trying to climb a ladder. You position the optic where you want to look and it stays there, he adds.

The images an operator sees can also be viewed on a standard video monitor. Or the equipment can be connected to a laptop and show an inspection via Skype or GoToMeeting, White says. Roop shares photos with Pratt & Whitney via email so he can talk to the OEM about whether an engine can continue operating or should have a shop visit.

The VJ-3 is mechanically articulated – when the user moves the joystick, the scope responds. "It's like a puppet on a string," White says. Mechanical articulation has some advantages over servo-driven operation, he says. In addition to being lower-cost and less expensive to repair, the mechanical system provides tactile feedback. "Because your thumb is moving the borescope, you can feel resistance if you hit the side," he explains.

High-end, servo-driven scopes can be a pain, Roop says. You have to be precise about where you're trying to look because you can overshoot. You have to "pre-think" it and release the switch early. He likes the VJ-3's mechanical articulation and its large angle of view. "That's really nice to look around corners," he says.

Gradient Lens

Gradient Lens plans to jump ahead in the middle market with the launch this summer of the company's Hawkeye V3 video borescope, as a companion to the V2 equipment rolled out in 2012. "We've worked hard on fundamentals" like resolution, image quality, and illumination, Kindred says.

The 4mm-diameter scope will incorporate a high-definition, full-megapixel camera, Kindred explains, with six times the resolution of the current V2 product and three times the resolution of high-end competitors, he predicts. The 5.5-inch-diagonal display will be sunlight readable and the image quality will be comparable to what you get on an iPhone 7 or 8, he says. Illumination will be brighter, employing a 35-watt LED. The LED will be mounted inside of the base and the light transmitted to the tip via fiber optics.

The V3 will move from manual to servo-driven articulation. An advantage with servos is that you can go much further and maintain the range of articulation much better, Kindred says. It will also add Wi-Fi, so that a technician can be

TPAerospace

WHEELS & BRAKES

IT'S THAT SIMPLE

WWW.TPAEROSPACE.COM

Shown left is a PT6A repair and on the right is a PW535A blade inspection. ViewTech images.

The ViewTech Borescopes team was established in 2008 as RF System Lab with the goal of bringing affordable, high-quality video borescopes to the market.

doing an inspection while his boss watches it on an iPad.

The V3 will be very competitively priced, he says, starting at around $10,000 vs. around $8,000 for the V2. "We don't make a Rolls-Royce or a Mercedes. We make a product that's extremely good quality" but that is not loaded with features like measurement.

Gradient borescopes are typically used in applications, such as inspecting turbine blades, combustion chambers, and fuel injection nozzles, to look for problems, such as cracks, he says. Some people, however, also use them to inspect areas of the airframe and wiring harnesses.

The company's aviation focus is more on business and general aviation, including helicopters, for organizations such as police and sheriff departments.

The most important thing for aviation customers is image quality, he says. "What it really boils down to is you have to be able to tell whether something is a very small crack in a turbine blade or maybe a tiny piece of lint."

Measurement

Some users have a requirement for measuring borescopes. You've got to have high image quality because you're doing a visual inspection, but you've also got to have measuring capability, says Craig Grave, owner of AIM (Aircraft Inspection & Management), a maintenance facility that works on a wide range of engines, including Pratt & Whitney, Rolls-Royce, GE, and others.

If you find something in a borescope inspection, the manufacturer wants to know the size of the damage, he says. AIM uses a GE video borescope with 3D phase measuring. "It provides a

YOU LIKE IT **SIMPLE**

That's where we come in.

When you need a part for your King Air, you want the process to be simple so you can get back in the air. At **Professional Aviation Associates**, simplicity is a way of life. We have the right part at the right price, and we're ready to ship from our stock soon after your call. We're the largest independent King Air parts supplier in the world – keeping aircraft flying for more than 30 years. We're based near Hartsfield-Jackson International Airport in Atlanta with access to quick, global air service to get critical parts to your technician, when you need them. While others may compromise on speed, quality or price, we don't.

It doesn't get much more simple than that.

Call us, we'll help get you there.
(800) 283-2105 / www.KingAirParts.com

ProfessionalAviation
ASSOCIATES

3D image on the screen that you can rotate around and see damage," he says. The equipment is very pricey, however. By the time you get all the accessories and extra tips, it's probably close to $70,000.

The unit itself is not overly complicated, but accomplishing an inspection takes skill – not everybody can do it, he says. You have to be able to manipulate the scope, get it into the right position, and get a good picture in order to do the measurement.

The other challenge is understanding what you're looking at, he says. For example, is it a crack or a shadow? Sometimes an image looks like a crack, but when you get the scope into a better position you can see that that it's something else, like a coating loss, Grave says.

Do's and Don'ts

Pay attention to the operator specifications, Roop says. Use the right chemicals to clean the lenses because the wrong chemicals can damage or fog them. And never use a borescope inside a hot engine, he adds. He usually waits four hours in order to let the engine get below a certain temperature range.

And don't drop it, White says. Warranties protect against manufacturing defects. They are not insurance policies against breaking the equipment. Also remember to steer the borescope out, he says. The borescope may have gone around some bends and turns during the inspection process. "You can't just yank it out."

"Don't walk backwards" while guiding it out, he adds, and have your hand ready to catch the camera so that it doesn't swing down and hit the deck. The cameras aren't that fragile, he says, but if the quartz lens hits the floor from 4 to 5 feet up with any force, it won't be too long before it shatters.

Olympus says their IPLEX NX produces highest-quality images and has an intuitive user interface, ergonomic design and rugged durability. Olympus image.

Another basic rule is to put the borescope back in the case when you've finished using it, White says. A common breakage scenario is when the scope is left on a table. Before long somebody comes along and sets a heavy part on top of it.

Also don't put the scope back in the case with the tip hanging out, Kindred says. And don't try to yank out the probe if the tip gets hooked around something. You have to straighten it out before you remove it. "It's just a matter of being impatient and not thinking."

Borescopes are fairly delicate pieces of equipment, AIM's Grave says. The company has around 10 scopes because they tend to break fairly often, he says. One thing on his wish list is faster repairs. AVM

Viewtech's VJ-3 kit comes with everything you see here: the scope, base, tube, carrying case, two li-ion batteries, charger and 16 GB SD card.

A TRULY TIMELESS TRI-PACER

Dale Smith

The stunning finished project - Tri-Pacer perfection.

"All you have to say is this...'I don't care what it costs.' And then, of course, you've got to really mean it, which, of course, no one ever does."

— Quote from 1999 movie "Blast from the Past"

When it comes to PA-22 rebuilds, there are good Tri-Pacers and there are great Tri-Pacers, but there is only one "truly better than the day it was built" Tri-Pacer. Here's the love story behind it.

The one thing I like most about attending events like Sun 'n Fun and Oshkosh AirVenture is the opportunity to just wander around and look at the airplanes. Walking the grounds with the sun barely up and the dew still dripping from wings, I sometimes am lucky enough to come across an airplane with a story that just has to be told.

Such was the case when I happened upon my friend Darin Hart, owner of American Legend Aircraft Company on a sunny Wednesday morning. He was busily wiping Lakeland's "liquid sunshine" off of the most amazing looking Piper Tri-Pacer that I have ever seen. It was like stepping back some 60-years to a spring morning in Lock Haven, Penn. just after the pristine PA-22 rolled off the assembly line.

"This is without a doubt the nicest Tri-Pacer in the world," Hart said. "And it's not just because we rebuilt it. It's as close to brand new as you're ever going to find. And it should be considering the owner spent nearly $250 thousand dollars on it."

While he had me at "the nicest Tri-Pacer in the world," the thought that the owner had spent "nearly $250 thousand" U.S. dollars having it rebuilt meant this was a story that had to be shared.

You Can't Put a Price on Love

"A lot of people say I'm nuts and that I'll never get my money back," explained the Tri-Pacer's proud owner, Mark Wyant. "But, I'm okay with that. That's not what this is all about. This is not just any airplane to me. It represents a lot of great memories and a very special part and person in my life."

Bringing back great memories and paying homage to his father are the two reasons why Wyant began the project to rebuild his beloved Tri-Pacer in the first place. But to understand how we got where we are today, we have to go back to 1974 when Wyant was an eighth-grader in Dallas.

"When you're going to school in Garland, Texas if you don't play football, there's not much left for you to do. I was too skinny for football, so I spent a lot of time reading," Wyant said. "I got a copy of *Anyone Can Fly* by Jules Bergman and I was hooked. I read that book three or four times."

"It was all about Bergman learning to fly in a Piper Tri-Pacer. It was full of

Tri-Pacer stories and pictures and that was my introduction and motivation to learn to fly," he said. "And, of course, I fell in love with the Tri-Pacer from the book."

When he turned 15, Wyant started taking flying lessons at Dallas' Addison Airport (KADS) in a Cessna 150.

"Then my dad and I got the idea of buying a Tri-Pacer together," Wyant said. "We started looking around for a nice one. Turned out there was one for sale at Addison Airport where I was learning to fly. My dad and I went over to look at it together."

"I just fell in love with it right there and we ended up buying it for $5,000. Later that night I snuck back into the hangar where it was and my best friend Jon Contreras just sat in it with the master on and all the lights flashing," he said. "I wouldn't have been more proud of it than if it was a new Learjet."

"I finished up my license in 8664 Delta at nearby Rockwall Airport. It was a lot more fun to fly than the 150," he said. "Two months after I got my license I flew my mom and dad a thousand miles up to Indiana to see my grandmother. My parents were very trusting – neither of them were pilots. I even took my grandmother for a ride back in the summer of 1976. It doesn't seem like that long ago."

Wyant said that during his senior year in high school he took a lot of his friends up flying and that the guys on the football team were now looking up to him – literally.

"I was suddenly the big man on campus, so to speak," he said. "Not many high school seniors have their own airplanes. The Dallas Morning News even did an article on me when I got my license on my 17th birthday."

While Wyant loved his Tri-Pacer, once he was out of high school, his head was turned by airplanes that were just, well, "sexier." Youth has a way of doing that to you.

"We had it for about a year then sold it," he said. "You always want to go further and faster. I went on to become a CFI and fly freight at night. After a while, I went to work flying for American Eagle and finally as a 767 pilot for American Airlines."

8644D: Gone but Not Forgotten

Wyant spent a total of 22-years flying for American, but while he loved his job, when the opportunity came along to take an early retirement from flying the line, he took it. And while he had a logbook full of hours in a wonderful assortment of aircraft types, he never forgot about his first love.

"I always knew my Tri-Pacer was out there. I kept checking on the FAA registry for it and fortunately nobody ever changed the N-number," he said. "That airplane just meant so much more to me than tubing and fabric. It has a history with me – a short one, but a very meaningful one in my life."

"My dad passed away some 19-years ago and he was always very supportive of my flying. That meant so much to me. It was one of those things that he and

Flight controls.

Corrosion and age.

I shared a great attachment to," Wyant said. "My dad couldn't fly because of poor hearing and eyesight. But that didn't stop him from loving time in the cockpit. He loved to fly. This right seat was his whenever we flew together."

"As time went on, whenever we would buy another airplane: Whether it was the Mooney, Bonanza or the Aerostar – when we flew together we'd laugh and say, 'It sure beats the Tri-Pacer.' But, that little airplane meant something really special to us," he said. "That's why I had to get this airplane back."

As luck, or maybe fate, would have it, Wyant's first love was living not far away in Tyler, Texas, which is about 80-miles from his home in Dallas.

"I had searched out the owner's phone number and called to see if he was willing to sell. His answer was no," Wyant said. "About a year later, I called and asked again. Same answer. Another year later,

Airframe skeleton before.

Teardown in progress.

Original engine data plate.

I decided that I was going to give it one last shot so I called and offered him twice what it was worth. That got his interest."

As Wyant happily admits, he ended up paying "stupid money" to get his beloved Tri-Pacer back. But, as we all know, when it comes to settling affairs-of-the-heart, some things just can't be measured in money.

She Didn't Look at All Like Her Yearbook Photos

"When the owner had finally agreed to sell the Tri-Pacer he had described it as being in 'excellent condition and always hangared,'" Wyant said. "When I arrived at the airport I found that, yes it was in a hangar alright, but leaning up against the hangar was more like it. It was horrible looking. It hadn't been out of that hangar for a long time."

Anyway, Wyant was too deep to turn back now so he bought 8664 Delta and flew her back to Addison airport. While many an owner would have been totally disheartened by the sad condition his high school sweetheart was in, he saw it as an opportunity to not just bring his beloved Tri-Pacer back to the way he recalled, but make her even better.

"That's when I contacted Darin Hart at American Legend Aircraft Company. When I decided to do a restoration, I didn't want just any restoration – I wanted to make this Tri-Pacer as good, or better than the day it left the factory in Lock Haven," Wyant said. "You can't find many people that can do that."

And who better to do a "factory fresh" restoration on the Tri-Pacer than a company that currently makes factory new "Cubs?" Which is precisely what the craftsmen at American Legend Aircraft Company have been doing since 2004 with their popular Legend Cub series.

Along with manufacturing new Legend Cubs, Hart has become a legend of sorts amongst the Piper community with the exceptionally high quality aircraft rebuilds that come out of his facility in Sulphur Springs, Texas.

"American Legend Aircraft Company actually started from our work doing high-quality restorations on Cubs. I think we've won five or six Lindy Awards at Oshkosh over the years," Hart said. "People call us on a weekly basis wanting to do a restoration on a Cub, Champ or Tri-Pacer, but they have to be really serious for us to do the job."

"For us just to pull the covering off and replace it, without doing anything else will take 400 man hours and cost $38,000," he said. "And that's not sandblasting the frame or replacing any hardware. That's just the covering. The price scares a lot of window-shoppers away."

Hart said that when Wyant called him about rebuilding 8664D, his first response was that the airplane wasn't worth the cost of just stripping and recovering it.

"But then he explained the story behind it, I could tell that this wasn't really about the airplane to Mark, it was much more," Hart said. "I am very proud that he put his trust in us to do the work for him."

You want it when??

While Wyant was more than happy to pay American Legend Aircraft Company's premium price for the work, there was one catch, if you will.

"We started the project in late January and Mark said he had to have it at Oshkosh that July. So we had inside of six months to rebuild the Tri-Pacer," Hart said. "I think he was a bit surprised when I said that would be no problem at all. We are a production shop so we are used to getting airplanes in and out quickly. We don't have room or time to keep projects sitting around for years."

While the timeframe was not out of the ordinary, the team didn't have any time to waste. Hart said that a big part of what sets an American Legend rebuild apart from another is the research and detail they put into a project.

After stripping the airplane and inspecting the steel tubing, wood ribs and components they set about repairing and replacing whatever needed doing. All-in-all, Hart said it was in serviceable condition for a 60-year old airframe.

"We took the frame down and sandblasted it clean then replaced what metal tubing wasn't up to our standards," Hart said. "Its essentially a new airframe. Then we replaced every nut, bolt, pulley and cable. Everything is brand new."

"Univar Aviation Corporation has a tremendous stock of parts for these classic old Pipers so it was easy to buy practically everything we needed," he said. "Control surfaces, ribs, flying wires, struts, the entire exhaust system: even the fairings that go around the struts – things you think you'd have to fabricate you can buy form Univar."

Hart said that instead of overhauling the 160-horsepower Lycoming engine, Wyant wanted a brand new engine because that's the way it left the factory in 1958.

Speaking of achieving that factory look, Hart said that one detail that many restorers overlook is the painstaking replication of the original factory stitching.

"Darin went back and found the original build sheet on this airplane to find out how they laid the fabric on, how it was stitched and even the location of the 'dollar patches,'" Wyant said. "The way they stitched it all is exactly to the original Piper specifications they published in their production manual. Everything is as authentic as it can possibly be."

"Also, most people don't realize that the back half of the baggage compartment was originally made of canvas cloth," he said. "Most have long since replaced it with the same fabric as they use to cover the exterior, but that's incorrect. We found original OEM canvas and put it back where it belonged: including the strap that holds the tow-bar in place."

Engine before and after (or old and new).

Back to the Future

Of course you can't put all that work into making every detail factory correct and then rattle-can any old paint scheme on. So, while Wyant liked the yellow and white scheme the Tri-Pacer had when he flew her as a teenager, it wasn't as she left the factory.

Since they already had Piper's dimensional drawings of exactly where the stripes and N-number laid out on the airframe, Hart contacted Piper Aircraft restoration expert Clyde Smith a.k.a. "The Cub Doctor," to find out the exact colors the factory would have used in 1958.

"He knew by the serial number what the exact colors were for that airplane," Hart said. "Santa Fe red and Daytona white. It's a very classic combination for Pipers."

"The only difference in the factory paint and what we used was that ours is shiny, while the factory originally used a matt finish, We felt the shiny paint would hold up better and be easier to clean," Wyant said. "All of the interior fabric is also Piper spec. Turns out it was the same upholstery that was originally from a 1958 Mercury Marquis automobile, which we were able to find from a supplier."

Hart said that while finding the original material to redo the upholstery was easy, replacing the original batting material used for cabin "sound-proofing" was much more labor intensive. But, again, if it was done at the factory, it was replicated in Mark Wyant's Tri-Pacer.

While it's crystal clear that Wyant and American Legend spared no effort, nor expense, to make the Tri-Pacer as 1958 as possible, that type of originality won't work when it comes to an airplane that's actually going to fly in today's airspace. Especially with the 2020 ADS-B mandate on the horizon.

N8664D Goes "NextGen"

So how do you keep an airplane looking like it's right out of 1958, while having all the avionics capabilities Wyant needs to safely navigation around Dallas's busy airspace? Well, turns out a bit of visual trickery works every time.

"My friend Jon that had sat with me in the airplane the night I bought it in 1976 and I took the panel rework on as our project. All of the instruments were sent to Keystone Instruments in Lock Haven where they were rebuilt and the faces were repainted in the original off-yellow color," Wyant said. "Most people think they've yellowed with age, but

Engine compartment and firewall before and after.

they were originally that color so that they would show up better when lit by the red cabin light."

Wyant was even able to locate and reinstall the original Piper ashtray that came in the Tri-Pacer. Not that there's any smoking allowed.

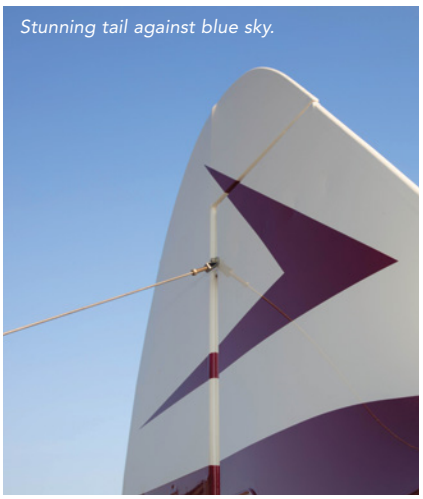
While he was able to add in many OEM details, when it came time for equipping the Tri-Pacer with the mandated new-generation avionics, Wyant was faced with a more difficult challenge and that's where the high-tech trickery comes in.

"I wanted anyone looking in the cockpit to see an airplane the way it was in 1958, but I also needed avionics that give me the same safety and capabilities I have in my Citation Mustang," he said. "To accomplish what I wanted, Jon took an original Narco Omingator and a VLR-3 low-frequency receiver and cut them down so that they were about an inch and a quarter deep. We needed several "donor" radios to accomplish this and it took more than two months to pull it off."

"We mounted them to a false panel piece that looks just like they are

Panel before and after.

Upholstery like new.



Stunning tail against blue sky.

original. They even light up when you turn them on," Wyant said proudly. "But, when you remove the faceplate, you'll find a brand new Garmin GTN touch screen 750 and a Garmin GTX 345 ADS-B Out/In transponder. As it turned out once installed in the panel, the height of the 750 and 345 were the same as the Omnigator and VLR-3 units so it's the perfect match."

Another significant upgrade Hart and his team performed on the Tri-Pacer was the switch from the OEM installed BF Goodrich brakes to much more modern and reliable Cleveland wheels and brakes. In addition, they replaced all the old incandescent exterior and interior lights with new LED lighting.

"Now I can leave all the strobes and landing lights on all the time, which is good for safety," Wyant said. "For additional reliability, we also upgraded to a new lightweight, Sky-Tec starter and replaced the old unit with a new 60 AMP alternator."

What Goes Around, Comes Around

Wyant said that true to their promise, the team at American Legend Aircraft Company completed the "brand-new" Tri-Pacer in time for Hart to fly it to Oshkosh AirVenture 2017.

"We put just about 1,800-hours in the total rebuild," Hart said. "I have to say that it really turned out great. And that it's a very nice flying airplane. I've flown it to Oshkosh and to Sun 'n Fun in Lakeland and it's a very comfortable cross country airplane."

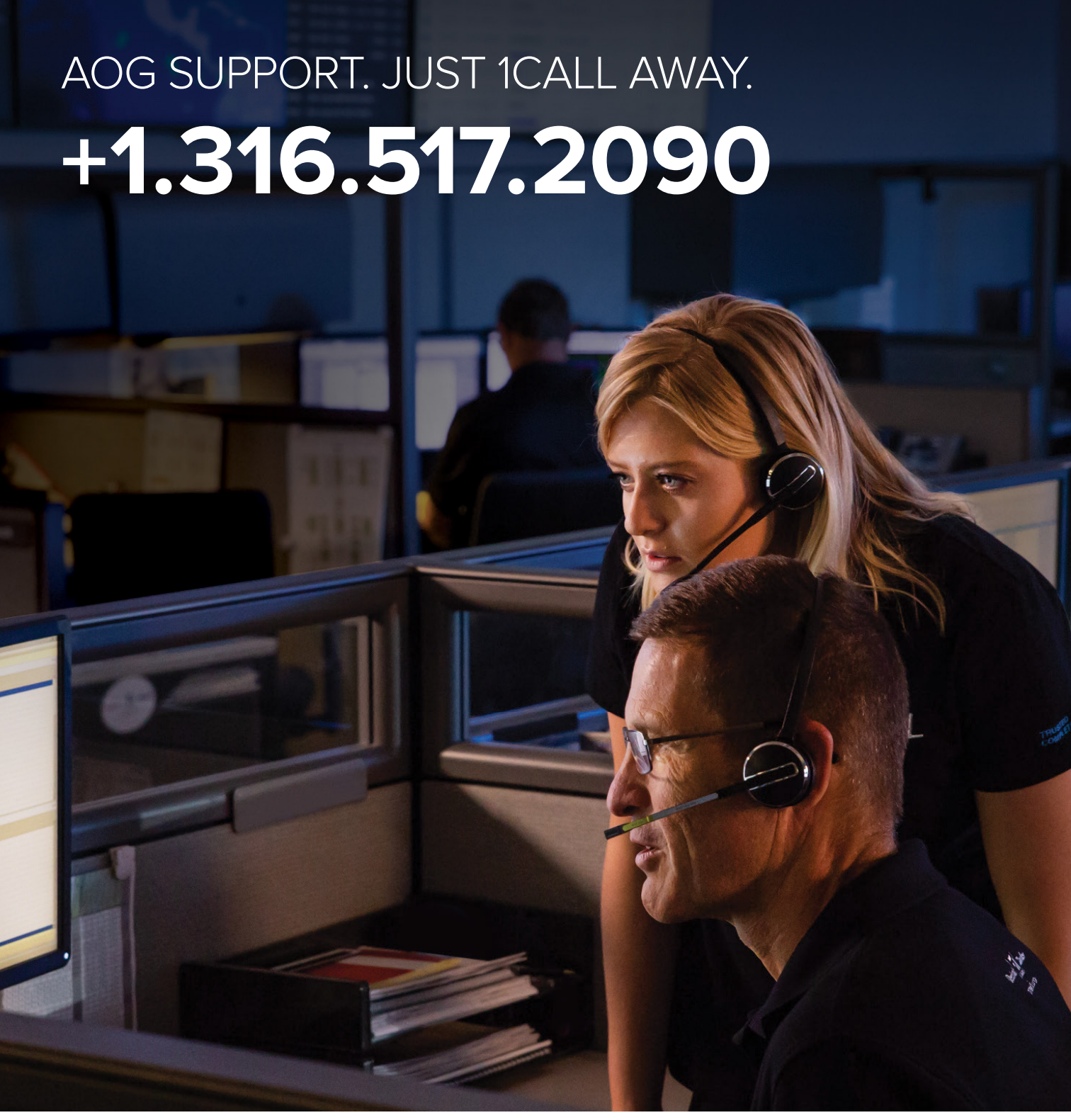
"Although, I can see why Piper quit making them. They are very complex airplanes and they couldn't compete with the Cessna 172 for production," he said. "In particular, the control cables being fully interconnected were very sophisticated and labor-intensive to install. Compared to the Piper Cub, the Tri-Pacer is probably twice as complex to put together."

No matter how complex or how much it ultimately cost, Wyant says that he is thrilled with how his beloved Tri-Pacer turned out. "I believe it's the finest example of a Piper Tri-Pacer in the world," he said proudly. "I don't mean that as any type of hyperbole, but I truly believe that we achieved our goal in every way."

So, you have to ask, now that the Tri-Pacer is done, what are his plans for it? "Back in 1958 people thought they were dumpy looking and nicknamed them 'flying milk stools,' but today, I think they've become retro," he said. "My son is 13 and he's a fan of the way it looks and flies. I'm slowly teaching him to fly the Tri-Pacer and he's loving it."

"Today, it lives in my hangar next to my Citation and my hangar/office is right inside. Every day when I walk in I take an minute to give her a little pat," Wyant said. "This is not just an airplane to me, it represents a lot of great memories and a very special part of my life and the people in it. There is no question that I own the world's most expensive Piper Tri-Pacer and I'm totally fine with that." AVM

To see the full gallery of photos of the rebuild, go to ***www.avm-mag.com/tripacer***



1CALL

TRUSTED SERVICE.
COMPLETE SUPPORT.

Total AOG support is 1CALL away. Dial our experts directly to keep your life and business flying on schedule.

Learn more at **txtav.com/aog-support.**

Beechcraft | Cessna | Hawker

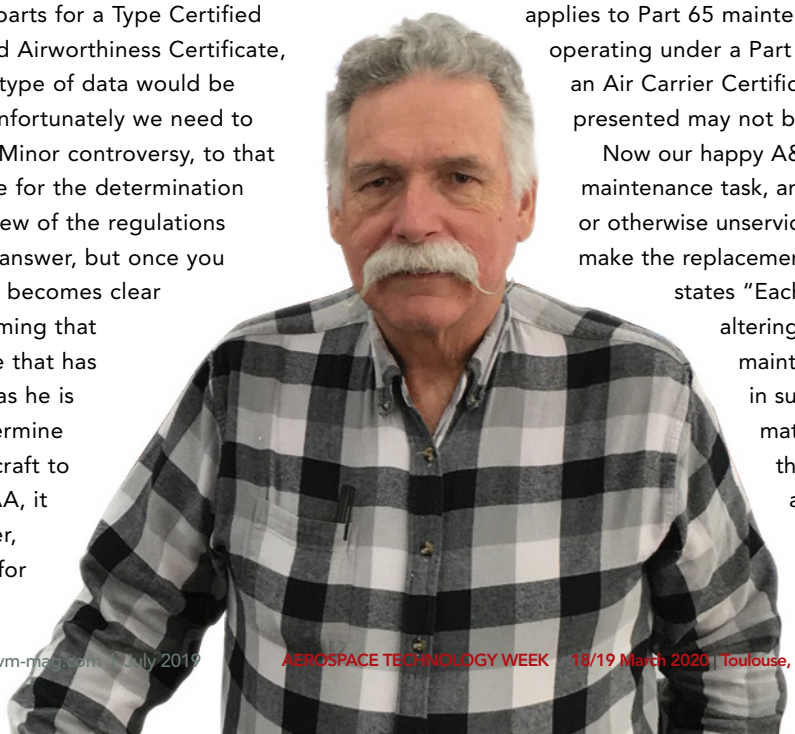
TEXTRON AVIATION

Fabricating Parts to Facilitate Maintenance, What Does 21.9 Really Mean?

By David Schober

A recent post I made on the Facebook "FAA Inspection Authorization and Inspectors" page stirred up a lot of unexpected controversy. The original post referred to a component fabricated in the course of maintenance, and how an FAA Aircraft Certification Office inspector threatened the person performing the maintenance with a violation unless he got a Field Approval for that maintenance task. What surprised me was the controversy that ensued covering several important points. The age old Major/Minor controversy. What really constitutes Approved Data. The inconsistency between not only FAA Inspectors, but FSDO offices, and ACO offices in how they read the regulations. An idea that all parts require an FAA Form 8130-3. Finally, can an A&P fabricate parts for installation in the course of performing maintenance.

This article will focus on the last of those controversies. Can an A&P fabricate parts for a Type Certified Aircraft with a Standard Airworthiness Certificate, and what approval, or type of data would be required? To answer, unfortunately we need to first look at the Major/Minor controversy, to that end, who is responsible for the determination of Major/Minor? A review of the regulations does not give a direct answer, but once you read 43.9 and 43.13, it becomes clear that the person performing that maintenance is the one that has to make that decision as he is the one that must determine who can return the aircraft to service. It is not the FAA, it is not the aircraft owner, the sole responsibility for making a Major/Minor determination rests entirely on the person performing the maintenance function. That Major/Minor determination is what drives the type of Data that is required, who can actually return the aircraft to service, and finally what documents are required for that return to service. For simplicity in this discussion, we will assume the maintenance function is a Major Repair as that sets up the most stringent requirements. That Major/Minor determination can easily be made by referencing the flow chart in AC43-210A Figure 4-1 along with the definition in Part 1.1 and Appendix A to Part 43. Given that we are assuming a Major Repair, 14 CFR 65.95(a)(1) identifies that Approved Data is required for the repair, and that repair must be made in accordance with that Approved Data. Recognize also that in the Part 65 world, an FAA Form 337 would be required, and the return to service is done by the holder of an Inspection Authorization. Much of the information in this article only applies to Part 65 maintenance facilities. While operating under a Part 145 Repair Station, or an Air Carrier Certificate some information presented may not be applicable.



Now our happy A&P is about to undertake a maintenance task, and he discovers a broken or otherwise unserviceable part. Can our A&P make the replacement part? 14 CFR 43.13 (b) states "Each person maintaining or altering, or performing preventive maintenance, shall do that work in such a manner and use materials of such a quality, that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original

or properly altered condition (with regard to aerodynamic function, structural strength, resistance to vibration and deterioration, and other qualities affecting airworthiness).", so if we use parts of such quality that it will be at least equal to the original we satisfy that requirement. When we are finished, we want an "Airworthy" aircraft, and under the definition of "airworthy" in 14 CFR 3.5, that part needs to meet Type Design as well as being safe for flight. Given that, do we have sufficient data to make that determination? That is a value judgement given the complexity of the part and the aircraft. Can it be reverse engineered from the existing unairworthy part? Do we have drawings or specifications that provide sufficient detail? Can we use existing publications from the FAA to fabricate the new part? All these are valid questions that we, as mechanics need to ask before embarking on the fabrication of parts for this aircraft.

Some examples of parts fabrication, fluid hoses. Sheet metal skin panels fabricated from raw aluminum sheet goods, Steel tubes to be welded into a steel tube fuselage, engine mount, or landing gear, flexible steel control cables, wood wing ribs, spars or compression struts, clear transparencies for side windows and sky lights. These are all examples of commonly fabricated items that may or may not be acceptable to fabricate locally. A hose assembly may have a pressure test requirement that you don't have the equipment to perform. A sheet metal skin may have a surface treatment that requires special processing, or has called outs for a manufacturers specification you aren't in possession of. The fuselage, engine mount, or landing gear may have heat treatment requirements you aren't equipped to comply with. There may be multiple reasons you may not be able to fabricate a part, but more frequently than not, these special requirements are not present.

If there are maintenance or structural repair manuals available for the aircraft in question, that is your first source of data. Aircraft manufactured prior to CAR 3 will have very limited, if any, maintenance information available. The primary source of maintenance and inspection data for these aircraft will be AC43.13-1B, all prior versions of AC43.13-1, and CAM 18. Recognize that with AC43.13-1, through the various revisions, critical information on inspection and repair was removed, yet if that information resides in an earlier version or CAM 18, and it is directly applicable to the repair, it is still valid information. The Signature page of AC 43.13-1B (and earlier versions) provides that it is acceptable data, and in certain cases it is APPROVED data. Recall we said that this was going to be Major Repair, so the data used in making the repair (fabricating the part) must be Approved Data.

The potential sources of Approved Data can be found in Order 8300.16 Figure 4-1. Our A&P needs to evaluate the Approved Data available and ensure that this data provides the ENTIRE data required to perform this repair

(part fabrication). If it is, then no additional data approval is required. If the data doesn't cover the entire repair, then additional approval will be required. Go back to Order 8300.16 and AC 43-210A to find how to acquire additional approved data. Recognize that many aircraft manufacturers have gone out of business or are no longer supported. Your ability to secure Approved Data for these airplanes will be primarily DERs, DARs, and the FAA. AC23-27 provides additional information concerning material substitutions or part substitution. Use caution when making substitutions as your repair may also become an alteration, requiring further approved data.

Assuming we have all the data, and referring back to 14 CFR 43.13(b), our fabricated part must meet Type design and be "at least equal" to the original. It doesn't say is has to be EXACTLY, it says at least equal. In most instances, reverse engineering can provide alloy, thickness, type of hose, type of cable, size, shape, thickness, hole pattern, fitting ends, and all other features related to an item or part. Many times, processes can be determined through hardness testing, spark testing, NDT, or other inspection techniques. If there is no manufacturers maintenance or structural repair manual, AC 43.13-1B will be the go to source. Given the limitations on the signature page, we have approved data for the fabrication of wood components, steel tube structures, sheet metal components, hoses, solid lines for fuel and hydraulic systems, control cables, and wiring. 14 CFR 21.9(a)(5) or (6) provide the legal authorization to actually fabricate parts for the purpose of repair. If we go to the original preamble of Part 21 in the Federal Register October 16, 2009, we find the following:

"In addition, the SBA's Office of Advocacy asked the FAA to clarify and confirm that the existing ability of a repair shop to produce a part during maintenance activities remains in place. Since the NPRM proposed to remove that language, several repair stations asked us to clarify whether they will still be able to produce articles that will be consumed in the course of a repair without violating Sec. 21.9(a).

It is not our intent to preclude that activity. To address that concern and clarify our intent, we established an exception in Sec. 21.9(a)(6). This exception, which was not proposed in the NPRM, allows for the production of articles without benefit of a production approval when articles are fabricated by an appropriately rated certificate holder with a quality system and consumed in the repair or alteration of a product or article in accordance with part 43. Maintenance providers who do not have a quality system may continue to fabricate owner-produced articles for installation on type-certificated aircraft using the guidelines set forth in Policy Memorandum, Definition of ``Owner Produced Part,'' Section 21.303(b)(2), August 5, 1993."

This clearly shows that the FAA's intent with the changes from the old 21.303 to the new 21.9 was not to limit the ability of an A&P fabricating parts for the purpose of maintenance. Mind you that FAA has no clear definition of "quality system". While that term shows up in Parts 145, 135, 121, and perhaps others, it does not mean that a shop that does not have a 145 Certificate can't have a quality system. While controversial, I move that for a Major Repair, a quality system is inherent in the fact that the return to service on FAA Form 337 requires signatures for persons with two independent certificates, the first indicating conformity and the second provides an independent inspection leaving 21.9(b)(5) as the controlling regulation for parts fabrication. It really doesn't matter since FAA provided both 21.9(b)(5) and (6) as methods for fabrication of parts consumed during maintenance.

To summarize,

1. Within the scope of the Federal Aviation Regulations, under 14 CFR 21.9, FAA clearly indicated that an A&P has the authority to fabricate parts either with a quality system under 21.9(b)(6), or 21.9(b)(5) without a quality system.

2. Any part fabricated in the process of performing maintenance still needs to conform to Type Design.

3. The installation of any part (purchased or fabricated) must follow the maintenance requirements of Part 43.

4. Part Fabrication, since it is considered maintenance, could be a Major Repair or a Minor Repair. Use the flow chart in AC 43-210A to help make that determination.

5. For minor repairs (part fabrication) only acceptable data is required. For Major Repairs (part fabrication) Approved Data is required. FAA Order 8300.16 has a listing of sources of approved data.

6. Parts fabricated under 21.9(b)(5) or (6) need to be consumed in the process of maintenance, they can't be sold, or put on the shelf for future installation.

7. If additional Approved Data is required, you can enlist the support of a DER that has Major Repair and Major Alteration Authority within the functional area where your repair is, a DAR that has Field Approval Authority, or the FAA FSDO for a Field Approval. (Many FSDO offices will no longer support Field Approval requests) AVM

David Schober is an A&P, IA and Vintage Aircraft DER. He has been an airline director of training, president of a Part 135 charter operation, DOM of a 145 repair station and is currently working with the Department of Navy supporting their fleet of commercial deriviative aicraft.

AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France

6 EVENTS UNDER 1 ROOF

The premier exhibition and conference for the aerospace technology industry

Aerospace Technology Week brings you the best in developments and trends in connectivity and e-enabling for airlines, the latest in regulatory, policy and technical SES and Next-Gen challenges for avionics, and the technological developments and systems that affect the design and construction of aircraft.

Bringing together the best aspects for aerospace technology, a great series of closely related sectors – Avionics, Connected Aircraft, Aerospace Testing, Flight Ops IT, MRO IT and FACE – offer greater insight and connectivity between these exciting, fast moving aerospace industry sectors.

- **Over 1250 delegates and attendees**
- **Over 100 airlines**
- **High Level Conferences**
- **Technical & Technology Workshops**
- **Certified Training**
- **Leading showcase exhibition**

Join us in Toulouse, France, the heart of Europe's aerospace manufacturing capability, on 18th-19th March 2020 for the largest gathering of aerospace technology, airlines, avionics, aerospace testing, flight ops and MRO communities – **get informed, get updated and get better connected!**

...building better aerospace connections

Simon Barker

Connected AIRCRAFT | Flight Ops iT | MRO iT | AEROSPACE testing

Sales Director – Aerospace Testing / Connected Aircraft / MRO IT / Flight Ops IT / Aerospace Tech Review
T: +44 (0) 203 892 3053
E: sbarker@aerospace-media.com

Amanda Kevan

Avionics | FACE

Sales Director – Avionics Expo
T: +44 (20) 3892 3057 (T)
E: akevan@avionics-expo.com

Jo Pembroke

AEROSPACE testing

Sales Manager – Aerospace Testing
T: +44 203 892 3054
E: jpembroke@aerospace-media.com

WWW.AEROSPACETECHWEEK.COM

Launching in the Autumn of 2019, Aerospace Tech Review is the new quarterly publication for all companies involved in the high-tech sectors of the aerospace industry.

Featuring the core sectors that Aerospace Tech Week covers, including; aircraft connectivity, avionics, testing, fight operations IT, MRO IT, new product developments and an industry news round-up.

Aerospace Tech Review will have a global circulation of 10,000 printed copies and sent to airline senior and middle managers, and to the aerospace suppliers/ OEMs. It will also have an online readership in excess of 50,000.

The official publication at our Aerospace Tech Week show - with an average of 1,500 copies being handed out at the show.

Simon Barker | Publisher & Sales Director | **T:** +44 (0) 203 892 3053 | **E:** sbarker@aerospace-media.com

Amanda Kevan | Sales Director | **T:** +44 (0) 203 892 305 | **E:** akevan@avionics-expo.com

Joy Finnegan | Managing Editor | **E:** jfinnegan@avm-mag.com

WWW.AEROSPACETECHREVIEW.COM

AVIATION WEEK
MRO
ASIA-PACIFIC

Singapore 2019

Conference September 24-26
Exhibition September 25-26

Join the Region's Premier Event for Maintenance, Repair and Overhaul.

Confirmed Speakers include:

Ang Chye Kiat
EVP, Aircraft Maintenance & Modification, Aerospace, ST Engineering

Lee Hui Fung
VP, Smart MRO, Aerospace, ST Engineering

Brandon Keener
Executive Director, Operations Strategy, Worldwide Repair, Collins Aerospace

Richard Kendall
Group Director Airframe Services, HAECO Group

Shingo Nishida
President, ZIPAIR Tokyo Inc.

Janite Quiran Parmanande
Innovation Engineer, TAP Maintenance & Engineering Aerospace

Rahul Shah
SVP Strategic Growth, Business Development Asia Pacific, Middle East and Africa, AAR Corporation

Frank Stevens
VP, Global MRO Centers, Embraer

Shiv Trisal
Associate Director, Aftermarket Digital Strategy, Aftermarket Services, Collins Aerospace

Ian Wolfe
Senior Advisor Engineering and Fleet Management, Cebu Pacific Air

5,000+ Attendees

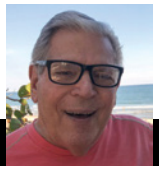
200+ Solution Providers

Co-located with AVIATION WEEK AeroEngines ASIA-PACIFIC

Register today! mroasia.aviationweek.com

AVIATION WEEK NETWORK

In 1970, PanAm Quartered Engine Change Times



By John Arcari, A&P

Mechanics scramble over 747 engine at JFK's Jet Center.

On June of 1958, I graduated from Manhattan High School of Aviation Trades with honors. In July of 1958, at 17 years old, I got hired by Pan American World Airways as a temporary aircraft cleaner. Pan Am was not hiring any aircraft mechanics then. I was given a commitment to work through Labor Day in September. When Labor Day rolled around, the employment office at Pan Am advised me, that if I so desired, I could remain on their payroll as an aircraft cleaner. I accepted their offer. In October of 1958, the employment office summoned me and informed me that I had been upgraded to a mechanic helper as a result of my good performance and because I held an FAA A&P Mechanic certificate, earned in high school. And so began my almost thirty-year career at Pan Am.

In the summer/fall of 1969, the new Pan Am aircraft, the B747-100 was being built and then test flown in Everett, Washington. The 747 was headed for commercial airline service, beginning in January 1970. I had been chosen to be part of the Pan Am Maintenance Team that would introduce the B747-100 into commercial flying service. I specialized in two areas, the fuel system and engine replacement. I wrapped my curious brain around both these areas as best I could. By this time, eleven years after starting, I had tons of experience changing engines on numerous types of aircraft and could do an engine change in my sleep.

January 1970 arrived and the first Pan Am B747-100 departed its gate loaded with passengers and cargo for its first commercial flight from JFK to London, England. On taxi, the wind blew up into the #2 engine tailpipe. The engine stalled and we had an engine with metal debris in the exhaust tailpipe. So now, an engine change was required. The aircraft went back to the departure gate and then to the maintenance hangar. My boss, Ron Marasco, called me at home, in the evening, and says, "Johnnie, you best get in here now…we've got a problem." That was the start of literally years of engine changes due to engine casing ovalization (where the engine case became slightly oval causing turbine blades to rub against the engine casing) at high engine power and high EGT temps. This caused compressor stalls due to airflow problems between the compressors and turbines.

It took us about ten to twelve hours to replace the first engine, perform the engine run-up check and get the airplane ready for further service. The aircraft flew the JFK-LHR leg the next evening successfully.

This ongoing engine problems caused a major shortage of engines for many years, but we maintenance folks certainly could not live with ten or twelve hour engine changes... it would ruin our flying operation schedule, and prevent us from a viable business plan.

Now for the good news. Our dedicated, determined, inventive, Pan Am mechanics came through with smarts and innovation.

I loved the Pan Am teams at JFK Maintenance. They consisted of WWII, Korean and Vietnam war veterans, and tons of diverse folks. Amazingly, the cultures mixed and blended smoothly together. We hung together, ate together, cried together, laughed together swore together, and yes, sometimes we even fought together. But most importantly, we all worked in unison to take on this massive challenge.

Aircraft mechanics in general are a breed of human being that tries to figure out ways of doing things easier and faster while still remaining safe, professional, efficient and productive. They are always on a quest to do things faster, better and safer. I can tell you, we all realized that safety on the ground and in flight is number one...period. These guys and gals plied their magic and mojo of change and the next thing you know, we were changing B747-100 engines in two to three hours.

We had terrific flight ops crews. Our airmen closely monitored engine performance. We devised a system of identifying engines that were beginning to fail (high EGT). The aircraft would be scheduled back to a main maintenance base to have its engine changed, rather than having an occurrence at an out station. We "borrowed" good engines from aircraft undergoing heavy checks. We made up logistic support kits, with the help of our great material and logistics folks, so they would be ready for use immediately, where and when needed. The ground support equipment to perform the engine changes would be lined up and waiting, as required. An engine change was something to see and admire from start to finish. We kept up our banter, jokes, digs and foul mouths (on occasion) as we debated this or that. At the end of the day, we were a band of loving sisters and brothers, doing our thing, successfully and safely.

Domestic and international airlines at JFK came to us for their engine changes as well. We pledged them a six-hour engine change time, unheard of at the time. I still have numerous thank you notes from our satisfied "repeat" customers, like SwissAir, British Airways, Alitalia, Aer Lingus, Avianca, American, Eastern, Braniff, etc. And, we made a few bucks (more than a few bucks) for old Pan Am. 'Twas quite the experience and we loved it, because we know we were doing good for our airline, our passengers, our fellow airlines, the industry, Boeing and Pratt & Whitney. We were also doing good for ourselves. I still have a wonderful, gracious award from P&W for "Our Pan Am" safe aircraft maintenance service to their cause! AM

@afiklmem

Augmented Reality

BEST4YOU

100%
Innovation

100%
Global network

100%
Airline MRO

100%
Adaptiveness

SnapPress

1. Download the **SnapPress** App for free.
2. "Snap" this page.
3. Explore the page's exclusive hidden content.

"I've specialized in hydraulic component overhauls for over a decade. Because I'm responsible for certification, I always strive for perfection. Our team makes sure that all the components we handle work optimally in all possible conditions and at all times."

***Maarten**, Hydraulic components specialist*

AFI KLM E&M delivers services guaranteed to match your requirements 100%, buttressed by know-how rooted in the experience of an MRO backed by a group of world-class airlines. Our Global Network delivers those solutions on your doorstep, giving you the benefit of our wealth of innovations, so that our services are always the **Best4You.**

AIRFRANCE INDUSTRIES
KLM Engineering & Maintenance

ADAPTIVENESS®


Elevated
expectations
For more than four decades, we've been a world leader in the design and development of flight controls, engine controls, and flight deck and cabin systems. Now we're using our expertise to produce world-class avionics for the next generation of aircraft that will feature autonomy, all-electric, and hybrid technologies.
baesystems.com/commercialsupport
BAE SYSTEMS