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STAY IN TOUCH WITH YOUR ROOTS AND YOUR PASSION

Spend a Sunday afternoon at the local airport

Why did you decide to get involved with, or perhaps pursue a career in aviation? For some it was a logical step after time serving their country in the military, for others perhaps family members worked in the industry, or for others maybe it was just a job.

I recall as a youngster being intrigued with airplanes and would run outside to watch as one would fly over my parents' country home. Eventually my father took me for my first airplane ride and then my next airplane ride. So as the saying goes … the rest is history.

I knew from a young age that I would be involved in aviation and I still am. I credit my father for his support and encouragement of my wanting to become an aviator.

After taking a bit of a break from flying the past few years, I recently took my Biennial Flight Review and have been back flying one of the Cubs at Stanton Airfield; the local airport where I live in Minnesota. I'm well known there and have been involved as a volunteer doing any number of things for decades. It's been nice to get reacquainted with old friends and new faces.

Last Sunday the weather was sunny, warm, with a light breeze from the southeast. It was a perfect spring day to go and just hang out at the airport. It was a busy day with numerous small airplanes coming and going. It's great to see the activity in an otherwise tough general aviation climate right now.

Eventually the visiting and hangar flying was interrupted by the usual chores of helping to move airplanes, pumping some fuel, and greeting a few aviators as they flew in to have an ice cream treat and watch the gliders launch on the beautiful grass runways. Yes … this is why I do what I do.

Regardless the weather it's attending one of the largest airshows in the world, a small local aviation group meeting, speaking to students about a career in aviation, interviewing someone for an article, or just hanging out at the local airfield, I am an aviator first. It's not a job, it's a lifestyle and most true aviators will say the passion never really goes away.

Get back to your roots and visit the local airport. It's good for the soul.

Ron

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AAR recently signed flight-hour agreements with Volotea, Enter Air and ASL for fleet support leveraging rotable parts pool and component repair services in Europe and beyond. A new parts supply team in the UK is now focused on selling ATR components.

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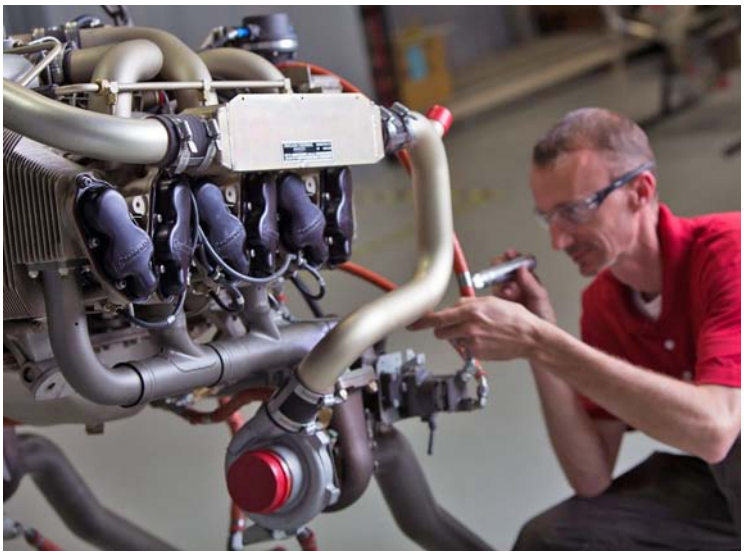
WHAT'S IN A CONTINENTAL MOTORS SERVICES OVERHAUL?

At Continental's Fairhope facility engines are cleaned, inspected, tested, repaired, overhauled, or replaced

By Tim Kern



CONTINENTAL MOTORS

After the press event announcing Continental Motors' investment in its Mobile facilities (see sidebar), I was invited to their nearby Fairhope overhaul facility, located on Sonny Callahan Airport (KCQF), where repairs and overhauls of existing Continental and Lycoming piston aircraft engines are performed, and where they assemble and test the Titan line of Experimental engines.

Though this facility, too, will be upgraded soon (including a new paint center and a workflow revision), I was allowed to photograph nearly everything, and followed the path of an incoming engine through its various stages of inspection, testing, and assembly.

Individuals, fleets, and other shops send engines to Fairhope, some with obvious damage, some with little documentation. After cleaning, the disassembly team performs a visual inspection and then performs nondestructive testing using a traditional array of methods: Magnaflux, Zyglo, and ultrasonic. If a part is undamaged, Tony Campbell (general manager, CMS Fairhope) says, "We'll check every dimension, looking for repairable or out-of-spec parts. We provide the customer with a quote for the repair or overhaul, and once it's approved, we proceed with the repair or overhaul. However, if the anticipated cost of the engine repair or overhaul is beyond economic sense we will contact the customer." There are several options. "We can offer a core allowance on a new or rebuilt engine from the factory, or swap his engine to a continuing time overhauled, zero time since overhaul. These three options offer a range of value propositions for the customer, including different warranties and content of new parts."

Depending on the season and particularly on the extent of repair and parts replacement necessary, **turnaround — from receipt to shipping — is typically about three weeks,** for the 500 or so engines that get overhauled or repaired in Fairhope every year.

Though owners can and do run their engines beyond recommended TBO (Time Before — or between — Overhaul), common sense should govern the decision. Obvious damage or trauma, such as a prop strike, severe overheating, or a loss of oil, are easy calls. But owners should start regular oil analysis early, always check the used oil filters, monitor oil consumption, and check for blowby

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CONTINENTAL INVESTS IN NEW FACILITY IN MOBILE

International Holding Corporation has chosen the city of Mobile, AL, for the first step of a three-year global investment plan to expand its manufacturing, customer service, and engineering infrastructure. This first step will build a new manufacturing facility and corporate office located at the Mobile Aeroplex at Brookley and will replace the company's current 11 building footprint with a single, state-of-the-art facility designed for lean manufacturing and office systems. The new facility will be nearly 225,000 square feet with the majority being dedicated to advanced engine and parts manufacturing. The facility will be populated with new manufacturing equipment and include a special area designated for evaluation of new manufacturing techniques and processes, including additive manufacturing and automation.

"The current operation being spread throughout multiple buildings, drives many challenges and inefficiencies," said Michael Skolnik, executive vice president Global Operations. "Continental Motors has been a big part of the local Mobile community for over 50 years and is pleased with the community support that allows us to renew our commitment to the region and our great team members for many years to come. The "greenfield" facility will modernize our manufacturing processes into a world class, high productivity, vertically integrated center of manufacturing excellence in the new center of aviation in Mobile, AL," he said.

Building a new factory is only one part of the plan to transform Continental Motors and the way the company designs, manufactures, certifies, and supports products. CMG will build a new customer and technical service infrastructure and environment that will allow assisting customers through phone, email, and app support, regardless of their location in the world, 24/7/365. Furthermore, Continental Motors will increase its capacity to develop new products and expand China market access with a new engineering and design service center based in China.

"We are pleased to announce a renewed partnership with all to secure the company's future for another 100 years. Further, I am pleased to announce our commitment to our global team members and customers with a firm investment to modernize our facilities, products, and support." said Rhett Ross, president and CEO of Continental Motors Group Ltd.

Continental Motors will finish building design and equipment selection in 2017 and will move into its new North American facility in 2019.

▷ **ALL VALVES** are lapped and maintain specific locations. TIM KERN

△ **THIS IS** a Lycoming cylinder undergoing a leakdown test. Continental's facility rebuilds Lycoming engines. CONTINENTAL MOTORS

△ **SOPHISTICATED TITAN** sump. TIM KERN

or loss of compression. A change in temperature from normal, in normal operation, can also be a sign of immediate or impending trouble.

Engines arrive in Fairhope at all stages of life, from newer units whose propellers have encountered unexpected solid objects, to run-out (and beyond), to engines with low hours, but which have exceeded calendar time limit. (Continental recommends 12-year overhauls, regardless of total time.)

All rebuilds are fitted with new AN hardware (nuts, bolts, washers), as well as new fasteners in critical areas such as connecting rods and counterweight bolts. Bearings, rings — all new, as well. Yes, and new magnetos.

After valves and guides (new or re-used) are fitted up and valve seats are re-cut if necessary, every valve is lapped into its specific position. Then each is checked, typically at 80 psi, for leakage, using the classic soapy water method, effective for over 100 years.

Continental maintains a selection of rotable stock for long lead-time items like crankshafts. Cranks can be and often are reground within factory limits. "Often, since we are using better equipment and

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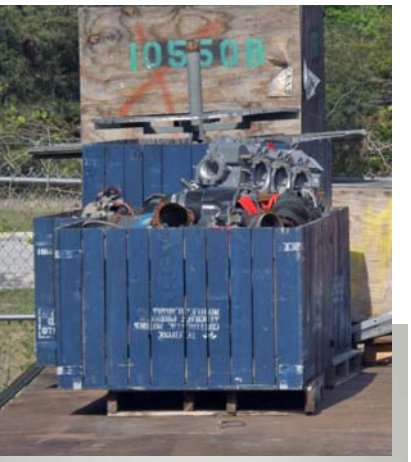

◁ **TITAN ENGINE** on test fixture.

▷ **SOME PARTS** can't be salvaged.

▽ **FINAL ASSEMBLY;** looks, performs like new.

PHOTOS BY TIM KERN

methods now, you're going to have a better crank than the one that came new with your engine 20 years ago," Campbell notes. Using rotables decreases build time, sometimes by weeks, since some items are processed only in batches.

Part of the big parent-company upgrade is a full test cell (dyno) for the Fairhope facility, to enable more efficient testing on both overhauls and new Titan engines. Today, overhauled or repaired engines get a one- to two-hour run (new Titan engines are run for three hours) on one of the two instrumented test stands, to ensure they meet all established performance parameters. After that test, which Campbell is strong to note isn't a full break-in, they drain the oil, open and inspect the oil filter, and prepare the engine, inside and out, for shipment.

All this attention and testing take a surprisingly short time. Depending somewhat on the season and particularly on the extent of repair and parts replacement necessary, turnaround — from receipt to shipping — is typically about three weeks, for the 500 or so engines that get overhauled or repaired in Fairhope every year.

TITAN ENGINES

Titan Engines serves the Experimental market, affording certified quality and process, plus near-limitless choice of configuration. Thousands of models are possible, varying compression, fuel systems and pumps, propeller controls, starters, injection or carburation, turbocharger(s), ignition options, inverted oil systems, oil filters and coolers, sump design, displacement and configuration, and many minor and cosmetic options, as well.

Sales manager at Titan, James "JB" Ball said that, in the case where the customer is building an airplane and building the perfect engine for it, "It's best to lock in the order and price five to six months before you'll need your engine. Titan engines are highly customized; the parts list is generated at the time of the order." Some customers have an exact configuration already in mind. Some have just a general idea. "The best part of my job is educating customers on the various advantages and disadvantages of each decision — prop, fuel system, ignition, even color — to match his engine to his future mission." With a current volume of about a hundred new engines a year, Ball smiled and estimated it will take "a lifetime" to build every possible model. ***AMT***

For more information visit continentalmotors.aero.

JETFLEX ELITE™ FROM SHERWIN-WILLIAMS PROVIDES 38 NEW AIRCRAFT INTERIOR COLORS

Extensive Cabin Coatings System Brings First Class Look throughout Aircrafts' Interior Settings

Featuring 38 new colors, new Jet Flex ELITE™ Polyurethane Enamel from Sherwin-Williams Aerospace Coatings now provides an extensive color palette for interior aircraft cabins.

Unique interior colors like Foggy Forest, Stormy Sea, Steamy Latte, Silvery Moon, Sunset Blush, Coastal Breeze, and even Golden Radiance, provide interior airline designers with a choice from the latest bright whites and neutral colors to warm hue effects -- all while still providing an interior aircraft surface with outstanding stain, high abrasion and scratch resistance.

Jet Flex ELITE is an OEM qualified paint system, ideal for commercial and private aircraft interiors. It provides improved appearance and application features, as well as options of either as a single-stage interior product (for colors), or a two-stage system (for whites and light colors).

Designed to offer subtle sophistication and mood enhancement to aircraft interiors, Jet Flex ELITE colors are responsive to LED lighting. These coatings create a subtle glow with highlights and colored shadows not seen with current interior cabin coatings. Color tones have been derived and inspired from Sherwin-Williams' most popular interior design and architectural color lines.

Using an interior cabin coating like Jet Flex ELITE is a cost effective way to improve the passenger experience in both the economy or premium class sections of the aircraft. It is recommended for interior applications and applies easily to plastic, metal and composite surfaces. Based off Boeing qualified technology (BMS 10-83), it meets the most stringent requirements for stain and abrasion resistance as well as the FAR / JAR 25.853 regulations for burn, smoke and heat release.

Sherwin-Williams Aerospace Coatings provide a variety of premier cabin coatings systems designed to provide a smooth, textured or soft feel finish. For information on the new Jet Flex ELITE colors or other interior or exterior Sherwin-Williams Aerospace Coatings, call 888-888-5593 or visit **swaerospace.com.**

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5 WAYS TO CONTROL COSTS WHEN MAINTAINING YOUR BIZ-JET'S ENGINES

ELLIOTT AVIATION

Selecting a suitable service center for your type of aircraft and engine can be one of the most important choices in understanding and controlling costs

By Mike Saathoff

Throughout the lifetime of an aircraft, the engine is commonly the most expensive part to maintain. Understanding the aircraft engine requirements can help you make informed decisions for your specific situation. Each step of properly maintaining turbine engines can have significant costs, and controlling these costs throughout the life of the engine can save hundreds of thousands of dollars. Focusing on the following areas will enable you to save money, time, effort, and energy throughout the process.

1. SELECTING A SERVICE CENTER

Selecting a suitable service center for your type of aircraft and engine can be one of the most important choices in understanding and controlling the costs. When evaluating a service center, consider the following:

- Choose a service center that has appropriately trained technicians on your engine model.
- Verify that the service center has technicians that have put their technical training into action in your particular installation. Oftentimes technical training is only part of the equation where experience can lead to higher efficiencies, lower downtime, and less chance for costly mistakes.
- All of the equipment required to meet your needs (including engine removal and reinstallation) needs to be located at the facility. This includes any required special equipment needed to complete all in-house engine and performance runs. If this is not the case, you may be paying part or all of an equipment rental fee.
- Ask about the relationship between the service center and the engine OEM. A good relationship with an engine vendor can be very important if a more serious engine issue is discovered, and that relationship can ultimately save time and money. In addition, the engine vendor may have a mobile team that can be used in a remote situation.


ELLIOTT AVIATION

- Understand how well-staffed the service center is by knowing the hours of operation and number of shifts that are worked. The number of technicians and hours of operation can be critical to saving downtime and are often overlooked.
- Request a copy of the selected facility's certifications and authorizations.
- A major service center has intimate knowledge of how engine programs work and has the right resources to help you understand how to maximize coverage of the program and avoid any unnecessary pitfalls or additional costs.

2. LINE MAINTENANCE

Engine line maintenance is defined as anything that can be completed at the appropriately rated service center level. These items include removal and installation of all external components and engine accessories, including hot section inspections. The majority of line maintenance is scheduled and listed in the aircraft manufacturer's inspection guide. It is much more cost effective to properly maintain aircraft engines so that issues can be discovered prior to causing substantial damage. The service center should also be reviewing the engine manufacturer's required inspection items. During line maintenance, engine parts will most likely need to be repaired or replaced. You can help control costs of those parts by understanding:

- Can the part be overhauled or repaired?
- Are there advantages to getting a part overhauled instead of repaired to control costs in the future?
- What is the warranty on a replaced part?
- What is the difference between repaired, overhauled, or new?
- If a part needs to be repaired, are there other items that can be taken care of during this repair to save time and money in the future?
- Have there been multiple quotes for a repair or replacement to get the best price?
- Is there a core charge and will there be bill backs for the core?

3. HEAVY MAINTENANCE

Heavy engine maintenance can be defined as the repair of internal engine components beyond the scope of normal line maintenance. It can be one of the largest expenses in your aircraft's operation, and understanding the costs by asking the right questions can make a big difference. Heavy maintenance is primarily engine overhaul (OVH) or core zone inspection (CZI). It can also include substantial engine disassembly and/or engine removal and reinstallation, engine service bulletin embodiment, engine repair from foreign object damage (FOD), major periodic inspection (MPI), or hot section inspection (HSI) that require engine removal. In order to save time and money, ask the following questions:

- How quickly can this work be completed?
- Can the engine work be combined with other items such as, an airframe inspection, paint and interior upgrades, or avionics upgrades?
- Is the engine vendor a manufacturer's authorized service center?
- What is the warranty for the engine work?
- Are any parts being used that may impact the warranty on the remainder of the engine?
- Have we received quotes from multiple vendors?

4. UNSCHEDULED MAINTENANCE

Unscheduled maintenance is any unplanned engine maintenance. Issues can occur in remote areas or airports that are not staffed with appropriately rated technicians. In these situations, the primary financial savings is time. Having a previously established relationship with a suitable service center can make all the difference, as they will

have the ability to quickly dispatch technicians. If needed, they can also involve the appropriate engine vendor to ensure your issue is taken care of in the most expeditiously and cost-effective way.

5. DOCUMENTATION OF MAINTENANCE

Documentation of engine maintenance is an extremely important facet to controlling costs. Make sure your service center has a quality control or inspection department to properly document any work that is being done. Make sure all of the following is happening throughout the process:

- The current engine times and cycles are documented to include hours since overhaul or CZI, cycles since overhaul or CZI, hours since hot section or MPI and cycles since hot section or MPI.
- During any heavy engine maintenance, the cycle sensitive item component cards should be updated and installed in the logbook.
- All engine service bulletin documentation should be updated.
- All Airworthiness Directives should be signed off as either completed or not applicable, and a signed AD log should be installed in the logbook (this simple step can save research time and money in the future).
- An optional but valuable step to consider is making a copy (electronic or paper) of all logbooks; ensure the copy is stored either electronically or paper copies in a safe place.

Improper documentation can be one of the most frustrating costs if not correctly completed, and the steps outlined above can amount to a substantial cost savings.

Understanding the requirements of your engines can make all the difference in controlling costs throughout the life of the engine. Get involved and ask the right questions to make sure you are getting what you pay for. The engine is one of the most important components on your aircraft and if taken care of correctly at the right price, you know you are doing the right thing for you and your company. ***AMT***

MIKE SAATHOFF has over 20 years of experience in corporate aircraft maintenance. He has held several service technician and Quality Control positions with Elliott Aviation and currently serves as the director of sales operations & engine and accessory sales. He has an Airframe and Powerplant and Inspection Authorization license with the FAA.

TAKING THE LEAP: CFM'S SUCCESSOR TO THE FABULOUS 56

THE LEAP-1B powers the 737 MAX. CFM INTERNATIONAL

The essential elements of a jet engine are materials, aerodynamics, architecture, and experience. LEAP represents a step forward in each area.

By Jerome Greer Chandler

CFM's new LEAP powerplant is no mere tweak of the ubiquitous CFM56. Nor is it a bridge too far. It is very much an evolutionary engine, but one with a revolutionary tang to it.

"Basically there are just a few building blocks of a gas turbine engine," says Bill Dwyer, services marketing manager for GE Aviation (CFM International was formed as a joint company between GE and Safran Aircraft Engines). The essential elements of a jet engine are materials, aerodynamics, architecture, and experience.

Dwyer says LEAP represents a step forward in each of those areas: composite fan blades, composite case, and ceramic matrix composites in the high-pressure turbine shroud — as well as a high-pressure hot section compressor that produces an impressive 22:1 compression ratio (a reduction in the volume of air 22 times as it passes through the compressor). This critical ratio is twice that of the CFM56 family's.

PARING DOWN PARTICULATES

There's a downside to advanced blade aerodynamics. The power-producing airfoils are more susceptible to wear. This susceptibility is felt most keenly in places such as China, India, and the Middle East, where Dwyer says, "there's a high concentration of airborne particulates." CFM's answer to the problem was to fit LEAP with a debris rejection

system. The aim is to keep sand, salt, gravel airborne effluent, and the like from migrating to the engine's core where they can wreak havoc with parts and erode fuel economy.

Here's how the debris rejection system works. During takeoff, an inherently high-thrust affair — especially at hot and high airports — variable bleed valves are opened. The idea is to direct debris around the engine, rather than through it. During lower-thrust flight regimen the doors are closed. This begets better fuel economy. The result, says CFM, "is an infinitely more durable engine."

Time-on-wing and fuel economy are two of LEAP's largest selling points. CFM says current production CFM56s have a 20,000-cycle life-limit on the core, and a 25,000-cycle limit on the low-pressure system. The CFM56 and LEAP share the same core life cycle limit, but the newer powerplant possesses a 30,000-cycle life-limit on the low-pressure system.

In written response to *Aircraft Maintenance Technology*, CFM says, "The commitment to customers was that LEAP maintenance costs would be comparable to that of the CFM56 … At the end of the day, we expect total engine life-cycle costs to be comparable to what customers have experienced with the CFM56 family" — this despite the introduction of some cutting-edge materials and blade aerodynamics.

Longevity and durability are hard-won when it comes to gas turbine engines. "Historically, [they] always used rich quench lean combustion," says Dwyer. "It's easier to do. It's lighter weight." It's also the source of hot streaks. He says the durability-robbing spots are concentrated on the static parts of the turbine. "That's' where parts wear out." It's also where LEAP's new TAPS II twin-annular, premixing swirler comes into play. Think of it as a nozzle on a dual mission: to lower maintenance costs and cut greenhouse gas emissions at the same time.

Fuel and air are premixed before they enter the combustion chamber for ignition. CFM says TAPS II produces "a more benign temperature profile." "Lean burn combustion lowers the difference between the average and the peak [temperatures]," says Dwyer. "It's a huge part of our design formula."

If TAPS II is revolutionary, so is the way the nozzle is fabricated. It's formed by additive manufacturing. CFM contends the fast-growing technique enables the engine-maker to produce parts "not possible with

THE LEAP-1A powers the A320neo family.
CFM INTERNATIONAL

conventional equipment. The use of the technique enables engineers to design the part the way it *needs* (author's emphasis) to be, rather than to accommodate traditional subtractive manufacturing [methods]."

LEAP's vaunted 15 percent fuel burn savings emanates from two areas of the engine: Half comes from the high-pressure compressor, the other half from the fan.

FANTASTIC FAN

Based on what the company calls "fourth-generation aerodynamic design," LEAP features single-piece composite fan blades and fan case.

CFM parent company Safran has been working on a way to fashion new fan blade resin for more than a quarter of a century. CFM doesn't detail just how the blades are manufactured. It does say the proprietary process entails weaving the carbon fiber on a three-dimensional loom, injecting resin and then baking the assembly in an autoclave. The final touch is application of a titanium leading edge.

There's an old axiom in engineering that the fewer pieces a structure possesses the easier it is to maintain. LEAP's composite fan has a mere 18 wide-chord blades. That's half the number of the CFM56-5B and 25 percent fewer than the CFM56-7B.

What airlines and aircraft leasing companies alike revel in the most, however, is this: LEAP burns 15 percent less fuel than its predecessor powerplant. Half of the 15 percent efficiency gain comes from propulsive efficiency — better aerodynamics. The fan is part 'n parcel of that. But there are also aerodynamic improvements in the core.

The other half comes from thermal efficiency — operating at higher temperatures and pressure ratios. Although the LEAP engine does burn hotter than the CFM56, it is still below the GE90 and GEnx. The twist is that CFM has maintained the durability of the CFM56 family. The blades in the LEAP high-pressure turbine are made of the same material as those of the CFM56, but CFM has incorporated improved cooling technology and aerodynamics to maintain durability. Look at the temperature profile of a LEAP blade and a CFM56 blade. You can't tell the difference, which means it is more durable. That is another reason why the OEM contends maintenance costs will be on par with the current engine family.

It's not as if massive, high-bypass ratio, other-than-metal fans are a new invention. Through its parent companies, GE and Safran, CFM has a world, quite literally, of experience with big, lighter-weight fan blades fabricated from carbon fiber composites.

Consider, the GE90 has been flying since the middle of the last decade of the century, 1995 to be precise. The engine has tallied in excess of 60 million flight hours. As of this writing, there have been zero ADs (Airworthiness Directives) covering the GE90's composite fan blades, and a mere handful have been removed from service. The engine-maker asserts, "This is the kind of record we expect the LEAP engine to achieve."

MRO AND LEAP

As of this writing, CFM says it's booked orders for some 12,000 LEAP powerplants. The LEAP-1A was introduced into commercial service on the Airbus A320neo in August 2016. LEAP-1B is slated to see service powering Boeing's 737 MAXes this year. LEAP-1C should fly beneath the fledgling wings of the new COMAC C919 in 2019 or thereabouts.

Although just a handful of airlines are actually operating Airbus neos so far, dispatch rates and other operational indices are impressive. Nine months into line flying, CFM said LEAP was flying 98 percent of available days. Some carriers are logging 11 flights per day and wringing out 25-minute gate turns.

When the first LEAP comes off wing for overhaul, indications are there will be enough options to accommodate the demand. Currently a trio of shops is certified to pull LEAP overhauls: Lafayette, IN; Brussels, Belgium; and San Quentin, France. All three are internal GE or Safran facilities. Third-party MRO shops have yet to be announced. "We are years away from the first LEAP overhaul," says CFM. These third-party announcements "will be made at some point in the future."

Meanwhile, new LEAPs continue to flow from a key domestic facility: GE's Lafayette, IN, plant. Some 500 hot section modules — consisting of compressor, combustor, and high-pressure turbine — are being manufactured at GE's U.S. facility. **AMT**

JEROME GREER CHANDLER is a two-time winner in the Aerospace Journalist of the Year competition's Best Maintenance Submission category; he won in 2000 and 2008. His best-seller 'Fire and Rain' chronicles the wind shear crash of Delta Flight 191 at DFW. Chandler's passion for aviation safety is more than professional. It's personal. Two of his relatives have perished on commercial airliners, one of them in the infamous Braniff Electra crash of 1959.

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- Air Cargo: FedEx, UPS, Empire Airlines, Integrated Airline Services
- Easy access to I-20, I-49 & I-220
- Enterprise Zone
- Southern University A&P School
- TWO RUNWAYS:
  14/32 - 8351 feet long, ILS CAT I, II
  6/24 - 6,202 feet long

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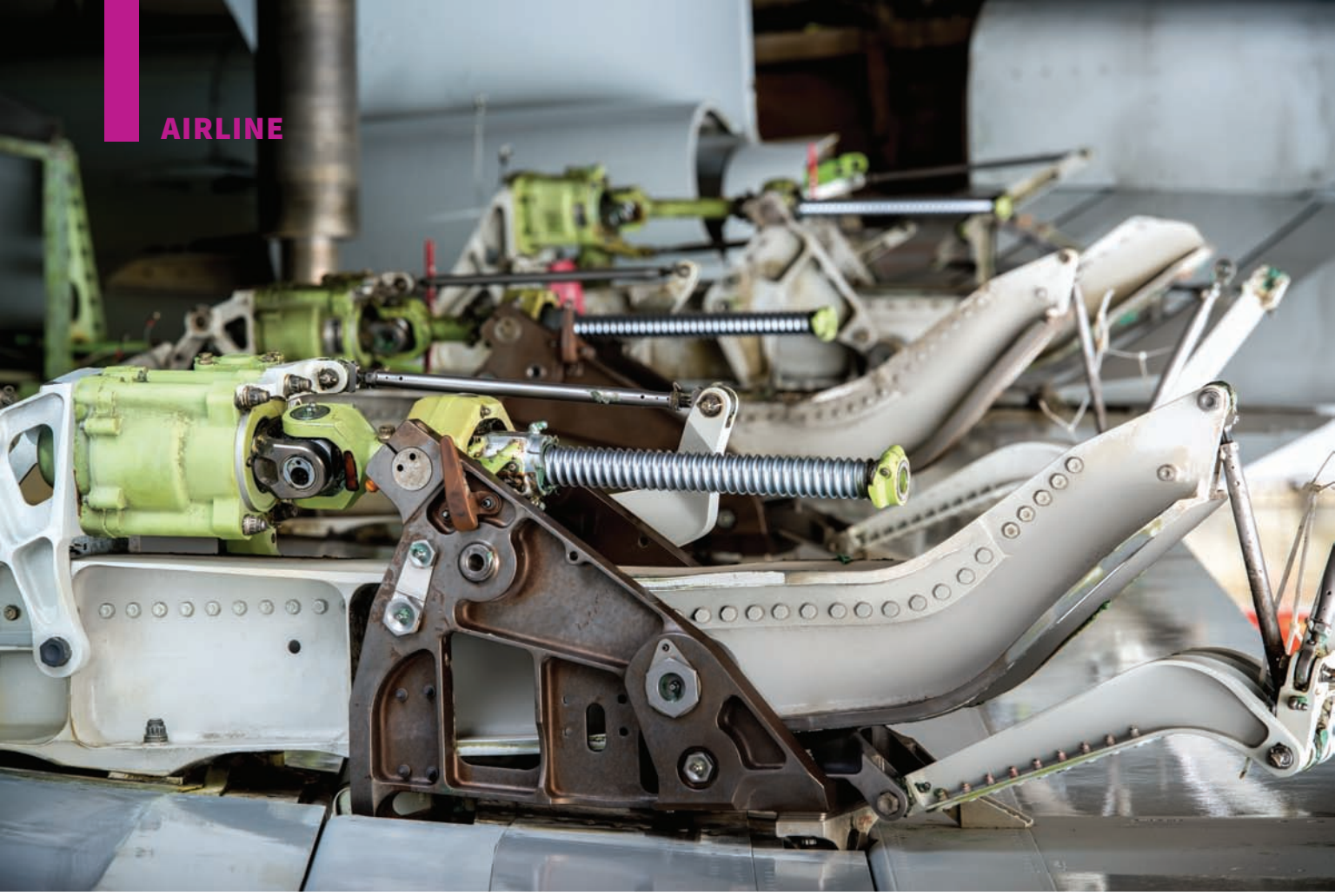


HOW TO MAXIMIZE MAINTENANCE EFFICIENCY **THROUGH PROPER GREASE SELECTION**

A multipurpose grease can deliver outstanding protection against wear and rust and extend the life of bearings and components

By Gary Dudley

Greases play a vital role in aviation applications. They protect critical components, such as wheel bearings, landing gear bearings, slides and joints from corrosion, extreme temperatures, heavy loads, rain, and rust.

Strict aviation regulations and mandatory OEM approvals help segment grease types by specification and ensure that operators use only greases that are specifically approved for their intended aircraft applications.

However, having common specification approvals does not mean that all greases perform similarly. In fact, typically, they do not. Since greases can have different formulations, it's no surprise that they do not perform exactly the same.

That's why choosing the right greases and having the right lubricant partner is a great way for airline operators to help maximize the efficiency and effectiveness of their maintenance programs.

IMAGES COURTESY OF EXXONMOBIL

SO WHAT IS THE RIGHT APPROACH TO GREASE SELECTION AND USE?

For many operators around the world, a successful grease lubrication approach usually includes the use of a few select greases that deliver proven value and effectiveness to the user.

A common scenario is for an airline operator to use a high-performance, multipurpose grease like Mobilgrease 33, which has a long shelf life, along with a specific application grease like Mobil Aviation Grease SHC 100, in their wheel bearings, due to its bearing rejection rate statistics.

HUNDREDS OF airframe components need routine lubrication to perform efficiently. Multipurpose greases can help airline operators simplify inventory management and reduce the amount of greases they need to have.

A multipurpose grease is extremely valuable to airlines for several reasons. Even under extreme temperature conditions, as high as 121 C and as low as -73 C, it can deliver outstanding protection against wear and rust and extend the life of bearings and components.

Its proven performance is also documented by its approvals across a wide range of industry and OEM specifications, such as USAF-MIL-PRF-23827, Boeing — BMS 3-33B and Airbus — AIMS 09-06-002, to name a few.

This means that a multipurpose grease can help airline operators consolidate their grease inventories, reduce complexity, and minimize the chance of misapplication.

WHAT IF I WANT TO SWITCH AND UPGRADE TO A DIFFERENT GREASE?

Making sure they have the right grease(s) to optimize aircraft performance is a primary concern of any maintenance team.

USING HIGH-QUALITY greases can help airline operators maximize the efficiency and effectiveness of their maintenance programs.

To that end, there are several common reasons why operators would choose to perform a grease conversion.

It could be that they are dissatisfied with the performance of their current greases and are seeking a change, or they want to streamline inventory management and use fewer types of grease throughout an aircraft and aircraft fleet.

Or, it could be that the airframe or component OEM has changed its recommended greases for some applications.

The lubricant supplier can help guide operators through the key factors that should be considered when selecting grease, including lubrication requirements, age of equipment, environmental factors and conditions, preferred methods of grease applications, and re-greasing intervals.

Grease conversion procedures are well defined by airframe and component OEMs and consist of full purging of all previous grease, sometimes with reduced intervals for the next greasing. During the purging process, the new, replacement grease is used to remove the old grease.

When re-greasing the dispensing pump, the old grease should be wiped off the external parts and the pump should be cycled until the new grease is dispensed from the delivery line.

By following the tips above, operators can help ensure that they are using the right greases and have the right lubrication partner to help maximize the effectiveness of their maintenance programs. **AMT**

MOBIL AVIATION Grease SHC 100 provides protection for operating temperatures up to 177 C, making it an ideal grease for aircraft wheel bearings.

Gary Dudley is global grease product technical advisor for ExxonMobil Research and Engineering. For more information visit www.exxonmobilaviation.com.

THAILAND 4.0: INVESTING IN AVIATION AND MRO DEVELOPMENT

The private sector will be allowed to join investment in the airports via the public-private partnership (PPP) program, while foreign companies will be eligible to handle airport management and hold a share more than 51 percent in the MRO centers

By Marino Boric

2017 IS GOING TO BE AN IMPORTANT YEAR for Thailand's future. The Thailand 4.0 governmental investment program is likely to change the country and catapult it in a new, advanced era. Thailand is heavily investing in infrastructural projects, manpower, and knowledge. The 4.0 program is promising hundreds of miles of new roads, railways, airports, logistic parks, and, yes, even new cities. So what is 4.0 all about? *AMT* was in Thailand and International Correspondent Marino Boric witnessed the actual

THE FORMER military airport AT U-Tapao served the U.S. Army as B-52 base. Those structures (huge hangars, long runway) are the ideal base for an MRO hub offering the possibility for further enlargement.

BELOW: AMT International correspondent Marino Boric visited the U-Tapao airport in mid February as it was first presented to the international press after the Thailand 4.0 event.

MARINO BORIC

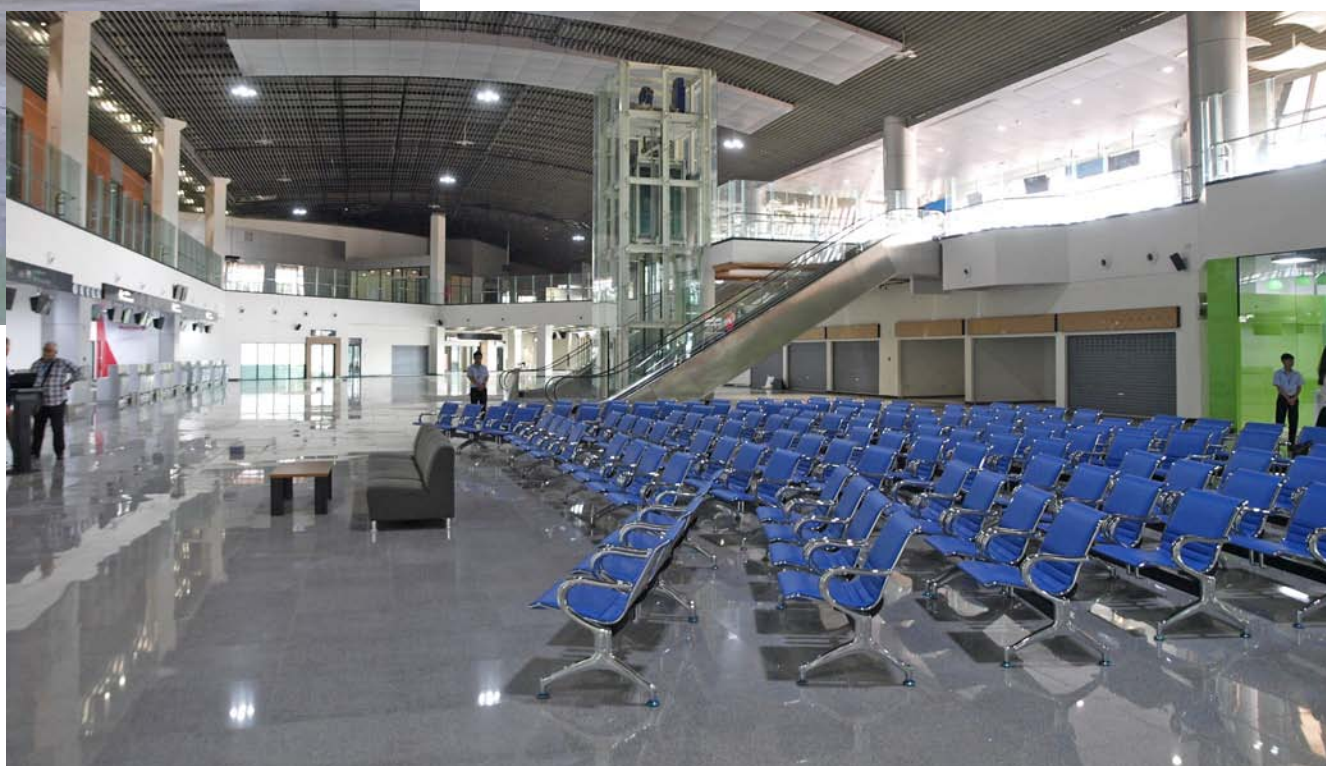
situation in Thailand visiting many aviation MRO centers and manufacturers.

Thailand's Board of Investment (BOI) kicked off the year 2017 with a mega seminar "Opportunity Thailand 2017" in Bangkok welcoming close to 3,000 investors where it promoted investment opportunities in Thailand and shared with the global community the "Thailand 4.0" model driven by the value-based economy. At the seminar on Feb. 15, 2017, Prime Minister Prayut Chan-o-cha and BOI provided investors with information about Thailand's latest investment incentives.

According to the Thailand 4.0 model, 10 new target industries were identified as the "New Engines of Growth" which likely will transform the country into a regional innovation hub by use of advanced technology, R&D, and human resource development. Some of the new engines of growth industries were included in breakout sessions on new S-curve industries, including aerospace, automation and robotics, and medical devices, with key speakers in each respective sector. The aerospace sector was highlighted with the presentation of the following companies which are already present in Thailand: TurbineAero Inc., Rolls-Royce, Senior Aerospace, and C.S.S.

According to Mrs. Hirunya, Thailand performed very well in terms of investment in 2016; the total investment value by the end of 2016 was 584 billion baht, an increase of 196 percent compared to 2015.

The foreign direct investments (FDI) also expanded, with the investment value of 301 billion baht and the top five countries



were Japan, Singapore, China, Hong Kong, and Netherlands. Although the U.S. wasn't ranked in the top five, it is continuously investing as Thailand is considered a distribution center in the region.

WHY THAILAND 4.0?

Thailand's government is promoting "Thailand 4.0" as a new economic model aimed to pull Thailand out of the middle-income trap in which it has been for over a decade. In the beginning of Thailand 3.0 stage, the Thai economy had enjoyed a robust growth which in recent years, has slowed down to 3 and 4 percent only. Thailand's growth slowed after having reached the middle-income levels. In other words, Thailand is moving on from a country with abundant, cheap, unskilled labor to an innovative high-income country based on "value-based economy."

WHAT WAS BEFORE 4.0?

Thailand has continuously been improving its economic model, starting from "Thailand 1.0," which focused on the agricultural sector, to light industries with "Thailand 2.0," where the country utilized cheap labor costs with a focus on domestic productions, through to "Thailand 3.0," which is focused on more complex industries attracting foreign investments making Thailand a production hub for exports. However, under Thailand 3.0, the country has faced the middle-income trap, growing disparities, and imbalanced development, major concerns which prompted the government to transform Thailand's economic structure to "Thailand 4.0."

The Thailand 4.0 development plan is focused on 10 targeted industries, which can be divided into two segments: development of existing industrial sectors and efficient agriculture and biotechnology.

Development of existing industrial sectors should be achieved by adding value through advanced technologies for five industries (Next-Generation Automotive; Smart Electronics; High-Income Tourism, and Medical Tourism. Efficient Agriculture can be achieved by use of biotechnology and food innovation).

THAILAND OUTLINES AVIATION ASPIRATIONS

The Thailand's Cabinet recently approved an ambitious 15-year aviation development plan of the Ministry of Transport, which is part of a wider agenda to pursue the Thailand 4.0 plan. In February 2017, the Cabinet endorsed an Aviation Industry Development Plan; Thailand's Ministry of Transport has set the framework and is offering relevant incentives to grow aircraft maintenance facilities and expand the aircraft parts manufacturing industry including the development of human resources in a plan that goes till 2032.

Thailand is competing — in this field — with Singapore, which is an important center for aircraft maintenance and is also the organizer of the region's major air show for commercial and military aircraft — a sales platform for the region's spare parts industry serving ASEAN aviation.

Thailand's Ministry hopes to achieve an ambitious target of establishing an "Aeropolis" to handle the maintenance of regional aircraft and upgrade the country aviation's industry to Tier 2 (Design & Build) as well as improve human resource skills in the sector.

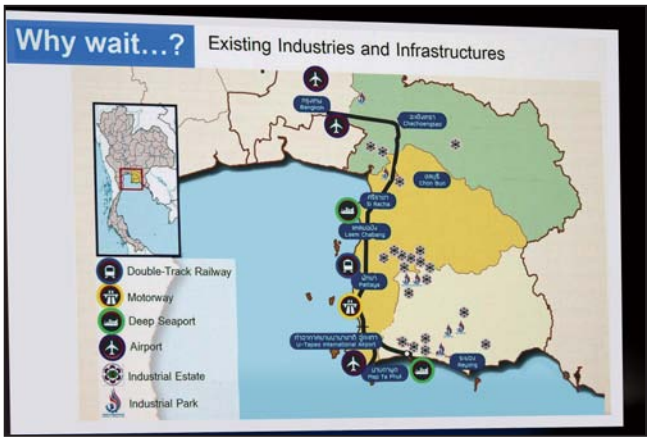
The Ministry officials say that this incentive could create a THB 10 billion industry and jobs for 7,500, additionally reducing the cost of the annual maintenance for local airlines by THB 6.5 billion over 30 years, Currently, in Thailand 28 factories manufacture spare parts for aircraft and by 2020 this number could rise to over 40. Aviation is one of the 10 targeted industries the government wants to improve.

THAILAND'S INFRASTRUCTURE INVESTMENTS

Development of the infrastructure is among others, a key element in the Thailand 4.0 aspirations that will create urban centers with strong skill sets and lucrative industries. Here officials speak of megalopolis and smart cities — all things to be created. To connect those new living areas with the production sites (already built, in construction now, and planned ones) a new and efficient infrastructure is needed. Amata group and Hemaraj (WHA Group) are present in Thailand and in the ASEAN region building logistics parks and industrial estates. Under the incentive 4.0, Thailand plans many infrastructural projects which will connect the present and future towns and industrial sites with new motorways, double track rails, high-speed trains, airports, and seaports (see map). This all should lead to "smart industry, smart city, and smart people."

THAILAND'S NATIONWIDE AIRPORTS UPGRADE WITH HELP OF PPP PROGRAM

Thailand's government approved on Feb. 6 an aviation reform plan that aims to enhance Thailand's status as the region's aviation hub and establish a center for aircraft maintenance, repair, and overhaul (MRO). Under the reform plan, approved by the mini-cabinet chaired by Prime Minister Prayut Chan-o-cha, the private sector will be allowed to invest in the airports via the public-private partnership (PPP) program, while foreign companies will be eligible to handle airport management and hold a share of more than 51 percent in the MRO centers. The public-private partnership program will be allowed for the following 11 city airports: Phrae, Mae Hong Son, Mae Sariang in Mae Hong Son, Tak, Phetchabun, Hua Hin, Nakhon Ratchasima, Pattani, Betong, Chumphon, and U-Tapao.



The 10-year airport development will cover not only the upgrade of the three main international airports but also 36 provincial airports. This action targets the improvement of the country's aviation industry and to make Thailand a key regional aviation hub. This was decided by the mini-cabinet which is the government's strategic national administration committee, chaired by Prime Minister Prayut Chan-o-cha. Under this plan, a total of 39 Thailand airports will be improved to handle an expected 277 million passengers annually within the next 10 years.

Over the next 10 years, Don Mueang airport will handle 40 million passengers, up from 30 million now, with the annual passenger capacity at Suvarnabhumi airport raised to 90 million from 45 million and U-Tapao to 30 million from 3 million passengers. Suvarnabhumi airport expects annual passenger capacity to rise to 45 million by 2025.

AMT AIRCRAFT MAINTENANCE TECHNOLOGY

EDUCATION, TRAINING AND CAREER DEVELOPMENT

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

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

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

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THAI AND AIRBUS SIGN MOU TO EVALUATE NEW MAINTENANCE FACILITY AT U-TAPAO INTERNATIONAL AIRPORT

On March 8, in almost perfect timing and in-line with the above described activities, the news reached us that Airbus Group is considering investing in an aircraft maintenance center in Thailand.

Airbus representatives signed a memorandum of understanding to conduct a feasibility study with Thai International Airways on opening a regional hub for aircraft repair, maintenance, and overhaul at U-Tapao International Airport in province Chon Buri in the south of Thailand.

The new MRO would be one of the most modern and extensive in the Asia-Pacific region. It might become a hub within the ASEAN region offering line and heavy maintenance services for a wide range of aircraft types. A new complex would feature the latest digital technologies to analyze aircraft maintenance data, as well as advanced inspection techniques, including the use of drones to monitor aircraft airframes. Today 40 percent of the aircraft manufactured by Airbus are imported to Asia. Airbus President Fabrice Bregier said that this project will help meet the strong demands of maintenance in the growing Asia-Pacific region, with air fleets in the region tripling to over 15,000 aircraft over the next 20 years.

This project is a part of the Eastern Economic Corridor (EEC) development plan 2017-2021. This will drive Thailand to become the most modern MRO center in the Asia-Pacific, equipped with the best innovation and technology that adheres to international standards, and supports other aviation business industries, bringing the country closer toward Thailand 4.0 as the future gateway to Asia. ***AMT***

MARINO BORIC graduated with a university degree as an aeronautic engineer, and acquired degrees in business development/trade and commerce and in journalism. He is a civil and military pilot and has built experimental aircraft. As a journalist, he specializes in aviation and propulsion and travels worldwide, flight-testing UL, LSA, Experimental, and certified aircraft. He is writing for U.S., European, and Chinese media companies.

MIND THE GAP: INNOVATIONS IN TALENT ACQUISITION

ExpressJet and the Talent Solutions Coalition (TSC) are working together to access the workforce needed for the aviation industry with guidance from numerous national industry leaders and experts in best practices for talent pipeline management

By Tim Welsh

TALENT SOLUTIONS
Coalition is retained by employers to help them develop talent supply chains to provide technical, supervisory, managerial, and leadership talent.
EXPRESSJET

Ask talent acquisition leaders in America's $70 billion aviation maintenance and manufacturing industry what has their attention nowadays, you're likely to get two short, and very cryptic, answers: "talent shortage" and "skills gap."

Let's take them in turn. First, the shortage: In commercial aviation, a 2016 report by the Boeing Company estimates a global need for 617,000 pilots, 679,000 airline maintenance technicians and 814,000 new cabin crew over the next 20 years. Subsequently, over the same period in the U.S., 112,000 pilots, 118,000 airline maintenance technicians, and 169,000 cabin crew will be needed. Comparable forecasts in business aviation paint a similar picture.

As for skills, the increasing complexity of the newest generation of aircraft has exposed a gap between the skills aviation personnel are generally taught and the skills employers now need in their workforce. "I hold an A&P license," said an airline maintenance executive, "and I know that the training I received to get that license would not prepare people to perform today's aviation maintenance technician roles." This skills gap appears to beg three questions for the aviation industry: Who will make its planes? Who will fly them? Who will maintain them?

For its part, Atlanta-based ExpressJet Airlines sees opportunity in these challenges. ExpressJet, employs about 6,200 people of which just under 25 percent are maintenance personnel. The company operates 10 maintenance bases to support its fleet of more than 270 aircraft serving over 170 airports.

ExpressJet's fleet offers some clues about the company's talent acquisition requirements. Ever mindful of its competitive environment, ExpressJet operates modern regional jets built using advanced manufacturing methods and equipped with state-of-the-art computerized avionics.

The link between ExpressJet's business plan and its talent acquisition objectives is clear. Competitive advantage accrues to airlines able to exploit technology to reduce maintenance costs while increasing capacity utilization.

Maintaining a close connection between its business objectives and the quality of its workforce is motivating ExpressJet to explore new avenues for acquiring its talent. Notable in ExpressJet's approach is how the company translates the vitality and can-do attitude of its employees into benefits for its customers. An introductory video on the company's website (www.expressjet.com) neatly makes the business case for maintaining a workforce that "… takes ownership in everything (it does), driven by a belief in getting the job done right because anything else is unacceptable."

ExpressJet's talent acquisition strategy is also shaped by the company's view of its position in the industry. The company sees itself both as a consumer and supplier in the aviation industry talent supply chain, a realistic recognition that regional carriers provide a pipeline of talent for mainline carriers.

It's also a crucially important business reality to acknowledge in a talent market where absolute numbers of job candidates may be declining. There's a widespread view that when it comes to acquiring talent, if employers cannot get enough of what they need, they must get the best of what's available.

MEETING A NATIONWIDE NEED FOR TALENT WITH A NATIONAL TALENT SUPPLY CHAIN

With its international service footprint (ExpressJet serves North America and the Caribbean), and facing industry talent shortage and skills gaps, ExpressJet

sought a national partner to help it to source talent nationally and increase its pool of qualified talent providers.

In late 2016, ExpressJet approached the Talent Solutions Coalition (TSC) for assistance. Headquartered at the National Center for Aviation Training in Wichita, KS, TSC (talentsolutionscoalition.org) functions as a national talent supply chain for the aviation industry. TSC was designed

with guidance from numerous national industry leaders and experts in best practices for talent pipeline management.

TSC's supply chain members are educational institutions and certification organizations which provide industry-recognized training, education, and customized professional assessments and certifications. The opportunity to increase the number of employers they serve, create new professional development opportunities for their faculty, and improve their institutional expertise in partnering with industry are among several of the factors motivating educational institutions to join the coalition.

TSC's customers are industry associations and individual aviation employers. And, especially important for ExpressJet's purposes, TSC's capabilities are not limited to technical personnel. It is retained by employers to help them develop talent supply chains to provide technical, supervisory, managerial, and leadership talent.

BUILDING A NATIONAL TALENT SUPPLY CHAIN

ExpressJet and the Talent Solutions Coalition are now engaged in their first project to develop a supply chain which produces Advanced Aviation Maintenance

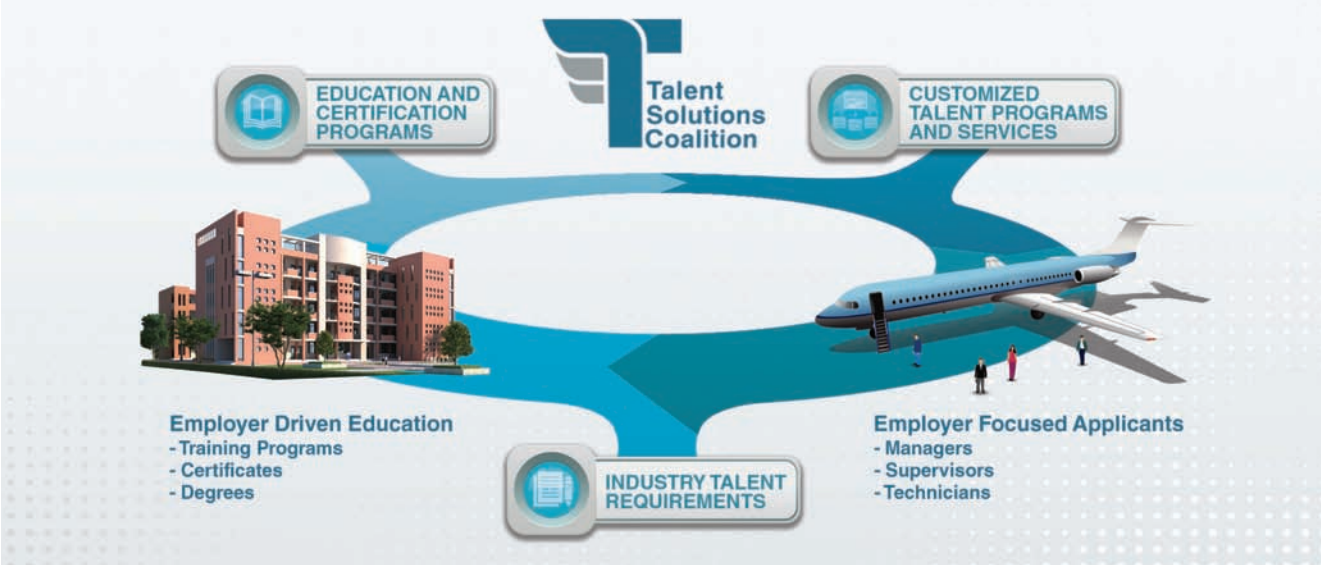

EXPRESSJET

The blueprint at the heart of the talent solution is a competency-based job-task analysis (JTA) jointly developed by TSC and ExpressJet. The JTA details ExpressJet's priorities and requirements in three areas: **workplace behaviors, advanced technical skills, and regulatory knowledge.**

Technicians (AMTs) for the company. The first phase of the project is focusing on TechOps, with plans to expand to other functional areas in the future.

Operationally, the project relies on TSC's group of educational institutions and certification providers located across the country. Together these organizations are coordinating as an integrated supply chain to create an ExpressJet talent solution. The blueprint at the heart of the talent solution is a competency-based job-task analysis (JTA) jointly developed by TSC and ExpressJet. The JTA details ExpressJet's priorities and requirements in three areas: workplace behaviors, advanced technical skills, and regulatory knowledge.

Importantly, this talent solution blueprint complements — does not replace — existing training content and programs



at these institutions. Participating educators, in fact, are using the ExpressJet talent solution as an opportunity to develop new modularized content to enhance existing offerings.

In supply chain terms, TSC functions akin to a manufacturer's representative. The participating educational institutions serve as 'talent factories,' and are asked to deliver education and training programs aligned to the company-specific AMT job-task blueprint.

No single program design is mandated, in fact the goal is to encourage participating educational institutions to play to their strengths. "We don't tell our talent supply chain partners how to teach," said an ExpressJet executive. "We impart what we need to be taught in order for their students to become successful employees at our company."

ExpressJet also requested TSC's help in creating a company-specific Advanced AMT Assessment, with two goals in mind. First, the certification helps the educational institutions participating in this talent solution to stay aligned to the company's current and future JTA requirements. Second, it helps ExpressJet reduce its talent acquisition costs by streamlining the recruiting process.

Another distinctive aspect of the ExpressJet-TSC talent solution is the high level of engagement by ExpressJet itself. Senior executives in Maintenance and Human Resources are lending their full support and front-line talent acquisition and maintenance training personnel are deeply involved.

Aware that not all aviation schools may have the resources needed to teach the skills ExpressJet requires in its 21st century workforce, the company is taking steps to support training in computerized avionics and related areas where possible. The company is also making its experienced personnel available to serve as guest faculty where feasible.

Increased employer engagement with educational institutions has long been a goal of workforce development leaders across the industry. ExpressJet's engagement with TSC in this 'all boats rise' approach may well guarantee ExpressJet national recognition as a leader in talent acquisition for the aviation industry.

Clearly, sustained engagement by employers in the design and delivery of talent solutions can help to both develop a higher quality workforce and drive innovations in aviation education and training. **AMT**

TIM WELSH is Executive Director, Talent Solutions Coalition, TalentSolutionsCoalition.org.
Contributors: Sandra Fearon, General Manager — Talent Acquisition and Recruiting, ExpressJet Airlines; and Michael McDaniel, General Manager — Maintenance Training, ExpressJet Airlines

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2017 AVIATION TECHNICIAN EDUCATION COUNCIL CONFERENCE

With the theme of "Building Career Pathways" this year's ATEC conference in Seattle, WA, saw record attendance by academic and industry attendees

IF YOU DIDN'T GET A CHANCE TO ATTEND THE AVIATION Technician Education Council (ATEC) conference this year in Seattle, WA, you missed one of the best and most professional conferences this year.

Huge thanks goes to The Boeing Company for being the host and active participant in this year's conference. Peter Boeskov, director, Simulator Services and Maintenance Training at The Boeing Company, provided the key note opening address, and throughout the three-day event others from Boeing's maintenance training group were panelists providing valuable insight into maintenance training. On the last day of the conference attendees enjoyed visiting multiple Boeing facilities.

PETER BOESKOV with The Boeing Company provided ATEC conference attendees with the opening key note address.

To help address the talent needs of industry, ATEC is focusing on facilitating relationships between educators and employers. This year's conference incorporated an inaugural "Employer Expo" attended by nine companies: Aircraft Technologies Group; Aviation Technical Services; Columbia Helicopters; Delta Air Lines Inc.; Endeavor Air; HAECO Americas; Panasonic Avionics Corporation; SkyWest Airlines; and United Airlines. Each company had a chance to address the group and explain what their company does and what types of employees and skill sets they are hiring. Understanding this valuable information was well received by the 177 educators in attendance.

"ATEC leadership worked really hard this year to drive home the theme, career pipeline development," explained Ryan Goertzen, current ATEC president. "We had incredible industry attendance, a reflection of the growing need for AMTs."

In response to ATEC's growth and the increased need for industry engagement, during the spring board of directors meeting, the ATEC board voted to change the number of industry member directorships from three to five to include additional representatives of general and business aviation companies, airlines, manufacturers, and repair stations. ATEC will begin actively seeking new industry board members.

But this year's conference wasn't all about industry attendees. The mission of ATEC is to support the Part 147 schools in this country. William Russo, Aviation Maintenance Program Director, University of the District of Columbia Community College (UDC-CC), traveled from Washington, D.C., to Washington State.

Russo commented, "We are a relatively small program, so we don't often get to interact with industry professionals from manufacturers, airlines, MROs, tooling and equipment suppliers, textbook and educational support companies, and recruiters. The ATEC conference puts all of these folks in one room, so it serves as a great opportunity to make the kinds of industry contacts that can help us to ensure that we are aware of the current state of regulatory and legislative issues relevant to Part 147, new developments in training and educational technologies and tooling that could enhance our curriculum, the ever-changing needs and desires of prospective employers, and the various ways that other Part 147 schools deal with some of the operational issues that all of us face on a daily basis."

PHILLIP (KEVIN) GULLIVER, Northrup Rice Foundation; Collin McDonald, student of the year; Andrew Smith, instructor of the year; and Ryan Goertzen, ATEC president.

FAA AND INTERNATIONAL PARTICIPATION

ATEC is appreciative to have a close working relationship with the FAA. ATEC board members regularly meet with FAA in Washington, D.C., to discuss Part 147 rulemaking activities and other issues brought forward by ATEC members.

Participation from the FAA in this year's annual conference included Kevin Morgan, manager, General Aviation branch; Murray D. Huling, deputy assistant manager, Aircraft Maintenance Division; Robert Warren, aviation safety inspector; and Susan Parson, special assistant, Flight Standards Service and editor, *Safety Briefing* Magazine. All the FAA representatives spoke on a variety of topics throughout the conference.

Dr. Yuanyang Gao, director, General Aviation Industry Research Center at Beihang University in China, and deputy secretary with AOPA China, provided attendees with an overview of general avia-

TOP: RYAN GOERTZEN, ATEC president; Susan Parson, FAA; Murray Huling, FAA; Robert Warren, FAA; Kevin Morgan, FAA; and Crystal Maguire, ATEC Executive Director.

DR. YUANYANG GAO, Beihang University and Kai Dwell, Cogent International Aviation Consulting, provide the ATEC conference attendees with an update on general aviation in China.

tion activities and the need for pilots and technicians in China. One interesting statistic given was there are 5,504 pilots in China vs. 584,361 in the U.S. The growth has been almost 11 percent in the last five years. There are currently only six universities, 56 aviation training facilities, and 16 other types of training schools to provide Chinese Civil Aviation education. Many Chinese schools are looking for partners in the U.S. to help with their shortage of pilots and technicians.

IN CONCLUSION

Goertzen concluded by saying, "ATEC looks forward to continuing the momentum and acting as a catalyst for employer-educator partnerships, which will be so important to fulfill future workforce needs."

I think that William Russo's conclusion says it best. "I left Seattle with a massive pile of literature and business cards, but more important than any of that, I left with knowledge that will help me to better serve my students. Some of that knowledge came from the excellent presentations, but a lot of that knowledge came from meeting and interacting with a diverse group of extremely intelligent, motivated, and dedicated professionals."

To learn how you, your school, or your company can become involved with aviation maintenance education and workforce development visit www.atec-amt.org. **AMT**

Out of 56 teams that competed at the 2017 Aerospace Maintenance Competition, United Airlines Team Cleveland won the 2017 William F. "Bill" O'Brien Award for Excellence in Aircraft Maintenance.

A new ASTM International guide will help assess competencies of avionics professionals who work with airplane technologies and who want to gain certification as aircraft electronics technicians (AETs).

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EDUCATION & TRAINING

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The Unmanned Safety Institute has launched a major CTE workforce development initiative in conjunction with high schools and colleges throughout the United States. The program provides teacher credentialing and all course materials, including a 400-page academic textbook, to secondary educational institutions throughout the United States. Students who successfully complete the program are eligible to take USI's credentialing exam leading to the Small UAS Safety Certification, an industry certification demonstrating expertise as a professional remote pilot and making them highly qualified for careers in the burgeoning industry of Unmanned Aircraft Systems (UAS), commonly referred to as "drones."

To learn more visit www.UnmannedSafetyInstitute.org or call (877) 535-SAFE (7233).

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THE **ROLE OF MAINTENANCE** IN CORPORATE CUSTOMER SERVICE

By Dr. Bill Johnson

Some have called airlines a customer service industry that flies aircraft. Airline customer service has been in the news lately. It has not been good news. Customer service goes far beyond the ticket counter, the boarding process, or the baggage claim. The customer seldom sees, or wants to see, the aviation maintenance technician; however, the role of the maintainer is key for keeping customers happy. What steps can maintainers and their organizations do to ensure customer satisfaction?

VARYING CUSTOMER SERVICE EXPECTATIONS

Succinctly, customer service is the support provided by a company to users of their products or services. It also extends to potential users of the service, like buyers of an aircraft major maintenance service or avionics package installation. They want to be sure that sales will be supported during installation or when unexpected maintenance arises. For an airline ticket buyer, unless cheapest is the only driver, they want a company with a reputation for good customer service. Of course, even the lowest paying customer should have appropriate treatment.

In general aviation, an FBO that supports high-end business jets will have different customer comfort amenities than a small operator that sells fuel to small single-engine recip aircraft. That's the customer expectation. It is relatively easy to deliver on the high-end expectation by building a nice lounge, keeping it open and clean, and providing the transportation and communication services that a jet customer would expect. That kind of treatment is obvious customer service. It is also nice to extend that same customer service to all customers.

In every aspect of aviation, the most critical product/service is safety. Safety is intangible. It is assumed by the customer. People don't shop for varying levels of safety. This industry accepts a fiduciary responsibility, meaning that the aviation product/service provider has the highest degree of trust and obligation to ensure safety for the passenger. "Safe enough" is not an option. It is that simple.

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

THE ROLE OF MAINTENANCE IN CUSTOMER SERVICE

While safety is assumed, we in the industry know that it's a goal that consumes much of our work. The job of the maintenance organization is to ensure that the aircraft are at the gate and ready/safe to depart on time. That must be done effectively and efficiently. Effectively means that it is right and safe. Efficiently implies that it is on time and as cost effective as possible. Both drive customer service/satisfaction.

When maintenance "gets it right" everyone is happy. From dispatch to gate, to flight and cabin crew, the flight launch is best when the aircraft is ready to leave on time and complete the route as scheduled. That is the kind of service that satisfies customers. Again, what specific actions should the AMT and maintenance organization take?

This author now puts on the human factors and regulatory hat to answer the maintenance customer service question. Based on analysis of maintenance delays and associated challenges, the checklist on Page 39 offers a list of maintenance topics that can contribute to high customer satisfaction. The AMT cannot complete this checklist without management support. Thus, this list also applies to management.

FITNESS FOR DUTY

Maintenance workers must be physically fit and mentally awake to perform their job. When you're tired you do not think clearly. Your decision-making is diminished, as well as your communication skills. You're also susceptible to forgetting. Any one of these, or a combination, can lead to an error. Come to work rested!


ELLIOTT AVIATION

MAINTENANCE CHECKLIST FOR HIGH CUSTOMER SATISFACTION

- ❑ Fitness for Duty
- ❑ Communication
- ❑ Technical Publications
- ❑ Voluntary Reporting
- ❑ Peer-to-Peer Observations
- ❑ Continuing Process Improvement
- ❑ Convey Competence and Professionalism
- ❑ Customer's Viewpoint

Perhaps you're tired from too much overtime or too many days without a 24-hour break. Beware of excessive overtime. If overtime is a corporate norm then it puts a question to the company commitment to safe flight and satisfied customers. Speak up, continuous overtime must be controlled. Tired workers become injured workers. Can you really afford to lose work due to a personal injury?

FAA Advisory Circular 120-115 provides extensive guidance on fatigue risk management in maintenance (see *AMT*, December 2016). Come to work fit for duty.

COMMUNICATION

Many negative events result from poor communication at shift change or when one worker completes a job that someone else started. The result is rework and/or flight delays. Talk to one another while recognizing that clear, correct, and complete communications will help ensure customer satisfaction. It is best to have written communications to help ensure that things "don't fall through the cracks." Clear communication and documentation leave nothing to chance.

FOLLOW THE TECHNICAL INSTRUCTIONS

"Failing to Follow Procedures" is the No. 1 challenge in maintenance work. Management must support a culture of using the job cards and other procedural information. Following procedures must become as automatic as wearing a seatbelt when driving. Everyone must do it, without exception.

Colleagues must question others when they see them working without documentation. If we are serious about safety, injury, and satisfied/safe customers then we must shift our individual and corporate culture to 100 percent compliance with technical publications.

Everyone must cooperate to identify and correct difficult documentation. If it's broke then get it fixed. Also, sometimes you remove wires or other parts to get access. Document all such removals to increase the likelihood of proper reassembly.

When someone does not use documentation ask "Why". Then, ask "Why" enough times to identify the multitude of factors that lead to the failure to use documentation. Finally, find ways to fix the issues. That is the only way to address this issue.

VOLUNTARY REPORTING SYSTEMS

When something goes wrong avoid the practice of fixing the problem and moving on. When a professional sports team has repeated an error they find the problem and find a solution. Sometime the sports team fires the manager. It is important that aviation maintenance technicians report organizational hazards as well as errors that they may have made. Of course, there must be a fair/just system that permits one to report without serious repercussions. A maintenance error can lead to an event where one or more customers are not satisfied. Failure to find and correct the underlaying cause(s) of an error is another, more serious error. In fact, a decision not to investigate and correct an error is an intentional action! Revisit the term "fiduciary responsibility."

PEER-TO-PEER ASSESSMENT

Peer-to-peer assessment permits mechanics to "look at" and "look out" for one another. The practice is named Line Operations Safety Assessment (LOSA) (See www.humanfactorsinfo.com). The website provides process information and checklists to set up ways for formalized peer-to-peer observations during normal working conditions. These programs have helped some organizations to enhance the safety culture. Of course, an enhanced safety culture is a plus to ensure the best customer service.

CONTINUING PROCESS IMPROVEMENT

High customer service is not a steady state. You don't merely reach it and then stop. It must be on the way up or it is on the way down. The maintenance organization must strive for ways to improve every process, if only a little. Small positive changes continue to add to customer service. Like the cultural change described in "Follow the Technical Instructions," organizations must keep looking for ways to improve.

A suggestion for improvement should never be considered in a negative light. Workers usually know more about the organizational changes than the managers know. Capitalize on worker information and input.

CONVEY COMPETENCE AND PROFESSIONALISM

Maintenance personnel know that they are surrounded by competent professional colleagues. They would let their spouses, mothers, and entire family fly on aircraft serviced by their colleagues. Workers trust their co-workers for all the demonstrated right reasons. Now, customers don't have the benefit of seeing and interacting with mechanics to know their competence. They only have a visual appearance check to decide if the mechanic is competent. Therefore, when there is a likelihood that you will meet customers, in general aviation or airlines, try a professional look. As much as possible, wear clean clothes and have a demeanor that you have the situation "under control." That's what the white shirt flight crews do every day. It's a fact that perceptions are often everything. When you look professional that contributes to great customer service. Managers, take this advice and buy the maintenance staff appropriate professional clothing if they are in the line of sight of your customers. This practice works well in every profession.

BE THE CUSTOMER

As a maintainer, put yourself in the customer's place as you look at the aircraft. You may know that the aircraft just completed a major service and that it may be better than new. But if the passenger has a broken tray table, or the lav smells then that superb technical work stinks from the passenger viewpoint. I always like to think that a customer might wonder, without SMS risk assessment, about the quality of flight control or engine maintenance when the overhead reading light and IFE is inoperable. That's the kind of questions that maintainers and their organizations must ask, in the interest of customer service.

THE BOTTOM LINE

To ensure that you make a maximum contribution to overall customer service be sure to know who you serve. In maintenance, you often serve one another. By working together in maintenance, you will ensure the custom service at your company. Perhaps this article will facilitate a customer service discussion. Remember, customer service is everyone's job. ***AMT***

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SPRINGING FORWARD **WITH DATA, ANALYSIS**

ARSA is still breaking down this year's survey data, but finding and retaining skilled workers has emerged as a key issue, along with managing regulatory burdens

FOR THE WORLD, SPRING'S ARRIVAL means flowers and pollen, sunny days, and the promise of summer's approach.

For ARSA and its allies, the season brings data and analysis, industry insight, and the tools for better policy. As Americans "spring forward" in observance of daylight savings time, the aviation world looks forward to tackling its most-pressing issues.

In the beginning of every year, the association administers its member survey to gather intelligence about the maintenance community's business outlook, workforce needs, and operational challenges. The yearly exercise allows repair stations to help shape the association's activities and programs while supporting its global advocacy. This year's survey wrapped in early April with 79 responses.

Every March, ARSA's Legislative Day attendees are briefed on that year's Global Fleet & MRO Market Assessment performed by Oliver Wyman. The annual analysis plots the future of the maintenance market alongside global commercial and business aviation fleets and measures the "right now" economic impact of repair stations around the world.

Together these two sources provide key tools for defining the industry and helping it grow. Need procedures for how to utilize these tools? Three steps:

STEP 1: REVIEW THE NUMBERS

The aviation maintenance industry is a global economic powerhouse. According to ARSA's 2017 Global Fleet & MRO Market Assessment performed by Oliver Wyman, global air transport MRO is expected to be $75.6 billion in 2017 and will approach $110 billion in a decade. Even when tested against four different economic scenarios ranging from "cloud nine" robust growth to "black swan" disaster, the maintenance market fares well against each variation – actually outperforming the baseline forecast in three out of four. It's a durable industry with a healthy future.

In the United States, nearly 277,000 men and women work in maintenance and parts facilities, bringing home an average annual wage of more than $58,000 (according to the Bureau of Labor Statistics). More than two-thirds work in FAA-certificated repair stations; there are almost eight times as many contract maintenance employees as airline mechanics.

The ARSA survey team is still breaking down the survey data, but finding and retaining skilled workers has emerged as a key issue. Respondents anticipate the increases foreseen in the market assessment: Nearly 60 percent expect their revenue and markets to grow in the next year and practically none foresee contraction. To support this expansion, businesses will either add positions overall (55 percent) or at least hire to keep pace with attrition (44 percent).

STEP 2: PUT THE NUMBERS IN REAL-WORLD CONTEXT

Unfortunately, finding the right people is challenging. Eighty-two percent of survey respondents reported having at least some difficulty over the past two years finding qualified workers to fill technical positions – nearly a third have had "a lot of difficulty." Overall, more than half of this year's respondents reported having open, unfilled technical positions with the number of vacancies ranging from one to 190 with an average of 19.

Those open positions and the problems filling them are translating into real pressure on the industry. When asked to identify the most-pressing risks to their company, 52 percent selected "difficulty finding/retaining technical talent." That makes the skilled worker shortage the second most daunting challenge (just behind managing regulatory burdens), in the pantheon of concerns keeping ARSA members awake at night.

STEP 3: TAKE ACTION

If you're one of those losing sleep about our industry's skills shortage, help the association and the aviation community:

1. Arm yourself with more data, including state-level assessments of maintenance and manufacturing employment, at arsa.org/economic-data.
2. Scroll through the last three years' worth of updates on arsa.org/technical-workforce-development to see what's been happening in aviation personnel policy.
3. Get involved at arsa.org/legislative (facility visits make issues personal for elected officials). Watch (and then share) "You Can't Fly Without Us," ARSA's seven-minute public television documentary at avmro.arsa.org.
4. Keep an eye out for more chances to share your insight with ARSA. Beginning this spring, the association will routinely distribute, via arsa.org, "quick question" surveys. In less than a minute, you can help us gather even more data to even better support our advocacy on your behalf. **AMT**

CHRISTIAN A. KLEIN and **BRETT LEVANTO** are executive team members for the Aeronautical Repair Station Association. To learn more about the association and its work on behalf of the maintenance community and the flying public, visit arsa.org.

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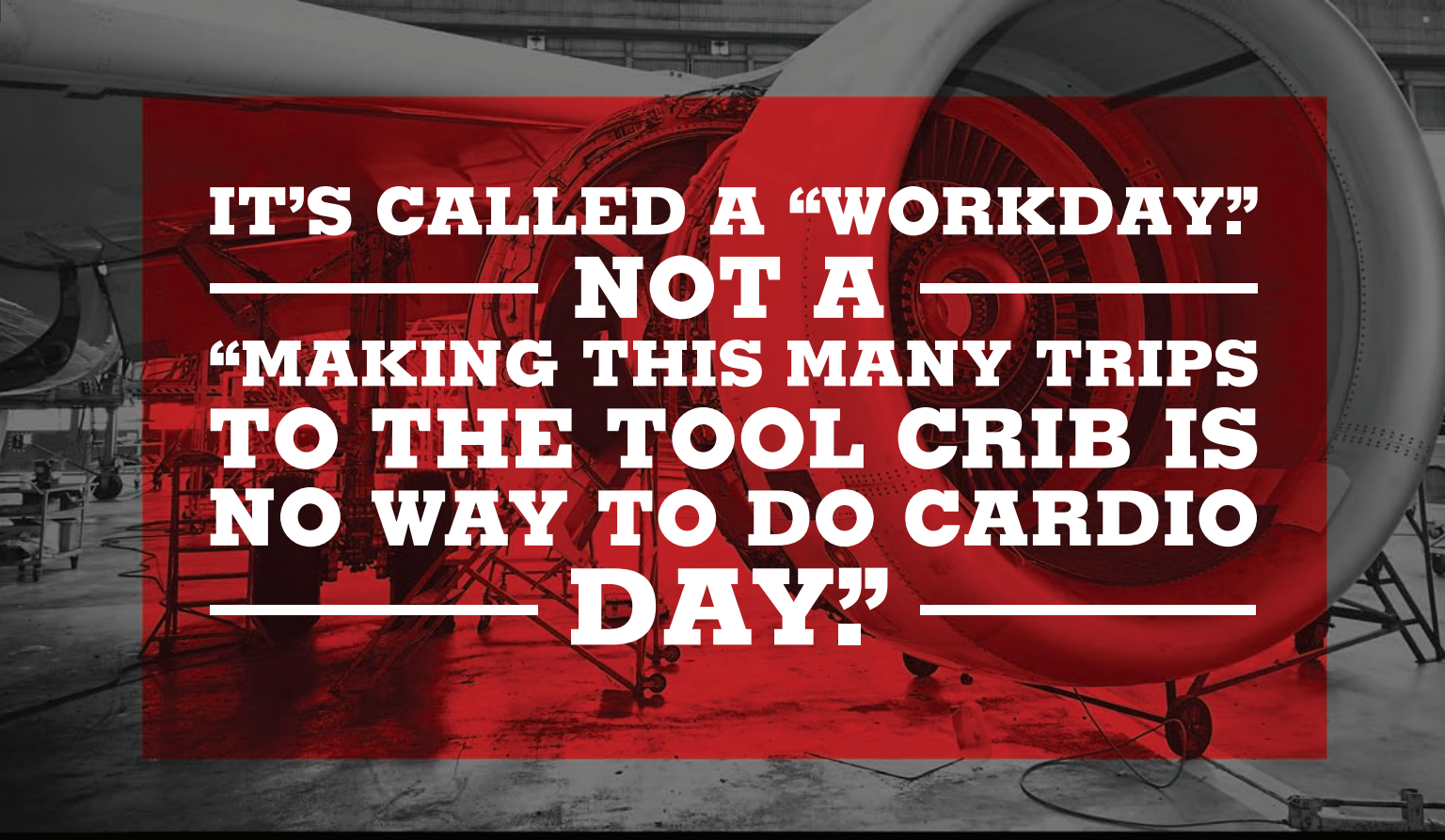

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