JANUARY/FEBRUARY 2016

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ONE ENGINE WITH TWO HEARTS BEING DESIGNED FOR LIGHT HELICOPTERS

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Era Helicopters AW139 landing on an oil production platform in the Gulf of Mexico.
PHOTO CREDIT: BARRY D. SMITH

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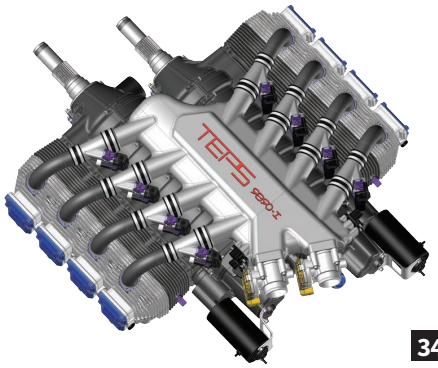

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KEEPING IT IN THE FAMILY

Were you inspired to be part of aviation by a family member?

The last issue of *AMT* for 2015 was our inaugural Next Gen 40 under 40 Maintenance Technician Award issue. I hope you enjoyed reading the profiles of the 41 winners. We had a great time sorting through all the nominations of young professionals, reading through the profiles, and putting together this issue highlighting the next generation of up and coming young aviation maintenance professionals.

One of those 41 winners was Nicholas Temple, a crew chief for Air Wisconsin currently based in Norfolk, VA. Nick comes from an aviation family including his father and two brothers. His father is a life-long mechanic with United Airlines. Nick told a story about traveling on the airline with his father as a youngster and how on a particular flight his dad assisted with a maintenance issue on the aircraft which would have prevented the family from returning home. Of course young Nick thought that was pretty special. (Page 28 of the November/December issue of *AMT*.)

After the magazine was published we received an email from Nick. He thanked us for choosing him as one the winners and requested more copies of this magazine to pass to family members and save for his children and future grandchildren. In this same issue on pages 19 to 21 we had a story about United Airlines dedicating a bust of Charles Taylor and placing it on display in the Chicago O'Hare Airport terminal. By coincidence, Nick's father Paul Temple was at the dedication ceremony and in the photo on page 20.

As Nick put it, "My father is featured before me in the same magazine at the Charles Taylor dedication at ORD, so by chance this edition of *AMT* is super special to me. This is something we will pass down to grand kids to highlight their grandpa and great grandpa." Keeping it in the family. Congratulations to the Temple family.

In this month's issue of *AMT* we take a look at some recent helicopter related developments with safety and piston engine technology. Our cover story written by Flight Safety Foundation's Greg Marshall explains some of the maintenance related aspects of the FSF Basic Aviation Risk Standard for Offshore Helicopters.

Marino Boric, a new writer for *AMT* out of Europe, describes a new piston engine design from Italy which uses existing design methods and technologies combined together in an unusual way. Marino visited the engine designer and discovered surprising features and brand new project details. You will read more from Marino in the months ahead as *AMT* continues its editorial coverage of aviation from around the world.

Ron

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SETTING THE STANDARDS:

ASTM is a steady, enabling force with five aviation-specific committees and counting

By Jerome Greer Chandler

The first thing you want to know about ASTM is that nobody *in* the know calls it the American Society for Testing and Materials, not anymore. "We were formerly under that name," says Christine M. DeJong, manager, technical operations for ASTM *International*, "But it's a global market now."

Never was that any truer than in the aviation arena.

Indeed, and somebody has got to set and reconcile the standards by which industry operates. One prominent player is ASTM International. In all, ASTM says some 12,500-

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.

ASTM ASCENDANT

plus of its standards are employed worldwide to improve product quality, enhance safety, and facilitate trade. Five committees manage a portfolio of aviation-specific standards. Several others maintain materials and testing specifications.

BY THE NUMBERS

ASTM's reach is wide, its expertise deep. Consider, as of Oct. 15, 2015, Lui Fei, chief representative of ASTM's China Office, said in a presentation that the organization had:

- 12,500-plus standards, 5,100 of which are employed in 75 countries;
- 147 committees;
- 32,000 members. Of those 32,000 members, 8,000-plus are international members. They come from 135 nations.

ASTM is accredited by ANSI — the American National Standards Institute, and its standards-setting process complies with World Trade Organization (WTO) principles, specifically the Technical Barriers to Trade (TBT) Agreement. It's a pact which WTO says,

FALCON 8X production - The ASTM General Aviation Aircraft Committee has spawned 11 approved standards. Its seven subcommittees address things such as structures, powerplants, systems, and equipment.
DASSAULT FALCON

"aims to ensure that technical regulations, standards, and conformity assessment procedures are nondiscriminatory and do not create unnecessary obstacles to trade. At the same time, it recognizes WTO members' right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or protection of the environment. The TBT Agreement strongly encourages members to base their measures on international standards as a means to facilitate trade. Through its transparency provisions, it also aims to create a predictable trading environment."

ASTM's six key principles mirror those of the WTO: transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and consideration of developing nations.

AVIATION-SPECIFIC COMMITTEES

That ethical umbrella covers a lot of territory in the aviation arena. There are five aviation-specific committees that translate these precepts into action:

- *F37, Light Sport Aircraft*: This first of ASTM's dedicated aviation committees was formed back in 2003. As of this writing there were 204 members. F37, has generated 33 approved standards, with four more still in development. F37 works through an octet of subcommittees, subcommittees that cover a considerable swath of the market, from gliders to gyroplanes;
- *F38, Unmanned Aircraft Systems*: Formed in 2004, this committee has 153 members and over the years has produced a dozen approved standards, with 10 more in development. There are a trio of subcommittees covering airworthiness, flight operations, and personnel;
- *F39, Aircraft Systems*: Also born in 2004, the 100-member committee has put together six approved standards and has another nine in development. Its five subcommittees run the gamut — from design, alteration, and certification of electrical systems to design of avionics systems;
- *F44, General Aviation Aircraft*: This is the big one, and perhaps one of the most encompassing (not to mention needed) committee ASTM has. Comprised of some 290 members, 46 of whom are regulators, the General Aviation Aircraft Committee has spawned 11 approved standards, with another 10 waiting in the wings. Its seven subcommittees address things such as structures, powerplants, systems, and equipment — even regulatory liaison. The committee's objectives are ambitious: harmonize current global GA requirements, increase safety while decreasing cost, and allow for newer technologies. That includes retrofits.

ASTM INTERNATIONAL

F44 is where much of ASTM's aviation action is just now. Greg Bowles is the committee's chairman, as well as the director of European regulatory affairs for the General Aviation Manufacturers Association.

He asserts, "The biggest benefit to the maintenance community is … the possibility of revitalizing light aviation." Noting that the average age of GA aircraft today is 45 to 50 years old, Bowles says the category's design rules "have become quite outdated and prescriptive." FAA Part 23, for instance is a half-century old. The result: "We've got this point-in-time that's frozen, and it's allowed our [GA] industry to sort of stagnate. That stagnation is born, he maintains, of the fact "that it's so expensive to get an exemption [to the rule] to do something different."

DeJong says it takes at least five years to change a regulation via the traditional route. "With all the technological and safety advances available in the industry the Part 23 rule is about 50 years old. How can industry and global regulators keep up?" To say the aviation world has changed during that period understates the case.

The issue says DeJong is, "How do you get safety-enhancing products into an aircraft without it costing [too much]. There are incidents that could have been prevented by technology. You have all these products that could have been installed into the aircraft, but they either can't be, or they're too cost-prohibitive to put in the aircraft.

"So, since rule changes take such a long time, the industry is starting to go toward industry-voluntary consensus standards instead of prescriptive regulation. A standard can change in six months, and *then* the regulator can accept the new standard through policy instead of going through a rule change." That's the beauty of ASTM

"So since rule changes take such a long time, the industry is starting to go toward industry-voluntary consensus standards instead of prescriptive regulation. A standard can change in six months, and *then* the regulator can accept the new standard through policy instead of going through a rule change."

— Christine M. DeJongamanager, Technical Operations, ASTM

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GULFSTREAM AEROSPACE

CIRRUS AIRCRAFT Production (top) and Gulfstream G650 Manufacturing (below) — The ASTM General Aviation Aircraft Committee has spawned 11 approved standards. Its seven subcommittees address things such as structures, powerplants, systems, and equipment.

standards. In the world of clunky, cumbersome regulation changes, standards can be downright nimble, the lubricant that keeps the system moving.

Overall, ASTM standards across the board (not merely aviation) are propagating pronto. As of this writing, some 6,788 standards have either been adopted, used as a reference, or employed as the basis of national standards outside of the United States.

There's movement too on the purely regulatory front. FAA has recognized just how cumbersome Part 23 is, and a re-work is on the way (indeed it may already be out by the time you read this).

Overall objectives will supplant tight, innovation-killing prescriptive rules. And that's where Bowles says ASTM comes into play. "Standards that are being developed in that area will be really helpful in staying modern," he says. "We can look for new ways of testing, new ways of manufacturing aircraft — and toward electric hybrid propulsion."

SUSTAINABLE BIOFUELS

ASTM standards already underpin the fast-rising use of sustainable biofuels among many commercial airlines.

The ASTM publication *Taking Flight: ASTM Standards that Support Aviation* shows just how standards-setting works. ASTM International revised its D7566 Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons by adding an annex to accommodate HEFA (Hydroprocessed Esters and Fatty Acids)-derived biofuels. Biofuels are destined to play an increasingly important role in commercial aviation in the years to come.

Developing the new standard, while melding it with an already-established one, was collaborative — just as all ASTM activities are. Involved were HEFA fuel producers, aircraft and engine manufacturers, regulatory representatives, and airlines.

The process entailed harmonizing D7566 with the provisions of D1655, a specification from the late 1950s. D1655 lays out the Specification for Aviation Turbine Fuels.

The aim was to ensure the new biofuel works, and won't generate any unwelcome side effects. According to the new edition of D7566, criteria for the bio-derived or HEFA component encompasses better thermal stability, distillation control, and trace material properties — as well as setting out requirements for lubricity, distillation, and composition after blending.

In the ASTM publication, Mark Rumizen, FAA's senior specialist for aviation fuels said, "The challenge [to revising D7566] was the need to balance safety with the need of the industry to introduce a renewable fuel and an alternative supply of aviation fuel."

Again from the ASTM publication *Taking Flight*: "Oil companies, refiners, and producers of aviation turbine fuel and

new alternative fuel producers will use the new specification in their operations to manufacture the fuel."

F46 AEROSPACE PERSONNEL

The latest ASTM standard, the one that rounds out the aviation-specific standards, is *F46, Aerospace Personnel*. Formed in 2014, this decidedly different committee has 73 members. As of this writing the committee had yet to have a standard approved. That's because it's so new. There are seven standards in development just now. Among other things the committee is looking at core competencies, soft skills, and that holy of holies in this business — compliance documentation.

To give you an idea of the scope of F46's endeavors, there are eight subcommittees. In addition to endorsements, those subcommittees are tackling terminology and regulatory liaison.

ASTM F46, Aerospace Personnel Committee, was formed in 2014, and has 73 members. **There are seven standards in development.** The committee is looking at core competencies, soft skills, and compliance documentation.

This, then, is standards' new frontier: people. And why not, asks Christine DeJong? "Standards aren't just for products," she contends. To be a good aircraft maintenance technician, she says, "'You have to test this, you have to check that, you have to ensure this, you have to clean that.' That's what specifications or standards are going to tell you. Why wouldn't that work for personnel? 'You have to have *this* amount of training.' This could come down to both levels of experience and base knowledge requirements."

Five aviation-specific committees and counting. In this ever more complex world we inhabit, ASTM is a steady, enabling force — one whose influence seemingly can't help but grow. As far as aviation is concerned that influence is on the rise at just the right time. **AMT**

For more information visit www.astm.org.

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SCIENCE FICTION BECOMES A REALITY: WEARABLES FOR MRO

Access to information and technical support through wearable computers is changing aircraft maintenance

By Kevin Deal

In-field A&D maintenance, compared to maintenance back at base or at the depot, is very different — usually complicated by factors such as distance from the home base, environmental conditions, operating pressures, and even cultural constraints. Maintenance engineers need to have the right equipment and technology to allow them to do their job as efficiently and quickly as possible. Wearable and context-aware technology is proving to be a highly capable solution in aircraft and military maintenance.

Maintenance activity requires, as a basic minimum, the right information and technical support with the right functionality to support operations, so it is a no-brainer that this needs to be tailored for the environment where the maintenance is taking place. For many years vendors have deployed solutions that are complex, full enterprise solutions on mobile devices. But in-field maintenance bears little or no similarity to that back at base; instead, the environment is unique and often extreme. Time pressure is often increased for field engineers who have to meet tight turnaround schedules, and have the right technical documentation and direction on hand, dependent on the task and time. Tailored functionality for the

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INCREASED AUTONOMY thanks to wearables and context-aware computing means the maintainer spends less time stopping work to consult collateral material, improving overall MRO efficiency.
IFS NORTH AMERICA

specific environment is critical to meeting operational deadlines.

UNDERSTAND THE SITUATION

Speedy resolution of unusual problems can be enhanced if equipment and those in support can understand the multiple contexts the field engineer is encountering. These include 'user' context such as the user's profile, location, people nearby, and even the current social situation; 'physical' context such as lighting, noise levels, traffic conditions, and temperature; 'time' context such as time of day, week, month, and season of the year at the deployed location; and operational context to monitor spare part availability and the maintenance task at hand.

This is where wearables and context-aware technology enter the fray. According to recent Forrester research, 68 percent of global technology and business decision makers say that wearables are a priority for their firm, with 51 percent calling it a moderate, high, or critical priority.

The relationship between wearables and context-aware applications is symbiotic. Wearables can sense the user's physical environment much more completely than previously possible, and in many more situations. This makes them excellent platforms for applications where the computer is working even when you aren't giving explicit commands. Future developments will introduce increased use of solutions that will automatically tailor their presentation and operation through recognition of the maintenance environment.

INDUSTRY APPLICATIONS

In the base environment, there are opportunities for application of the technology across production, quality assurance, safety, warehousing, and logistics. For example, wearables can increase worker agility. Supporting the location of faulty wires or equipment on a grounded aircraft, and notifying workers

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about hazards such as the presence of other activities being conducted on the aircraft, are areas that could be addressed right now. Boeing is currently experimenting with augmented reality for aircraft maintenance with a hands-free device instructing workers where to find a product in the inventory.

This could be extended to giving mechanics virtual 'sight' of components hidden behind other systems or structures relative to their personal location — allowing them to remove, fit, or adjust a component that they cannot physically see.

Wearables can also be used for **maintenance, repairs, and over-the-shoulder coaching** for remote engineers.

IMPROVE MRO EFFICIENCY AND SAFETY

Wearables with augmented reality have the potential to automatically identify the spare part required by a field engineer. Information on the appearance, known context, and maintenance task required can then be fed through to the engineer's wearable device negating the need to barcode scan or consult technology documents in difficult maintenance environments — such as a dark submarine bilge or the underbelly of an aircraft — where movement is limited. It also removes the requirement for the intimate support of a base supply chain and logistician. This comes with the added bonus of not having to hike miles across an airfield to access catalogs in a maintenance hangar or planning office.

With context-aware and wearable technology, the engineer can ensure that the right item is selected, with the benefit of reducing time-consuming document and database searches that introduce a greater opportunity for error. Increased autonomy thanks to wearables and context-aware computing means the maintenance engineer spends less time stopping work to consult collateral material, improving overall MRO efficiency.

Wearables can also be used for maintenance, repairs, and over-the-shoulder coaching for remote engineers. Cargo and maintenance personnel from a major airline have tested the use of an optical head-mounted display (OHMD) to help inspect aircraft on the tarmac. They capture video and photos and send them to a central office where technical safety professionals assess an aircraft's condition.

IFS is working with XM Reality to bring forward a remote expert to assist in complex maintenance to broaden the capabilities of maintenance engineers on the ground — 'augmenting' flight-line workers' skills. IFS believes adding cognitive applications and voice-controlled intelligent agents similar to Siri to wearable devices would further augment such workers' skills, helping them identify and act on specific problems with more autonomy.

FUTURE OF CONSUMER-BASED TECHNOLOGY

With device development enabling us to monitor activity in more detail, user context awareness will be included in consumer devices to an ever-increasing degree. Imagine what could be achieved if technologies like cameras and the Kinect (a motion-sensing input device by Microsoft for the Xbox One video game console) were included in appliances and devices in your base maintenance facility or field location. Recognizing where people are and what they do will enable designers to create attentive applications that look at what is going on and react appropriately. For example, teleporting — sometimes called "follow-me" computing — is a tool available today to dynamically map the user interface onto the resources of the surrounding computer and communication facilities in office complexes.

In a maintenance environment, this could be adapted so that relevant applications can 'follow' a worker moving around maintenance locations or even different equipment and process bays in an aircraft, and be available as required. The maintenance station will recognize which member of your maintenance team is going to use it based on identity tag or even body profile, and preselect that person's authorized maintenance or repair task schedules. If directly linked to equipment health monitors, it could automatically add high priority preventive maintenance tasks to a repair schedule being undertaken in the same location.

CCS Insight predicts that there will be up to 100 million smartphone companions such as smartwatches by 2017. Business Insider Intelligence rsearch indicates the global wearables market will grow at an annual compound rate of 35 percent over the next five years.

Future wearable technology must be demonstrably useful — both needed and wanted. To be wanted, we have to have valuable applications that will benefit wearables and be contextually aware — only then can we demonstrate a return on investment that warrants change and adoption of the technology.

THE WAY FORWARD: USER-FRIENDLY PLATFORMS

The key to this is not so much wearables, but the context-aware applications that are accessed by

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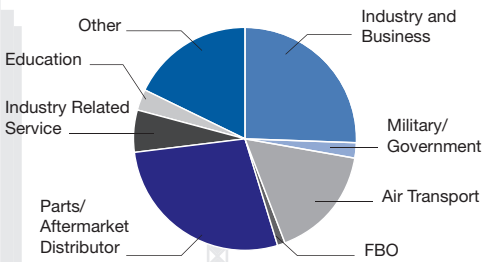
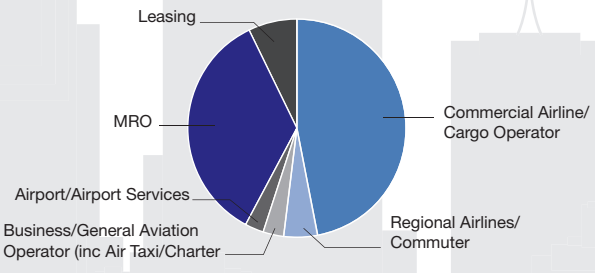
Industry Breakdown



MRO's Airline Audience Makeup



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or loaded onto them. Making applications more social and user friendly through context-aware wearable technology will surely be the way forward. Mobile apps offer a solution to the problem of gaining essential feedback of operational information without inundating the engineer. They must be task-specific, in a recognizable format, optimized for specific equipment, easy to customize, and devoid of superfluous overhead.

The ability to add operational data relating to flight, crew, and vehicle in real time adds real value to enterprise resource planning (ERP). The next step would be to install mobile apps on to a wearable device that automatically records when and where a fault is logged

Research indicates the global wearables market will grow at an **annual compound rate of 35 percent** over the next five years.

— saving valuable time by negating the need for the engineer to stop working to log on to a laptop or handheld device to gain access to back-office information.

Operators could have direct support at their fingertips, in their ears, or in front of their eyes, and also intimately understand the challenges they are facing. The development of hardware and sensors to 'socialize' the technology is about to take off, but these are really just delivery and input points for information that allows context-tailored applications to link users to powerful enterprise processes.

The immediate benefits of delivering powerful computer support directly to users and capturing contextual information to improve enterprise-level knowledge offer opportunities to streamline MRO activity and allow supply chains to get ahead of the game. Integrating innovative wearable and context-aware technology with an agile aircraft maintenance ERP application streamlines support and reduces costly operational downtime. The result is aircraft spend more time in the air with maintenance support tailored to suit any environment, at any time. ***AMT***

KEVIN DEAL is vice president for Aerospace & Defence, IFS North America, headquartered in Itasca, IL. For more information visit www.ifsworld.com or call (888) 437-4968.

GAUGE THE GOUGE: HOW TO REPAIR COMPOSITE PROPELLER BLADES

Repairing a general aviation structural composite propeller blade is quite different than an aluminum blade. Instead of just removing material, composite repairs replace material lost to gouges and other damage

By Dean Ward

TBM 700 retrofitted with unlimited life Hartzell five-blade structural propeller. HARTZELL PROPELLER

AIRPLANE PROPELLERS HAVE BEEN AROUND, well, since the first powered flight. In the early days they broke at an alarming rate, a function of being carved from wood, a porous and fibrous structural tissue.

Today aluminum and structural composite blades are the norm and repairing them when they get dinged has become commonplace. Damage can result from stones and other objects being swept into the prop wash and from impact with external objects or the ground.

With aluminum blades, repair consists of removing material and using metalworking tools – files, sandpaper, grinding discs, etc. – to re-establish a smooth finish for the airfoil. Repairing a structural composite blade is quite different, because instead of just removing material, composite repairs replace material lost to gouges and other damage.

INFINITE FATIGUE LIFE

First, some background on their makeup: Hartzell structural composite blades are composed of a

metal blade-shank retention section. A low-density foam core is molded onto this section, and it supports built-up layers of composite laminate. Beyond their obvious weight advantage over aluminum blades, structural composite blades have additional advantages.

These advantages are a longer service life and the ability to maintain a more optimum airfoil shape over the service life of the blade, resulting in an infinite fatigue life. This is possible because most damage to composite blades can be repaired, and they can be returned to service without adversely affecting the airfoil shape.

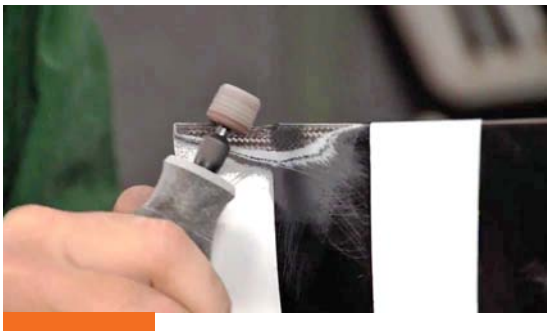
A composite blade is far more robust than an aluminum blade from an erosion and impact point of view. The stainless-steel leading edge of a composite blade is three to four times harder than the aluminum blade's leading edge.

It can withstand a lot more impact. A FOD strike that may not hurt the composite blade's leading edge may damage an aluminum blade.

HARTZELL TECHNICIAN
Kevin Ryan repairs a composite propeller blade.
HARTZELL PROPELLER

A composite blade may continue to fly to the next service date while a similar size object hitting an aluminum blade might ruin its airworthiness.

With aluminum repairs, the material is ground down to remove all the pits and with repeated repairs the blade gets thinner and thinner and must be scrapped after two or three overhauls. A composite blade can be repeatedly repaired to factory-new shape and aerodynamics.



CARBON TIP repair for composite propeller blade.
HARTZELL PROPELLER

CARBON BLADE gouge repaired according to the manual.
HARTZELL PROPELLER

While the composite materials that form propellers are incredibly durable, they are not entirely immune to operational damage. Propeller manufacturers have created and published protocols to help airplane operators and maintainers determine when and how to repair composite blades.

HARTZELL PROPELLER'S FIVE STEP EVALUATION PROCESS

1. Stop Flying

This is the single most important step you can take. Even a small crack or gouge can escalate quickly under the intense forces of flight. The cost of a propeller repair is far less than the cost of a wrecked aircraft. Inspect your prop before and after every flight. If you see damage, do not fly again until you have it professionally inspected or repaired.

2. Assess the Damage

Gouges on the outboard region of a blade and damage to the tip or trailing edge may be minor enough to repair yourself. Hartzell recently published a series where Kevin Ryan, a Hartzell technical representative, demonstrates these repairs in several Hartzell Propeller videos at HartzellProp.com/Composite-Propeller-Repair. If the damage is more severe, it is best to contact a Hartzell Recommended Service Facility.

3. Identify the Material

If you choose to make the repair yourself, the first step is identifying whether your blade is made from Kevlar or carbon fiber, which look similar. Even if you think you know, it is a good idea to verify this using the blade model number. This is located on a sticker on the cylinder of the propeller. This sticker may be located on the blade of older composite props. If you cannot find the sticker, the blade model number will also be on the inspection sheet that came with your prop.

4. Read the Manual

The Hartzell Propeller Composite Propeller Blade Field Maintenance and Minor Repair Manual is the ultimate guide to composite propeller repair. It is more commonly identified as Manual 170. Within its

pages, you can determine whether you are capable of making your own repairs or should trust them to the manufacturer. The manual contains step-by-step instructions on each minor repair and is a vital resource for any repair and maintenance. Download it at HartzellProp.com/manual170.

5. Contact Your Nearest RSF

If your propeller has sustained more than minor damage, contact a Hartzell Recommended Service Facility. This worldwide network of propeller repair stations meets rigorous standards, including regular on-site quality systems and process audits, technicians who attend required training updates at Hartzell and approved tools and equipment.

THE COIN TAP TEST

Best practices include getting factory training and advice, along with making sure you understand overhaul requirements, inspection differences, repair criteria, and repair limits. One of the primary tests is a "coin tap" audible check of the blade body and the blade erosion shield to identify any discontinuities.

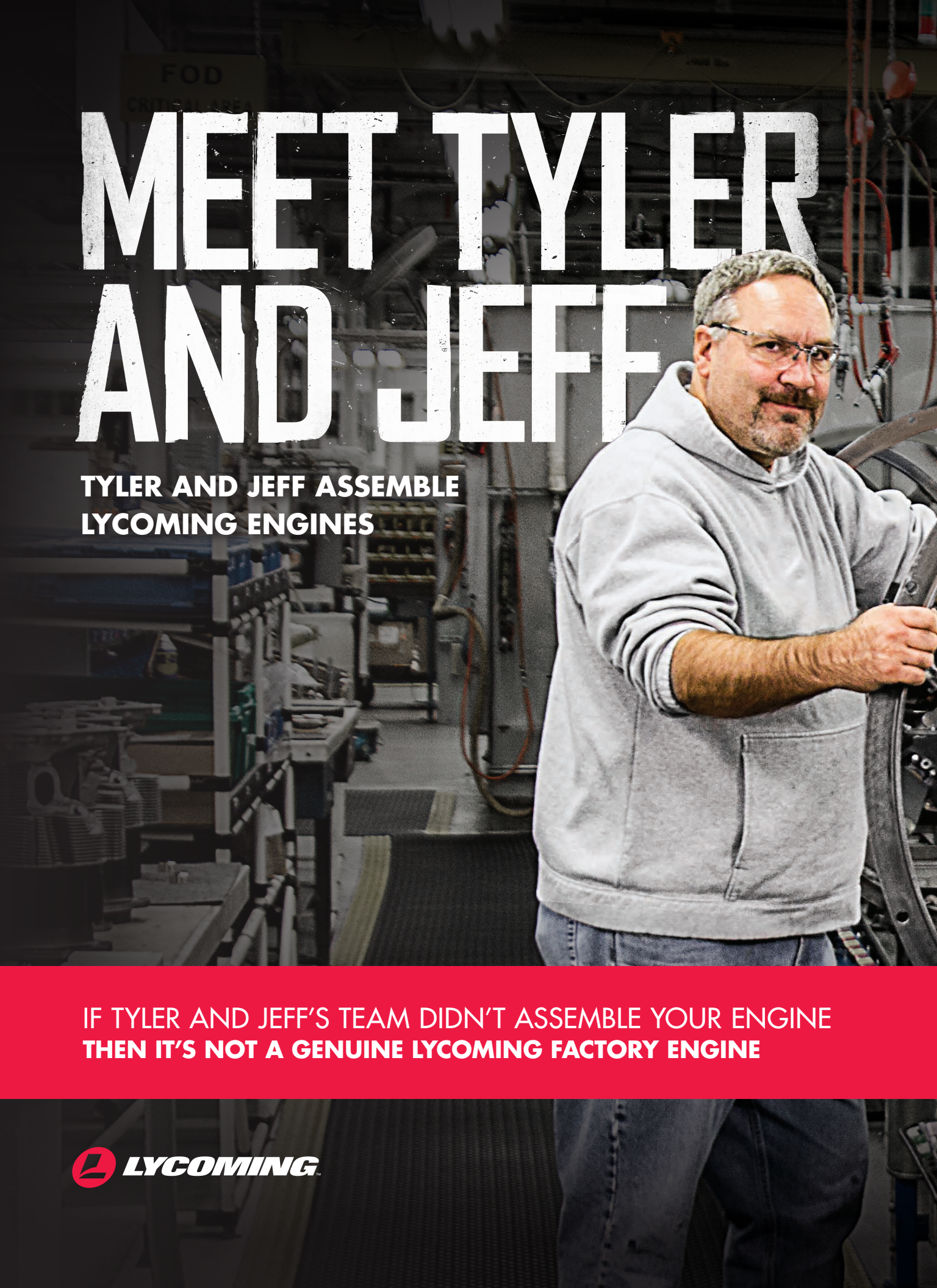
For the coin tap, you create a grid on the blade and use a round metal disc to tap the blade, listening for changes in the tone. You look for any de-bonding in the blade body and in the laminates. If you find issues, then you have to evaluate them from a size, depth, and location perspective. In some specific instances, an ultrasonic test may be needed, but that is very limited. ***AMT***

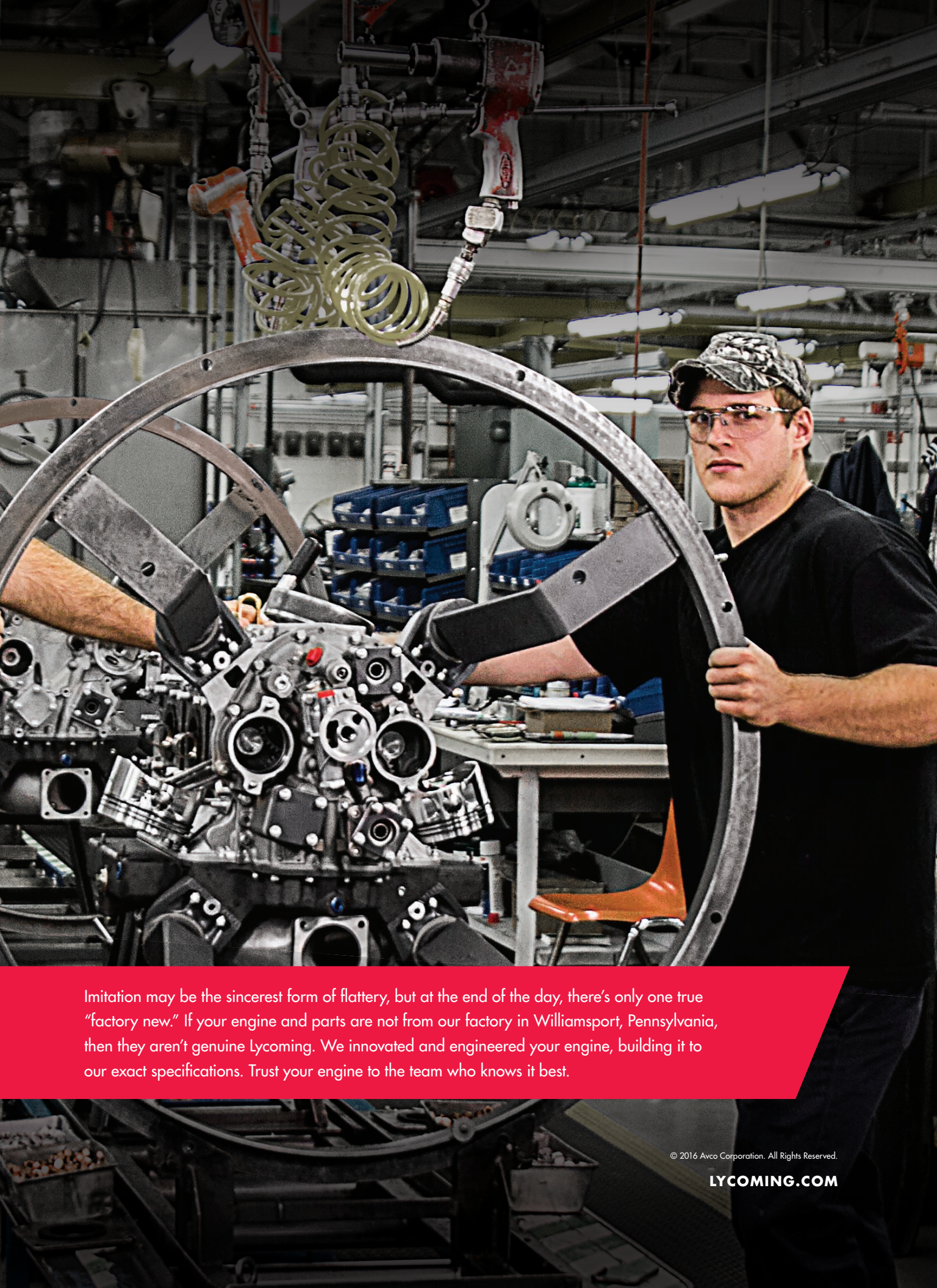
THE COIN tap check provides an audible test for structural composite blade damage.
HARTZELL PROPELLER

CLASSES AND HOW-TO VIDEOS

Kevin Ryan teaches repair classes around the world, and walks viewers carefully through the evaluation and repair processes. Hartzell Propeller has also created a series of informative how-to videos describing how to repair Hartzell's structural composite propellers when they suffer minor damage. These videos are helpful both for professionals and do-it-yourselfers. The techniques to repair Hartzell's structural composite propeller are pretty straightforward but if it looks too intimidating, a recommended service facility is always willing to help.

DEAN WARD is the director of aftermarket parts and service for Hartzell Propeller Inc. Through his 30+ years with Hartzell Propeller, Ward has gained wide ranging experience that uniquely qualifies him to lead the Aftermarket Parts and Service Team. His team is responsible for aftermarket sales and customer service, forecasting, export compliance, shipping, and the Hartzell Service Center.


MEET TYLER AND JEFF
TYLER AND JEFF ASSEMBLE LYCOMING ENGINES
IF TYLER AND JEFF'S TEAM DIDN'T ASSEMBLE YOUR ENGINE
THEN IT'S NOT A GENUINE LYCOMING FACTORY ENGINE
LYCOMING



Imitation may be the sincerest form of flattery, but at the end of the day, there's only one true "factory new." If your engine and parts are not from our factory in Williamsport, Pennsylvania, then they aren't genuine Lycoming. We innovated and engineered your engine, building it to our exact specifications. Trust your engine to the team who knows it best.

LYCOMING.COM

Basic Aviation Risk Standard for

Flight Safety Foundation provides an examination of some of the maintenance elements contained within the BARSOHO

By Greg Marshall

Helicopters, by their very nature, are very complex machines demanding exacting engineering standards both in manufacture and with maintenance. Because of the unique capabilities, they are often used within challenging and hostile environments in activities with relatively high-risk exposure. Added to this are the risks of operating single-engine operations over hostile terrain or at night.

Across a number of developing areas of the world, the regulatory oversight of aircraft operators varies considerably and should not be relied upon as a sole source of safety assurance for organizations providing outsourced aviation support.

The Flight Safety Foundation, in conjunction with the resources sector, introduced the first ver-

Offshore Helicopter Operations

ERA HELICOPTERS
AW139 search and rescue aircraft flying over tankers waiting to enter the Houston ship channel off the coast of Texas.
PHOTO CREDIT: BARRY D. SMITH

sion of the Basic Aviation Risk Standard back in 2010. This was followed by a number of updates and enhancements where we are currently at version number five. An Implementation Guidelines document was introduced to complement the standard and this provides additional detail on what is expected to be established to meet the requirements of the relevant controls. This is a valuable resource tool for aircraft operators, auditors, and end users of contracted aviation services.

BAR STANDARD FOR OFFSHORE HELICOPTER OPERATIONS (BARSOHO)

In response to a need from a number of organizations, a dedicated BAR Standard for Offshore Helicopter Operations (BARSOHO) was intro-

COMMON CONTROL 1.9, Continuing Airworthiness Management, is vital to ensuring that an aircraft is safe and airworthy for the mission and environment, and addresses more than simply hands-on maintenance tasks.
RON DONNER

duced along with its own companion Implementation Guidelines document. These documents were produced in conjunction with recognized industry experts to meet the needs of aviation risk in this unique sector. Version 6 of all of these documents will be released progressively during this year.

The threats and associated controls that appear within both the onshore and offshore versions of the standard were essentially borne of the lessons learned from past aviation accidents. These threats and controls apply to both airworthiness and flight operations.

An examination of some of the maintenance elements contained within the BARSOHO may prove useful in the context of maintenance and airworthiness.

Common controls 1.1, Safety Leadership, and 1.2, Safety Management Systems, are fundamental elements that should not only exist but be endemic with any reputable organization providing aviation support. Where demonstrated, a fully integrated SMS is a demonstration of a highly mature organization with robust and effective safety systems in place.

Common control, 1.11, Fatigue Management, is particularly important where maintenance tasks may be carried out very early in the morning or very late in the evening. It is crucial where these tasks are carried out on a 24-hour basis. Human factors training is also complementary to this control and is covered

CASE STUDY 1 – BARSOHO, CONTROL 8.5, CONTROL 8.3

On Jan. 1, 2014, an EC130B4 helicopter was being flown on a post-maintenance check flight. When on short final to Boulder City Municipal Airport, Nevada, at approximately 200 feet above ground level and at an airspeed of 40 to 50 knots, the engine flamed out.

The pilot lowered the collective to initiate an autorotation but was not able to successfully complete the landing. The tail boom touched the ground first and a hard landing ensued. The pilot was uninjured but the helicopter sustained substantial damage.

An inspection of the wreckage noted that the main fuel supply line B-nut fitting was found without the safety wire and the nut was loose when turned by hand. Before the accident flight, the line had been disconnected during a task to replace the bidirectional suspension cross-bar assembly and the accident flight was the first since the task was performed.

According to the noncertified maintenance technician who performed the task, the line was removed to defuel the fuel tank which was contrary to manufacturer's maintenance manual procedures.

It is likely that the B-nut fitting was not properly tightened and safety-wired during reassembly.

(SOURCE: NTSB, AEROSSURANCE)

CASE STUDY 2 – BARSOHO, CONTROL 8.5

On Nov. 9, 2013, an EC135P1 helicopter was being flown on a post-maintenance check flight with a pilot and two mechanics on board. All received minor injuries following a loss of control in flight incident and attempted an autorotation landing in a field. The helicopter landed hard and rolled on to its right side.

The investigation found that the anti-torque pedals had separated from the anti-torque levers. A review of he helicopter's logbook found that a mechanic had performed an action to "disassemble, inspect, and reassemble tail rotor pedals". This was associated with an 800-hour check and scheduled engine change. After the accident, an inspection of the maintenance area located a small parts bag tied to the tail rotor control cable that had been replaced. Inside the bag were bolts similar to the bolts used to secure the anti-torque pedals.

The scope of work had originally been scheduled for four to six weeks however pressure from a customer dictated that this be shortened to the minimum time needed to complete the inspections and any repair needed to ensure airworthiness. Together with staff shortages, this created a working environment where maintenance personnel were continually required to work between a number of aircraft undergoing maintenance at the same time and precluded continuity.

It was evident that an independent inspection was not conducted. Further evidence suggested that no independent inspections were occurring. Whilst these may not always be required for certain aircraft, the lack of duplicate inspections removes a valuable defense, especially when subject to schedule pressure.

(SOURCE: NTSB, AEROSSURANCE)

under common control 1.10, Maintenance Personnel Competence. Understanding why humans are prone to errors and the circumstances under which these arise is critical to the process of risk mitigation. This is particularly important with helicopters given their critical complexity.

Common control 1.9, Continuing Airworthiness Management, is vital to ensuring that an aircraft is safe and airworthy for the mission and environment within which it is operating. These take place over remote and hostile terrain including over water. It is more than simply 'hands on maintenance tasks'.

Control 8.2, Engine Usage and Trend Monitoring, and Control 8.3 Engine/Powerplant Modification Standard and Maintenance Procedures. Irrespective of whether you are operating single or twin-engine helicopters, if you operate offshore or over any hostile environment, continuing airworthiness policy and monitoring systems are critical at minimizing engine power loss.

Control 8.4, Vibration Health Monitoring/Health and Usage Health Monitoring. This is proving to be invaluable technology in detecting the onset of probable technical failure before it actually happens. It is also an excellent means of trend monitoring prior to scheduled maintenance periods. These types of systems were first developed during the early 1990s to assist in the identification of airworthiness related failures and relied on the storage of data to PCMCIA cards from which information was downloaded and assessed. Whilst this type of data capture and retrieval still exists, the continuing development has seen a broader range of information captured which may be processed on board the aircraft or downloaded for analysis on the ground. HeliOffshore, an organisation representing the interest of offshore helicopter operators, has

CASE STUDY 3 – BARSOHO, CONTROL 8.5

On Dec, 7, 2011, an AS350B2 helicopter was operating on a sight-seeing flight to the Hoover Dam when it suffered a loss of control accident and crashed in mountainous terrain east of Las Vegas. The pilot and four passengers were killed.

The day before the accident, a team of mechanics completed a 100-hour inspection of the aircraft along with a replacement of the engine, the tail rotor servo, and the main rotor fore/aft servo. During the examination of the wreckage, the main rotor fore/aft servo was found with its flight control input rod not connected. The bolt, washer, self-locking nut, and split pin that normally secure the input rod to the servo were not found.

The investigation revealed that the hardware was improperly secured during maintenance conducted the day before. One of the probable causes noted that there was inadequate post-maintenance inspections, which resulted in the in-flight separation of the servo control input rod from the fore/aft servo and rendered the helicopter uncontrollable.

Following the accident and investigation, the families of the four passengers killed in the accident pursued a legal claim for damages. A jury in Las Vegas subsequently awarded them $16 million. (SOURCE: NTSB, AEROSSURANCE)

GREG MARSHALL is vice president of global programs for Flight Safety Foundation. Greg has been involved in the aviation industry for over 30 years in a variety of operational and management roles. Until recently, Greg was the managing director of the BARS Program based at the Melbourne regional office of the Flight Safety Foundation, a position he has held for three and a half years. He has recently been appointed to the position of vice president of global programs based out of the Foundation's head office in Alexandria, VA.

AAR AIRLIFT

recently produced an excellent document titled 'HUMS Best Practice Guidance'.

Control 8.5, Critical Maintenance Tasks and Independent Inspections. The three brief case studies included with this article highlight the importance of this control. Although independent inspections of certain critical tasks may not always be mandated by the regulatory authority for certain categories of operation, the control is required under the standard in recognition of the value of this control as a defense.

Although completion of a BARS audit provides aviation clients who are members of the program with an accredited and independent audit report to an international, industry standard, an aircraft operator doesn't have to undergo a BARS audit to take advantage of this valuable resource material. The suite of BAR Standards, together with their accompanying Implementation Guidelines documents, are freely available for download from the Flight Safety Foundation website. When implemented by an aircraft operator, such as Control 8.5, they can become a key mitigation of risk whether required by regulation or not.

HELICOPTER OPERATORS IN THE PROGRAM

There are currently 29 helicopter operators who are formally a part of the BARS program. This means that they have undergone a formal BARS audit and are registered on the BARSoft system for member clients, such as the

SIKORSKY S-92
SIKORSKY

mining and offshore sectors, to access. This also means that they have demonstrated that they comply with the requirements of the program by having these controls in place. Each of these BARS registered aircraft operators perform either onshore or offshore aviation support activities, in some cases, both.

More information can be found at http://flightsafety.org/bars/bar-standard.

Effective safety management systems and industry-based standards, such as BARS, have made a tangible contribution to aviation safety. Where an aircraft operator does not have a control in place prior to a BARS audit, they certainly do to attain a successful completion of the audit. For those aircraft operators who have not undergone a BARS audit, you can still take advantage of the benefits of the standard by self-application of the controls from the standard. The brief case studies included with this article attest to that.

With the incremental increase in the application of controls such as those in the BAR Standard, comes an incremental increase in safety for the industry. From this, everyone benefits. **AMT**

ONE ENGINE WITH TWO HEARTS

BEING DESIGNED FOR LIGHT HELICOPTERS, UAVS AND FIXED WING

The Twin Engine Pack System (T.E.P.S.) is using existing design methods, technologies, and engine parts but is combining them in an unusual way creating a surprising result with unprecedented combustion piston engine redundancy

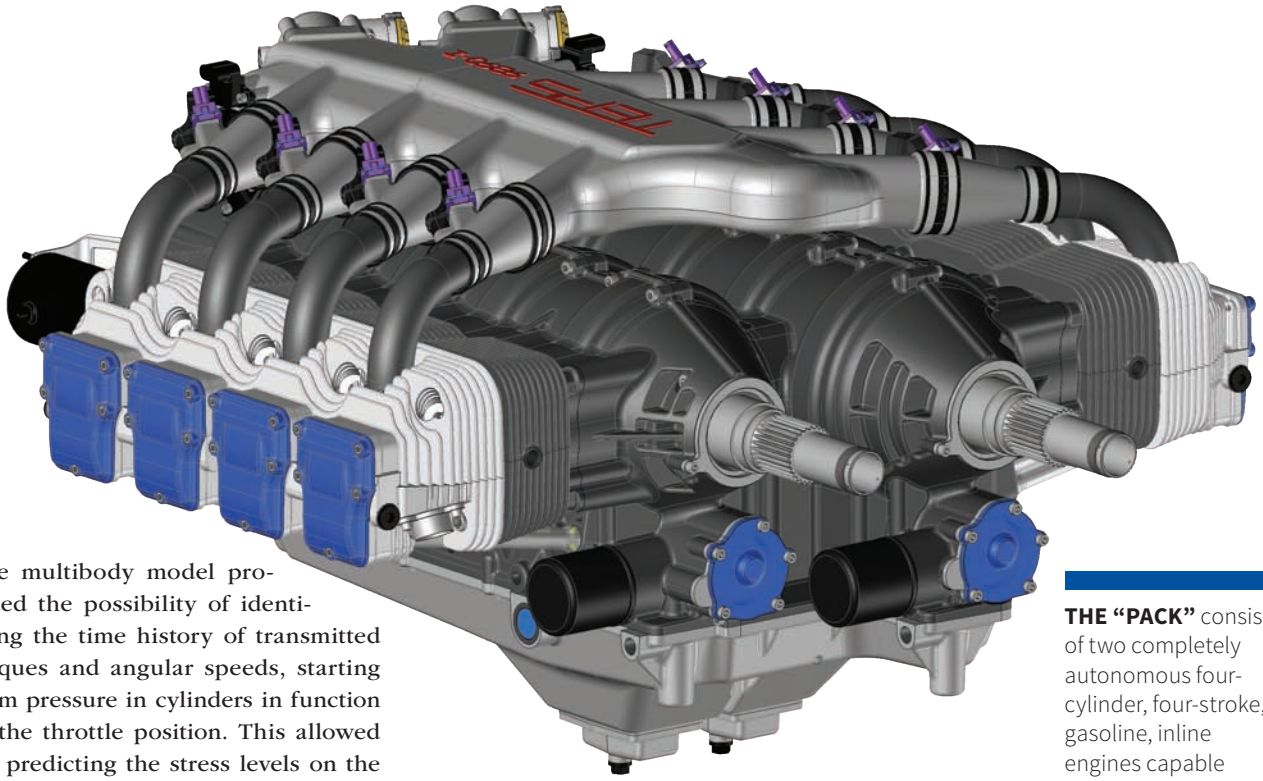
By Marino Boric

A new engine project, officially presented by the Italian engine designer RME at the AHS Annual Forum in Virginia Beach, held in May 2015, is a different approach to a more reliable and highly redundant piston engine.

The new engine is using existing design methods, technologies, and engine parts but is combining them in an unusual way creating a surprising result with unprecedented combustion piston engine redundancy. The hulking acronym T.E.P.S. means Twin Engine Pack System and actually means two engines in one. Our European correspondent visited the engine designer and discovered surprising features and brand new project details.

A detailed, virtual, multibody model of the T.E.P.S. engine unit was developed at Politecnico di Milano (Milan Technical University) using the multibody/multidisciplinary software MBDyn.

MARINO BORIC graduated with a university degree as an aeronautic engineer, and acquired degrees in business development/trade and commerce and 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.

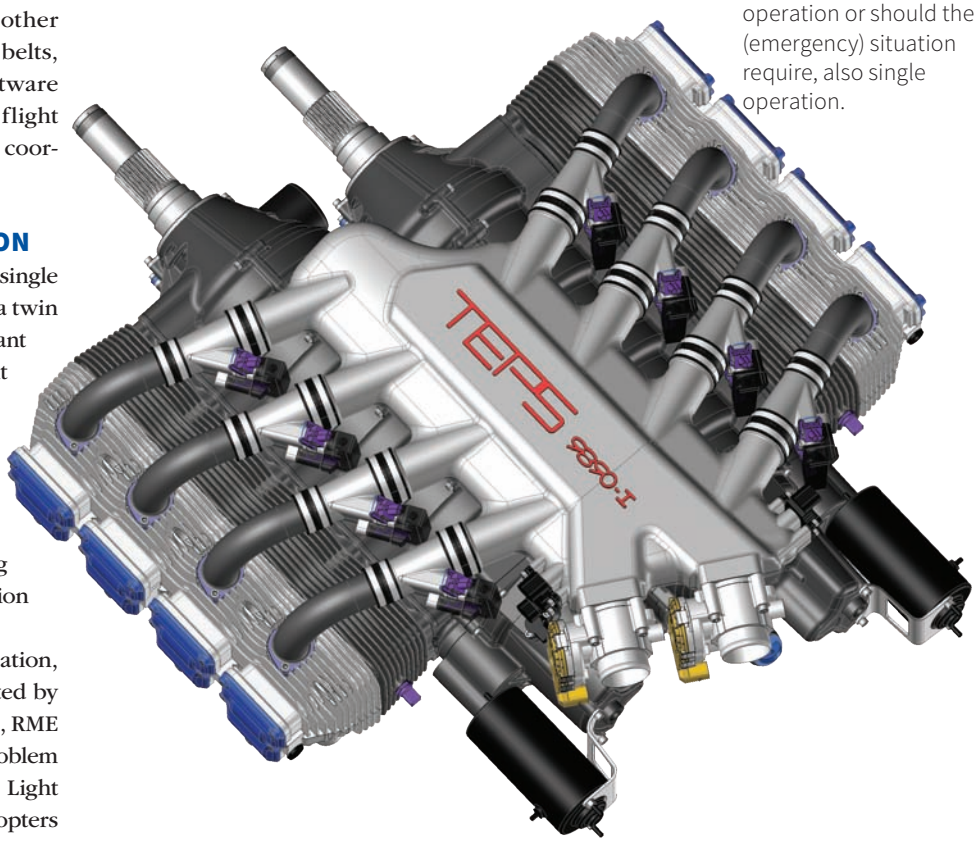


The multibody model provided the possibility of identifying the time history of transmitted torques and angular speeds, starting from pressure in cylinders in function of the throttle position. This allowed for predicting the stress levels on the engine components like pistons, connecting rods, crankshafts, and other components of transmission like belts, pulleys, mast, and rotor. The software even allowed simulation of some flight maneuvers like pull-out, flat, and coordinated turns.

CURRENT MARKET SITUATION

Today's rotorcraft are powered by a single piston engine, single turbine, or by a twin turbine — defining with its powerplant the helicopter category. Powerplant redundancy can be found only in twin turbine helicopters which usually weigh more than 2,000 kg/5,000 pounds and where each turbine delivers more than 400 SHP. The result is high operating cost due to the high fuel consumption and complexity.

Starting from this market evaluation, where the entry market is dominated by light, single-engine powered devices, RME CEO Roberto Papetti identified a problem and designed the possible remedy. Light piston, twin-engine powered helicopters are missing because suitable twin-engine



THE "PACK" consists of two completely autonomous four-cylinder, four-stroke, gasoline, inline engines capable of synchronous operation or should the (emergency) situation require, also single operation.

solutions are not available. RME wants to leverage this dilemma and offers the T.E.P.S. engine as a problem solver.

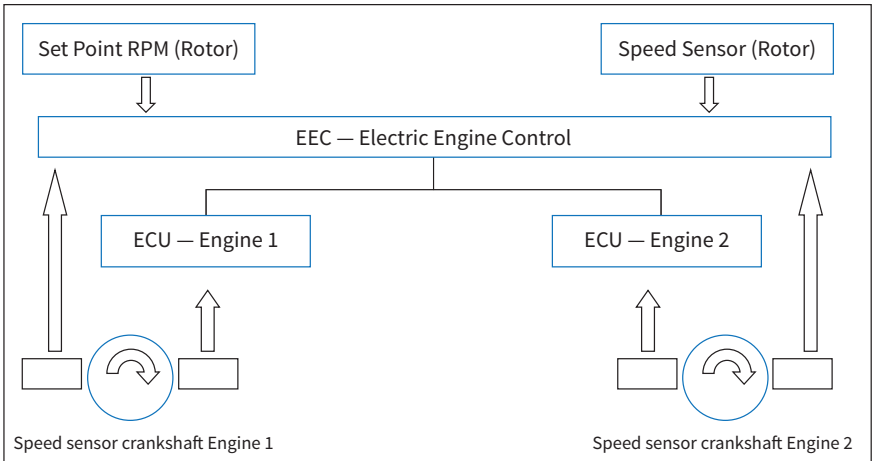
THE PROBLEM

The lack of usable powerplants is limiting the use of light helicopters and only a twin engine is according to RME able to ensure the possibility to certify the aircraft as a Class-A, VTOL aircraft and to fly over densely populated areas.

T.E.P.S., TWIN ENGINE PACK SYSTEM SOLUTION

The T.E.P.S. engine project is based on the RME four-cylinder, flat, 100-hp engine with 2.5-liter displacement. The RAP 2.5A engine is already being tested in a fixed wing aircraft and has logged almost 1,000 operating hours on a RME dyno and is now is in first industrialization phase.

The experience acquired in RAP 2.5 engine testing has allowed it to significantly speed-up the T.E.P.S. project, delivering real-life data.



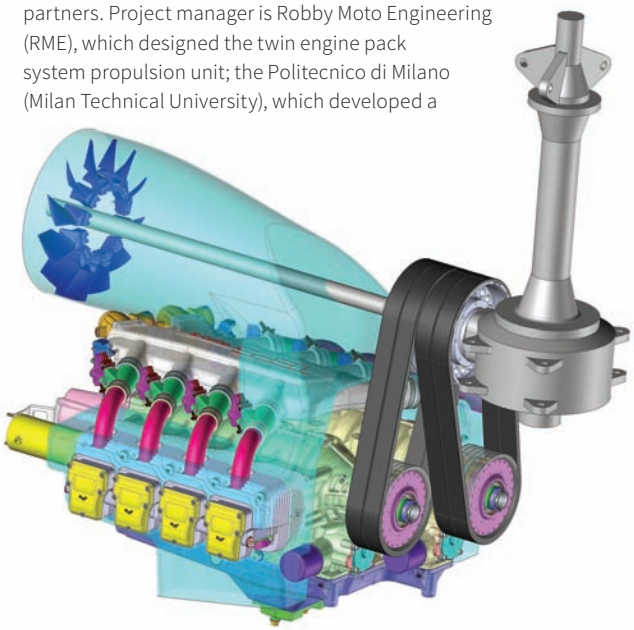
GRAPH 1: STRUCTURE OF THE CONTROL SYSTEM

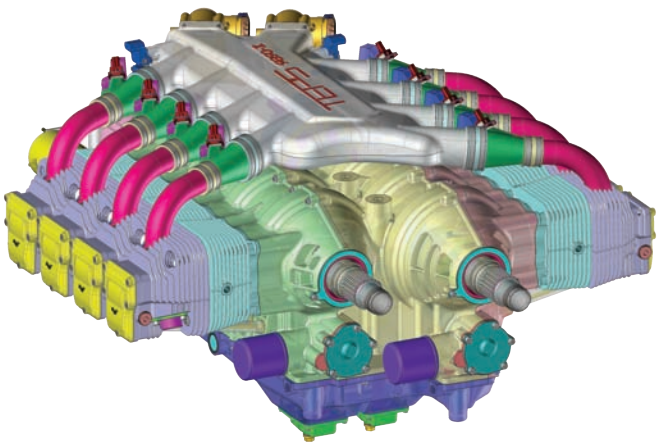
Although the Twin Engine Pack System is one engine, the manufacturer calls it a "Pack" because of the integration of two engines in one single unit. The "Pack" consists of two completely autonomous four-cylinder, four-stroke, gasoline, inline engines capable of synchronous operation or should the (emergency) situation require, also single operation. Total weight of the package is 285.6 pounds (130 kg), and 330-cubic-inch (5.4-liter) displacement engine delivers up to 240 hp.

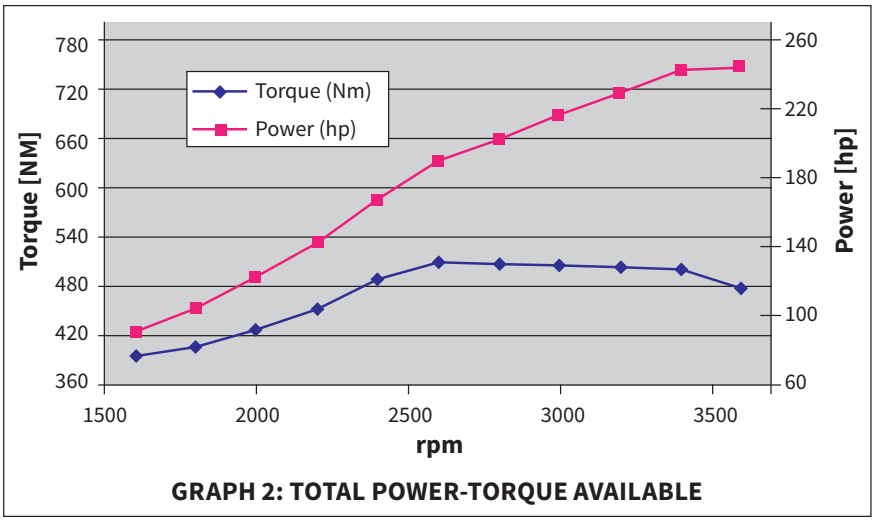
The T.E.P.S. engine consists of two, four-cylinder, inline engines that are attached to each other with their

WHAT IS T.E.P.S. AND WHO IS BEHIND IT?

T.E.P.S. is a conceptual design project of a low-cost twin piston engine primarily for very light rotorcraft (VLR). This engine project is the result of the collaboration between several north Italian partners. Project manager is Robby Moto Engineering (RME), which designed the twin engine pack system propulsion unit; the Politecnico di Milano (Milan Technical University), which developed a multibody model to optimize and predict the performance of the engine and the helicopter; research center AQM; and electronic specialist Metasystem. Because of its innovative character and unique qualities in terms of efficiency and reliability in the combustion engine field the project was co-funded by the Italian state authorities in this case by the Lombardy province and Cariplo Foundation.







GRAPH 2: TOTAL POWER-TORQUE AVAILABLE

crankcases, creating an eight-cylinder, flat engine with two fully independent, separated crankcases. It's like having Siamese twins attached to each other, back to back, by the skin. To minimize the engine width, RMA designer slightly shifted one engine approximately 3 inches (86 mm) backwards so that the crankpins of one engine are aligned to others engine main bearings.

Each engine with 2.7-liter displacement is equipped with its own lubrication/cooling system, power supply and a two-channel engine controller unit (ECU). In order to ensure highest safety standards two sparkplugs and two fuel injectors per cylinder will be used. Each engine has its own electronic throttle-body controlled by a proprietary ECU. Both ECUs are controlled by a common EEC (electric engine control). This EEC controls the synchronous operation of both engines and in the case of an emergency — when one engine looses power — automatically and instantaneously increases the power of the remaining engine.

WHO IS ROBBY MOTO ENGINEERING (RME)?

Robby Moto Engineering (RME) has been active in the field of engine tuning, development, and research for three decades. The engine division, the Robby Moto, is the heart of the company and it is famous for its activity in the motorbike racing field. Robby Moto is collaborating with the most important SBK and MOTOGP bike championship teams. The racing activity began some 25 years ago with tuning of stock motorcycle engines for racing purposes and has led to a serial production of special parts for stock and racing motorcycles (e.g. Suzuki, Benelli, Ducati) that are sold worldwide. The latest products in this field are design and production of its own GP3 engine, a 250cc; engine for the MOTO3 racing series and for go-cart racing. The racing activity was awarded numerous placements and victories in several national and international series and has led to 12 world records. Lastly, a few marine applications were developed and currently a range of extender engines is being developed for automotive use.

The activities in bike and automotive fields are pursued by the RME special parts and RME engine departments. The RME aero division was established in 2007 and is developing combustion, piston engines for aviation use. In 2007 the project of a four-cylinder, flat, direct-drive, 100-hp engine was kicked-off. This 2,700cc; engine called RAP 9890 is now in a pre-production stage where the first six engines are just being completed — besides a few that are being tested on a RME dyno and one being flight-tested in an UL/LSA airframe. The last project in the chain is the T.E.P.S. engine with 5,400cc; that is described in this article. Because of the activity in this field RMA has applied for the Design Organisation Aproval - DOA in Europe.

FULL POWER WITH ONE ENGINE INOPERATIVE

Each engine in a pack is designed to deliver continuous 120 hp at 3,400 rpm; in a normal operation mode the pack could deliver up to 240 hp — all depending on the installation. In the case the engine is installed in a two-seat Class-A VTOL helicopter, certified for flying over densely populated areas, 120-hp output will be assured all the time even with one engine inoperative. This is the highlight of the T.E.P.S. engine. In a case of failure of one engine (in a 120-hp, normal operation mode, each engine delivers 50 percent of its nominal power) the EEC opens the throttle of the remaining engine so the result is always 100 percent power or 120 hp.

In a common four-seat helicopter, UAV, or fixed wing total power output could be 240 hp (2 x 120 hp) on both engines or 120 hp on one engine.

The cooling of the T.E.P.S. engine is provided by two independent cooling systems and is mainly (by 80 percent) assured by a patented oil to air system (oil cooling with an air-cooled radiator). Cylinders and cylinder heads are fitted with cooling fins which are designed to provide 20 percent of cooling in case of an oil cooling system failure. Besides the newly designed crankcase, the T.E.P.S. engine is using "engine top" (cylinder, heads, pistons) components tested in the smaller four-cylinder engine.

For more information on Robby Moto Engineering visit www.robbymotoeng.com.

RME designed a proprietary helicopter transmission/reduction unit similar to solutions already in use. The RME system is based on a combination of grooved pulleys, reinforced elastomeric trapezoidal belts and with free wheels with multiple clutches. It is able to withstand the high load irregularity of reciprocating propulsion units. The first rpm reduction step is performed by two parallel belt drive systems that connect each engine shaft pulley to two driven pulleys located on a common output transmission shaft.

FINAL COMMENT

First of all we have to say that the T.E.P.S. engine is right now just an engine project, and potential buyers could get it in several years. Despite this, the information received from RME indicates that the probability that this engine project could be realized soon, has recently, risen considerably. The Italian RME was in final negotiations with "three major, established engine manufacturers" in December 2015 and is expecting that ink on the sale contract might be drying when you read this.

The RME engine is opening the way of the technical feasibility of a helicopter to be certified as a Class-A VLR device, powered by an innovative twin piston engine pack. Currently the design of the T.E.P.S. propulsive unit design is completed and the realization of the first prototype is underway. First run-up and beginning of dyno testing is scheduled for first quarter of 2016. This engine could be of interest even for a fixed-wing applications and for UAVs. The idea of a twin engine pack connected to a single propeller is very appealing and means a higher safety and redundancy level compared to existing solutions. ***AMT***

A COMPETENCY-BASED 147:
A FULL SCHOLARSHIP FOR EMPLOYERS

Industry desperately needs competency-based teaching guidelines that allow educational institutions to cater programs to the needs of employers

TITLE 14 CODE OF FEDERAL REGULATIONS (CFR) Part 147, the regulation governing aviation maintenance technician schools (AMTS), has not been significantly updated in more than 50 years. Given the wild advances in technology since that time, the law mandates AMTS teach many skills that aren't even used in the real aviation world. After tuition checks are deposited, industry is left holding the bill for actually ensuring graduates are capable of completing the basic tasks required to maintain modern, sophisticated aircraft.

After years of planning and effort by industry and regulator working groups, a notice of proposed rulemaking was released in October 2015. The proposal would make a lot of needed changes, most importantly removing specified curriculum and hour provisions that require each AMTS to pour resources into teaching outdated technologies. It would also allow for a credit-based system, which brings the regulation in line with Department of Education requirements and guidelines.

There is still room for improvement. Industry desperately needs competency-based guidelines that allow institutions to cater programs to the needs of employers. The proposal does not provide for such frameworks; in fact it contains many specifics carried over from the current rule that fly in the face of a competency-based program.

For instance, the proposed rule would require that "[t]*he system … show hours of absence allowed, and show how the missed material and hours will be made available to the student.*" While making missed material available to students is a completely rational idea — one that arguably need not be dictated through regulation — agency guidance has interpreted the regulation to mean that *all* missed projects and assignments must be "made up" and the manner in which that must be accomplished (see Order 8900.1, Vol. 2, Ch. 12, Section 1 and Section 3 and Advisory Circular [AC] 147-3B). This has led to wasted time and increased costs for the AMTS community, forced to re-teach outdated content to students, many of whom may already be deemed competent in the subject matter.

Similar challenges are presented by requiring specific student/teacher ratios and "passing norms," the inability to teach above defined curriculum levels without FAA approval, and requiring approval of instructor rosters. These prescriptive, inflexible regulations will not ensure a qualified workforce.

Put simply, the proposal maintains its predecessor's antiquated concern with the time a student spends in a classroom seat at the expense of the skills he or she actually gains. A competency-based standard, free of defined schedules and specific hour requirements, will allow industry to transition away from seat time in favor of a structure that creates flexibility, and allows students to progress as they demonstrate mastery of subject matter, regardless of time, place, or pace of learning. A flexible framework would also further other educational initiatives including distance learning, dual enrollment programs with secondary education, and project-based learning.

A competency-based standard will create flexibility, and allow students to progress as they demonstrate mastery of subject matter, regardless of time, place, or pace of learning.

Fixing 147 is an industry imperative. Handicapping our schools burdens both graduates and employers — imposing costs on the entire aviation community. Let's all step back and consider a wildly new approach that would allow the educational system to provide the best workforce through the most efficient means. To do that we need to let the educators do what they do best, and get the regulators out of the teaching business. **AMT**

CRYSTAL MAGUIRE is senior managing associate of Obadal, Filler, MacLeod and Klein, P.L.C. advising clients in international aviation safety regulation and government affairs. She serves as vice president of operations for the Aeronautical Repair Station Association and business manager for the Aviation Technician Education Council.

"COMPLIANCE PHILOSOPHY" IS THE **FAA'S NEW APPROACH TO REGULATORY COMPLIANCE**

This new approach will evolve current enforcement action beyond strict adherence to rules. Inspectors will form partnerships with certificate holders to see how certificate holders' processes and practices are improving safety.

By Dr. Bill Johnson

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.

I have about 50 years of aviation experience, including a decade at the FAA. Throughout that time I could not have predicted FAA's current approach to safety. As a longtime safety professional, I am delighted to highlight that we are experiencing a regulatory re-organization, doing "the new right thing." This new objective strives to ensure that regulatory compliance and safety are mutually inclusive. Let me explain.

WAS FAA REALLY WATCHING ME?

For the first decade or two of my aviation career I saw the Federal Aviation Administration as the aviation police. They tested me and issued my flight and maintenance certificates. The FAA would conduct ramp check or review the approved 141 or 147 curricula. Quite frankly, I did not see the FAA inspector as a partner who could help me to ensure safety. In fact, as a pilot/mechanic/Part 147 instructor, I never really saw the FAA but I perceived that they were "watching." Through rules and guidance material they oversaw all of my actions.

The FAA aviation rules and guidance helped to ensure that my training met a safety standard. They were intended to guide me to maintain a level of currency/proficiency. Most of the time, it was straightforward to comply with the rules. The implication has always seemed to be that if I was legal, then I was safe. However, I came to understand that minimum compliance was not a guarantee of the highest level of safety. The difference between a certificate holder and a good certificate holder is the ability to find ways to go beyond the rules to achieve continuing safety and operational efficiency. That's what safety management systems (SMS) are about. SMS is important in a transition from being the "watcher" to becoming a partner.

Throughout my career, it became clear that unintentional noncompliance with a regulation did not necessarily breach acceptable levels of safety. Regardless, if such noncompliance was discovered, it would result in a Letter of Investigation, with likely regulatory action. Plainly, FAA would "bust" you. The good news is, the new FAA approach does not include "busting" someone as the first course of action. This new approach is called the "compliance philosophy." It represents another important second step for FAA in transforming the nature of compliance and safety.

COMPLIANCE PHILOSOPHY AND SMS

The current FAA "Compliance Philosophy (see Order 8000.373, June, '15) is straightforward. An excerpt from that order states:

"… When deviations from regulatory standards do occur, the FAA's goal is to use the most effective means to return an individual or entity … to full compliance and to prevent recurrence.

… FAA recognizes that some deviations arise from factors such as flawed procedures, simple mistakes, lack of understanding, or diminished skills. The agency believes that deviations of this nature can most effectively be corrected through root cause analysis and training, education, or other appropriate improvements to procedures …"

When Administrator Huerta briefed this concept to the FAA workforce in July 2015, he was very serious about the concept, stressing that the traditional enforcement action must not be the first choice to ensure regulatory compliance. He stipulated that we are not ceasing enforcement action, rather attempting to apply it to the extreme cases of noncompliance.

At the ground level, the guidance material for your FAA Aviation Safety Inspectors is located in Order 8900.323. Refer to it and see how your Aviation Safety Inspector is guided to apply the new compliance philosophy. It also stipulates how serious FAA management is about supporting the inspectors who embrace this new approach to compliance. Sample guidance states:

"… the Aircraft Flight Standards approach to oversight and compliance is evolving to stress an engaged, solution-oriented, outcomes-based approach. The goal is to identify deviations from standards and correct them as effectively, quickly, and efficiently as possible … This approach will more effectively address inadvertent deviations and conserve FAA enforcement for intentional, reckless, criminal, and uncooperative behavior … Accordingly, AFS leaders, managers, and supervisors will support inspectors when they use critical thinking to exercise sound professional judgment and take actions in accordance with this notice."

This new FAA attitude will take some time to evolve. The good news is, this is an approach that certificate holders and inspectors have clamored for, as evidenced by the hundreds of comments throughout our 25 years of conducting human factors courses. The next important step lies with certificate holders and inspectors to strive for new and improved methods for open communication and joint efforts to solve challenges. This is not an overnight process merely driven by an order; the compliance philosophy shall evolve.

NECESSARY PROCESS FOR COMPLIANCE PHILOSOPHY TO SUCCEED

FAA acknowledges that the complexity of today's aviation environment requires that safety improvements move beyond simple compliance through prescriptive rules. Certificate holders have been instrumental in identifying multiple avenues to compliance which suits their unique organizational needs. In this same way, all segments of the industry must move forward with effective ways to identify hazards and manage their respective risk. FAA Inspectors will use this new approach to evolve current enforcement action beyond strict adherence to rules. Forming partnerships, inspectors will work with certificate holders to see how certificate holders' processes and practices are quantifying and improving safety.

The old hide and seek games played by industry and the FAA must become a noncompetitive engagement, where success and failure is a shared outcome. Again, the industry must apply a process to identify and then address personal or organizational hazards. Voluntary reporting of safety hazards, or even minor violations, must become a norm. In order for that to happen, FAA will continue to respect voluntary reports and not use them against reporters. The current FAA Aviation Safety Reporting System (ASAP) is the best example of the industry and government partnership of identifying hazards, reducing risk, and sharing the lessons learned.

WHAT CAN YOU DO?

The answer to how to capitalize on the new philosophy depends on your role and segment in the industry. The International Civil Aviation Authority (ICAO) recommends that civil authorities and those whom they regulate have a safety management system. Authorities must comply with ICAO or have evidence for why they cannot. You can learn about FAA SMS regulations and guidelines at (www.faa.gov/about/iniatives/sms/). If you are in an airline organization (Part 121) or an MRO (145) doing work for the airlines, then you are probably high on the learning curve. You know about risk assessment, root cause analysis, and receive regular updates and training from your companiy. Other operators and individuals are voluntarily adopting SMS practices not only to prepare for evolving regulations but also to ensure continuing safety and increasing operational efficiency.

When you are able to "walk the talk" surrounding safety management you can expect many things, but here are two. First, it diminishes the chance that you will have noncompliance issues with your FAA inspector. Second, should a noncompliance issue arise; your documented approach to personal and organizational safety management will make you the ideal candidate for proper execution of the compliance philosophy.

Finally, I believe that the FAA has a very good safety culture. It is clearly a corporate value that is expressed at the top and practiced throughout the organization. FAA employees can tell you their role and activity that supports continuing safety. The compliance philosophy is only the latest example of how the FAA is trying to reinforce and formalize the safety culture that permeates our industry. **AMT**

THE LESSON

To share our experience with others, to submit changes that could improve the reliability of aviation maintenance, and to be a voice that protects the airworthiness of our aircraft create a career worthy of pride

The mission of aviation maintenance training schools across the country is to ensure that new AMTs are ready to enter the workforce. To be truly "ready" for the awesome responsibility of keeping the world safely in flight requires more than technical skill and mechanical savvy, it demands aviation professionals truly understand the impact of their work. The member institutions of the Aviation Technician Education Council (ATEC) work tirelessly to provide students with all of the tools they will need to succeed in the workforce, support aviation business, and keep passengers and cargo safe and on time. How seriously do A&P schools take this responsibility? See for yourself through the eyes of industry professional Jay Dankoff, graduate of ATEC member school MIAT College of Technology:

Learn more about ATEC at www.atec-amt.org, MIAT College of Technology at www.miat.edu and Convergent Performance at www.convergentperformance.com.

Everyone has a moment that changes the way that they approach their profession, one that is permanently branded into what makes that person tick. Like all AMT prospects, I had to invest thousands of hours in required training, study advanced sciences and engineering principals, and give up a noteworthy amount of sleep, all while incurring a healthy bit of debt. Though our curriculum and its administration are set to see some much-needed updates in the near future, I found that every morsel of knowledge that I gained in technical training was beneficial to my career. Looking back on all of those hours of study and application, there was one lesson that I learned while in technical training that was not part of the required curriculum, yet was undoubtedly one of the most defining and important lessons from my whole training experience.

PREPARING MECHANICS FOR INDUSTRY CHALLENGES

One evening I stayed late at the training center and got the opportunity to talk with one of the gray-haired instructors. Knowing that he had retired from a 30-plus year career as a major airline mechanic, I was interested in understanding why he was working at the AMT school. I jokingly asked him if the retired life was too boring for him, or if I should look into a career field with better retirement options. I was taken aback by the unexpected response I received, and it took a while for it to really sink in.

He told me that during a large portion of his career, he was responsible for trimming the airline's 727 engines at night, in order to prepare them for the flight schedule of the following day. He said that most nights he only had himself and a trainee to get the job done, and they would have several planes to do. He also said that two experienced technicians are really needed to get the work done reliably, one in the cockpit and one at the engine, working in careful coordination. He felt like he was being forced to make do. He shared with me the terrible nervous feeling he experienced every morning when the planes started taking off; he always hoped they would perform the way that they were supposed to and fly safely. The words that followed changed me:

"That is no way to live, and it isn't a career to be proud of," he said. "Now, I want to make sure that I can help future mechanics prepare for challenges like this, to help repair some things I left unfixed."

He wanted to have an effect on the industry and felt that he owed it to himself. His story really shifted my view of our responsibilities as aviation maintenance technicians from simply doing a good job, to an understanding that it is really much more: Every day we are either making our industry stronger, or we are allowing it to degrade.

It can become very easy to be overwhelmed by the bureaucracy, the heavy-handed regulation, and the slow-moving wheels of the aviation industry, and feel like we do not really have that much of an appreciable impact. In reality, we are often the only people who can have an impact on industry safety, by making an important decision. A decision to look for the opportunities to help ourselves, our organizations, and our coworkers grow. A decision to share our experience with others, to submit changes that could improve the reliability of aviation maintenance, to be a voice that protects the airworthiness of our aircraft. A daily decision that results, when we look back, in a career worthy of pride.

How will your decisions affect our industry? **AMT**

JAY A. DANKOFF is a lead instructor of aviation maintenance safety at Convergent Performance. He was one of *AMT*'s 2015 Next Gen Award winners. You can read more about him at: www.aviationpros.com/article/12128576

HEY, WHERE'S THAT LOGBOOK?

Will your insurance policy cover maintenance logbooks if they are damaged, or worse yet lost?

WHERE ARE YOUR CUSTOMERS' aircraft maintenance logbooks? Do you keep them in a safe place or piled on the side of a desk? What condition were they in when you received them? Are you sure you returned all of them when the plane left the shop? And the big question, will your insurance policy cover maintenance logbooks if they are damaged, or worse yet lost? How much would the aircraft go down in value if the maintenance logbooks were lost, damaged, or destroyed?

These can be scary questions that many aircraft repair shops and service providers may not have thought about. Don't assume the aircraft's maintenance logbooks are considered part of the aircraft and covered by the aircraft insurance policy. It is common for aircraft insurance policies to include "tools and repair equipment" and "parts temporarily removed and not replaced" in the definition of aircraft, but no mention of aircraft maintenance logbooks.

Will your insurance policy cover maintenance logbooks if they are damaged, or worse yet lost? How much would the aircraft go down in value if the logbooks were lost, damaged, or destroyed?

The Federal Aviation Regulations only stipulate that aircraft maintenance logs be transferred with the ownership of the aircraft. They do not include logbooks in the definition of an aircraft. As such, it is left to the insurance policies and the courts to decide what should and should not be included in the definition of aircraft on a disputed claim.

You might say to yourself "I'm paying thousands for insurance every year to cover my maintenance shop, my insurance policy must cover logbooks, right?". Not necessarily. Most repair shops buy liability insurance which means the shop must be found negligent for the damage or loss. If the loss was unintentional (Acts of God, theft, or simply misplaced) a liability policy may not pay. And if they do, they may only replace the logbooks (with new, blank ones), not "reconstruct" the logbooks to their original content. As you know, the older the airplane the more entries were in those logs. Complete reconstruction of older logbooks may be a monumental task.

So, what can you do? Practice some practical and straight-forward best practices when it comes to handling maintenance logbooks for your customers.

- **When the logbooks arrive in your shop take digital photos of each page and upload them to off-site storage.** Technology and storage are cheap these days, and taking a few extra minutes on the front end can save a lot of headache if the books are lost.
- **Store the logbooks in a safe, dry, secure place during maintenance.** A lockable fire-box or fireproof cabinet works well for this.
- **Have an acceptance/delivery document listing the logbooks and require signatures by the customer and the shop.** Sign when you receive the logbooks, and sign when you return the logbooks. In this manner both parties acknowledge receipt of the logbooks, and no one has to rely on memory.

Taking these simple steps will give your customers renewed confidence in your shop, and may save a lot of time, hassle, and money should the logbooks become destroyed or misplaced. **AMT**

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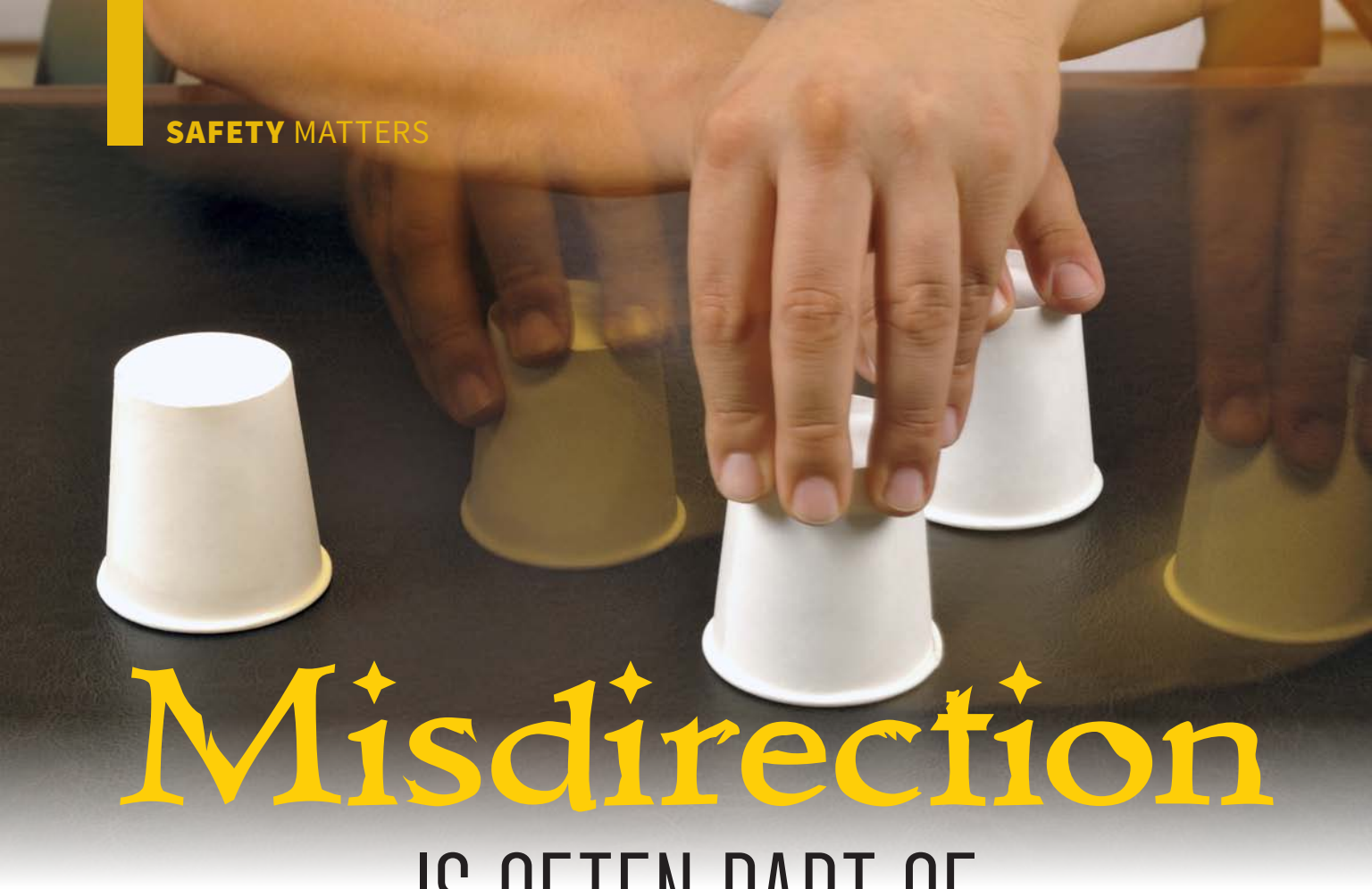

Misdirection IS OFTEN PART OF ACCIDENT INVESTIGATIONS

If you focus on the obvious, you miss the subtle. Complete facts and reliable analysis are vital to accident investigation.

By Stephen Carbone

I love watching Penn and Teller, they're so entertaining; their presentation so streamlined; and their technique so obvious. Teller works alone while Penn monopolizes the audience's attention; Teller works silently while Penn laughs it up; and Teller works openly while Penn misdirects.

In accident investigation, the same thing happens: if you focus on the obvious, you miss the subtle. In reviewing my first accident investigation: LAX01MA272, I got caught up with the conspicuous while ignoring the elephant in the room. But I wasn't alone.

On August 10, 2001, a Papillon Grand Canyon Helicopters air tour Eurocopter AS350-B2 with a Turbomecca Arriel 1D1 engine, tail number N169PA, crashed near Meadview, AZ. There were no witnesses; the sole survivor could not provide reliable information. The accident's probable cause: the pilot's loss of control of the helicopter for undetermined reasons.

Onboard were six family members – all adults – and the tour guide/pilot. N169PA was one of two Grand Canyon tour helicopters running a mapped-out sightseeing excursion of the canyon. After a planned stop and refueling, N169PA preceded the sister following helicopter (FH) by a few minutes toward the Grand Wash Cliffs. When the FH entered the same valley, N169PA was burning, destroyed, laying on its side on a 40-degree sloping wall. The survivor's burns were extensive, her memory limited from shock.

Both helicopters' passengers were part of the same tour group, N169PA being the lead helicopter during

the tour's last leg. The FH saw the smoke before coming up on the wreckage and called for help. It was believed that N169PA slowed to allow the FH to catch up, hovering just inside the Grand Wash Cliffs valley. The experienced pilot had no reason to set N169PA down on the 40-degree slope, the pitch of which would guarantee the helicopter's main or tail rotor would strike the valley wall.

RECONSTRUCTING THE ACCIDENT

With no reliable witnesses, the accident had to be reconstructed. A powerplant investigator, a structural investigator and I — the aircraft maintenance investigator — were asked to assist from DC. Almost two weeks passed before all the maintenance records arrived in DC. During this time what was left of the engine was torn down and the aircraft's structure examined. However, too much time had passed – and this is important – before the fuel depot where N169PA refueled, was tested for contamination.

The engine was found to have operated correctly in all parameters. Despite the engine's post crash condition, all settings were correct; all air and flame necessary for combustion were properly regulated and available. Unfortunately fuel from the engine and filters was consumed by the fire or was too contaminated from the surrounding terrain for decisive findings of impurities.

As the maintenance investigator, I looked into N169PA's maintenance as far back as its construction in May 1991. After one month of inspections and modifications, N169PA entered service for Papillon on August 2, 2001. All maintenance was performed according to manufacturer's recommended inspection programs. The 10-year-old helicopter was employed strictly as an air tour transport — no lifting or special functions, e.g. firefighting. It had no unusual history, except for a catastrophic event the year prior.

GROUND RESONANCE

Its previous owner was a Japanese company that used N169PA (not its tail number at the time) for moving executives about the city. On one occasion, the helicopter experienced a ground resonance while landing; the event was so violent that the helicopter suffered extensive damage to the airframe.

Here my lack of helicopter experience worked against me as I focused on this event. Ground resonance occurs when a helicopter with rigid landing gear, e.g. skids, either attempts to touch down or rise without breaking ground contact; a quasi-flight/non-flight mode. The helicopter's rotorhead is equipped with drag hinges, each blade oscillating in the plane of rotation at its own harmonic. When this type of helicopter contacts the ground in this fashion, the resulting vibrations have the potential to destroy the aircraft. My friend, a former Vietnam Huey driver, told me the helicopter experiences this event during any flight cycle, but the time in ground resonance is momentary, almost too short to matter. However, if the ground resonance is extended, the vibrations from the main rotor translate through the hull, receiving feedback from the ground, which, itself, has no vibration.

N169PA was written off by the company's insurance agency before being sold to a New Zealand company where it was repaired; it lacked any export certificate of airworthiness (C of A) from Japan to New Zealand. Major repairs were conducted in New Zealand, including the replacement of the left and right center beams; in addition to a complete dismantling and rework, a "C" check was completed four months prior to the accident. The aircraft was sold, crated up, and shipped to Papillon in June 2001. N169PA operated eight days in August with no abnormal issues.

COMPLETE POWERPLANT TEARDOWN

A complete powerplant teardown and structural examination produced no findings, eliminating the ground resonance question. Unfortunately in the absence of credible findings, the NTSB too quickly assigns 'Pilot Error' as the probable cause; this also misdirects from more involved investigating. The pilot was experienced, his skills admired by his fellow pilots. In the absence of better proof, ground effect was suggested. According to Paul Cantrell at www.copters.com, ground effect, "is due to the interference of the surface with the airflow pattern of the rotor system, and it is more pronounced the nearer the ground is approached."

But would an experienced pilot allow himself to enter ground effect with no escape? Would ground effect occur against a 40-degree sloping wall? Wouldn't there be obvious blade strikes from main and/or tail rotors against the sloping wall from such an event?

More importantly, in the absence of a quality fuel sample was fuel too easily dismissed?

Misdirection. Complete facts and reliable analysis are vital to accident investigation. A maintenance investigator unfamiliar with helicopters; fuel evidence not preserved; and the push to put an accident investigation 'to bed'; these all amount to probable causes and recommendations that are nothing more than sleight of hand. **AMT**

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

TEXTRON AVIATION LAUNCHES 1CALL

Textron Aviation Inc. bolsters its customer service offering with the launch of 1Call, which provides a single point of contact for Beechcraft, Citation, and Hawker customers during unscheduled maintenance events. Customers can access the dedicated 1Call team by dialing (316) 517-2090.

With technical support services available 24/7, the 1Call team oversees every step of a maintenance event using visual display boards that track all calls, air response aircraft, and mobile service units through issue resolution.

EXECUJET ACQUIRES MUNICH FBO

ExecuJet Aviation Group will offer handling and ground support services from its fixed-base operation (FBO) at Munich International Airport following acquisition of the former European Business Aviation Services' (EBAS International GmbH) facility.

The Munich FBO is ExecuJet's second handling facility in Germany after Berlin Schoenefeld, and began operation Feb. 1. This addition takes the ExecuJet FBO network to 20 locations across Europe, the Middle East, Africa, and Australasia.

GULFSTREAM SERVICE CENTERS GET INTERNATIONAL MAINTENANCE APPROVALS

Gulfstream Aerospace Corp. reports that several of its service centers recently earned approved maintenance organization (AMO) designations from civil aviation authorities worldwide, increasing maintenance and repair options for customers.

The authorizations include Qatar, which granted AMO status to Gulfstream's maintenance facilities in Savannah and Luton, England. Any Gulfstream aircraft registered with Qatar's Civil Aviation Authority can undergo maintenance, repairs, alterations, and inspections at those two service centers. The designation coincides with Gulfstream's recent delivery of a G650ER, the first of up to 30 aircraft, to Qatar Executive, its business jet division.

The Savannah service center received approval from the Hong Kong Civil Aviation Department (HKAR) to perform maintenance on HKAR-registered G650ER and G650 aircraft, and was authorized by Brazil's Agência Nacional de Aviação Civil (ANAC) to work on ANAC-registered G650ER, G650, G280 and G150 jets. Gulfstream's service operation in Teterboro, NJ, and its Las Vegas service center earned approval from the Cayman Islands' Civil Aviation Authority (CAACI) to work on all CAACI-registered Gulfstream aircraft.

Its service center in Dallas was authorized by India's Directorate General of Civil Aviation (DGCA) to perform maintenance on all DGCA-registered Gulfstream aircraft.

GLOBAL JET SERVICES EXPANDS

Global Jet Services Inc. adds veteran aviation instructor, Jim Sparks to its staff. His avionics expertise will provide new training opportunities on several of the more complex avionics systems and upgrades placed in a wide range of today's aircraft types.

Sparks brings nearly 40 total years of experience acquired from multiple locations across the entire globe (reaching every continent except Antarctica). Sparks' previous roles included technician, DOM, instructor, and now with GJS as a program manager.

CORRECTION

Our apologies to Daniel T. Moore and CD Aviation Services for a mistake in the description for the Next Gen Awards in the November/December issue. The copy should have read:

Daniel Moore is shop supervisor at CD Aviation Services in Joplin, MO. He was nominated by Rick Gibbs, general manager/chief maintenance officer at CD Aviation Services. He holds an FAA A&P Certificate and has achieved Level 2 for NDT Fluorescent Penetrant Inspection and Magnetic Particle Inspection.

According to Gibbs,"Daniel works alongside his team, and leads by example that fosters integrity. Daniel contributes to the industry by instructing an EMT course that is offered to our customers and various tradeshows to educate MROs, pilots, and operators to better understand the TPE331 series engines."

AIRCRAFT PROPELLER SERVICE OPENS BRAZIL FACILITY

Aircraft Propeller Service LLC, Lake Zurich, IL, just opened its facility in Atibaia, Brazil,

located approximately 90 kilometers from São Paulo's international airport and less than 60 kilometers from Viracopos. Serving as general manager for the APS Brazilian facility is Fabio Nascimento, who formerly served as operations manager for the facility when it was owned by UTC.

EASTMAN LAUNCHES WEB-BASED VISUAL GUIDE

Eastman Chemical Company recently launched "Eastman Supports Aviation," a digital, visual guide that highlights all areas where Eastman provides products and services to the aviation industry.

The guide highlights products like Skydrol aviation hydraulic fluids, Eastman Turbo Oils and aviation solvents like SkyKleen, as well as other established aviation products like Clearway deicers. To learn more visit www.EastmanAviationSolutions.com.

COMLUX LAUNCHES VIP SERVICE IN MIDDLE EAST

Comlux The Aviation Group signs a cooperation agreement with Texel Air, in order to provide its Middle East customers with dedicated MRO line maintenance and cabin upgrades and refurbishments on their VIP aircraft.

COMLUX

While Texel Air will provide hangar, maintenance, and certification services through its 3,200 m² facility at Bahrain International airport, Comlux will take care of system upgrades and cabin modification services by hiring local craftsmen and engineers, managed and assisted by Comlux America experts on-site.

The service center will provide maintenance and refurbishment on ACJ and BBJ narrow body aircraft. Last year, Comlux America was granted the warranty and repair facility approval by BBJ and became the first independent ACJ Authorized service center worldwide.

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ATTACKING REGULATORY BARRIERS TO **INVIGORATE THE ROTORCRAFT MARKET**

The success of the Part/CS-23 efforts is why GAMA is working with other industry groups to similarly streamline airworthiness certification standards for Part 27 and 29 category rotorcraft

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

ONE OF THE BRIGHT SPOTS FOR THE U.S. government recently came just before Thanksgiving two years ago. On Nov. 27, 2013, President Obama signed into law the Small Airplane Revitalization Act (SARA), which sought to boost the lighter end of general aviation, known formally as Part 23 aircraft. The bill had passed the U.S. Congress unanimously and was based on the work of more than 150 government and industry experts who spent 18 months examining how to streamline certification for small airplanes: pistons, turboprops, and light jets below 12,500 pounds.

While the Obama administration still must act to implement SARA — and missed a crucial deadline to do so on Dec. 15, 2015 — the overwhelmingly bipartisan support the bill enjoyed in Congress, coupled with the strong support of the Federal Aviation Administration (FAA) leadership and their certification workforce, showed a hunger for getting rid of overly prescriptive requirements that hinder our industry's ability to get innovative safety-enhancing products and technologies into aircraft.

> Technologies are quickly changing how aircraft operate. Regulations should be reviewed and updated to ensure they can accommodate tomorrow's aircraft.

Across the Atlantic, regulators in Europe are also moving to bolster CS-23 for small airplanes, and are likely to issue new regulations for aircraft this year. The success of these Part/CS-23 efforts — and the need to get rid of unnecessarily burdensome requirements for other types of aircraft — is why GAMA is working with other industry groups to similarly streamline airworthiness certification standards for Part 27 and 29 normal-category rotorcraft and transport-category rotorcraft, respectively.

Last year, GAMA, along with the AeroSpace and Defence Industries Association of Europe (ASD), established a working group of leading representatives — including AgustaWestland (now known as Finmeccanica Helicopters), Airbus Helicopters, Bell Helicopter, Sikorsky, and Enstrom Helicopters — to examine how to best move forward on this issue. I want to briefly outline some of the key issues we'll be focusing on.

Although regulators have traditionally considered passenger load, size, and engine types when regulating aircraft, those measures may no longer be the best way to do so. Technologies are quickly changing how aircraft operate, from increased performance and more complex systems that weigh less than previous ones to new approaches for propulsion, including hybrid/electric engines. With this in mind, reviewing and updating the current regulations is a good idea to make sure they can accommodate the future aircraft flying in the skies.

In making any changes, though, it's important to ensure leading regulatory authorities around the globe are on board, as we've done with Part/CS-23. Differences in safety performance, operational needs, and market characteristics all need to be considered. So as we begin this process, the rotorcraft community needs to organize a thorough certification process review first — and that's just what we're doing.

The general aviation manufacturing community has made huge strides in our efforts to help bring new, safety-enhancing products and technologies for small airplanes to market without having to cut through rolls of red tape. It's time we now do the same for rotorcraft. The FAA coined the moniker for the Part 23 effort as "Twice the Safety at Half the Cost" — that is, half the cost for certification to both government and industry. There is no reason that we cannot achieve these same lofty goals for rotorcraft. **AMT**

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