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CASA on Human Factors Training

AMT

Aircraft Maintenance Technology

Written by aircraft maintenance professionals for the professional maintenance team

Official publication for AMTSociety

September 2013

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Technologist at the Air BP Lubricants lab located in Naperville, Illinois prepares glassware for 'Coker Mister' test run. This lab represents the global technology center for the Air BP Lubricants business covering new product research and development, technical support, manufacturing support and OEM liaison activities.

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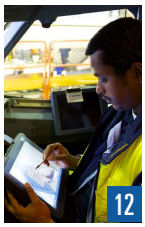

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The More Things Change, the More They Really Change

The airline industry continues to experience its share of change

Ron Donner, Editor

Ron Donner has held both technical and management roles in general aviation and during his 27 years with Northwest Airlines. He holds FAA certificates as an A&P/IA and a commercial pilot.

Open your mobile device, tablet, computer, or a newspaper these days and you can't help but read news or commentary about the airline industry. The subject of airline merger continues to capture the headlines. The impact of fuel prices, labor concerns, shortage of talent, charges for meals, baggage and in some cases seat assignments, all seem to prompt regular comments. We recently read how the Department of Justice brought suit against American Airlines and US Airways in an effort to halt or stall the pending merger on grounds that consumers would have fewer travel options and face higher prices after a major competitor in the industry disappears. You can't help but question why this decision comes now, at a point well into the merger process, and after numerous airline mergers have occurred in the past decade.

Who would have guessed a couple decades ago an airline would operate an oil refinery, or you could go onto any number of internet sites and purchase inexpensive tickets (although most with additional fees attached), or OEMs would actively provide maintenance services rather than only manufacturing aircraft, engines, or components. I've heard comments like will this dynamic industry actually *settle down*? It doesn't appear like it, but the answer to this question really depends on your definition of *settle down*. Yes, the more the airline industry changes, the more it really changes.

Although the business model of airline maintenance has changed for a variety of reasons, you also have to consider how much new technology has impacted, or will impact, aircraft maintenance programs. Examples familiar to us all are the use of advanced composites for the major structure of an airplane, fly by wire technology, and information technology (IT) relating to passenger entertainment, or how the health of new technology aircraft can be monitored, data collected, and future maintenance activities predicted. In this issue of *Aircraft Maintenance Technology* we examine a few new technologies and their potential impact to airline maintenance.

This month we are very pleased to welcome Karen Berg as associate publisher of *Aircraft Maintenance Technology* and *Airport Business* magazines along with corresponding responsibility for AviationPros.com. No stranger to aviation, Ms. Berg was most recently the VP of Business Development with Thompson Aerospace where she led efforts to enhance sales, public relations and business development offerings. Ms. Berg joined KLM in Amsterdam, the Netherlands, in 1999, holding leadership positions as the Director of Operations for Cygnific BV, KLM's wholly owned customer care subsidiary, as well as in KLM's Information Technology and Air Freight divisions. Ms. Berg was also the Director of maintenance and modifications for the KLM fleet and more recently, the VP Sales North America for Air France Industries and KLM Engineering & Maintenance.

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AJW Technique

Fast track to certification at the new Montreal MRO

By Charles Chandler

Charles Chandler began his aviation career as a junior mechanic for American Airlines and retired after 27 years of service.

Early last April, British-based AJW Group invited *Aircraft Maintenance Technology* to a two-day media event celebrating the opening of its new component repair and overhaul facility - AJW Technique - in Montreal, Canada.

We were given the opportunity to tour the facilities, look behind the curtains, peek in the closets, meet and interview employees, and take some photographs. This was as we Americans would say was a really "big deal." It was a big deal for the AJW Group of companies because they can up the level of completion and service to their regional customers. Getting a new international company and creating jobs is very important to the Canadian and Montreal economies. This was demonstrated by presentations from several French Canadian Ministers, Christopher Whiteside, president of AJW Group; AJW Technique's general manager Gavin Simmonds; and other senior managers. With the conclusion of formalities, media members representing maintenance were able to conduct interviews with President Whiteside, Gavin Simmonds, and other AJW Technique senior management and tour the new facilities. After visiting with AJW staff we were able to sort out some of the corporate hierarchy.

Allan Pennycuick, AJW Technique engineering and quality manager.

Photo courtesy of AJW Technique.

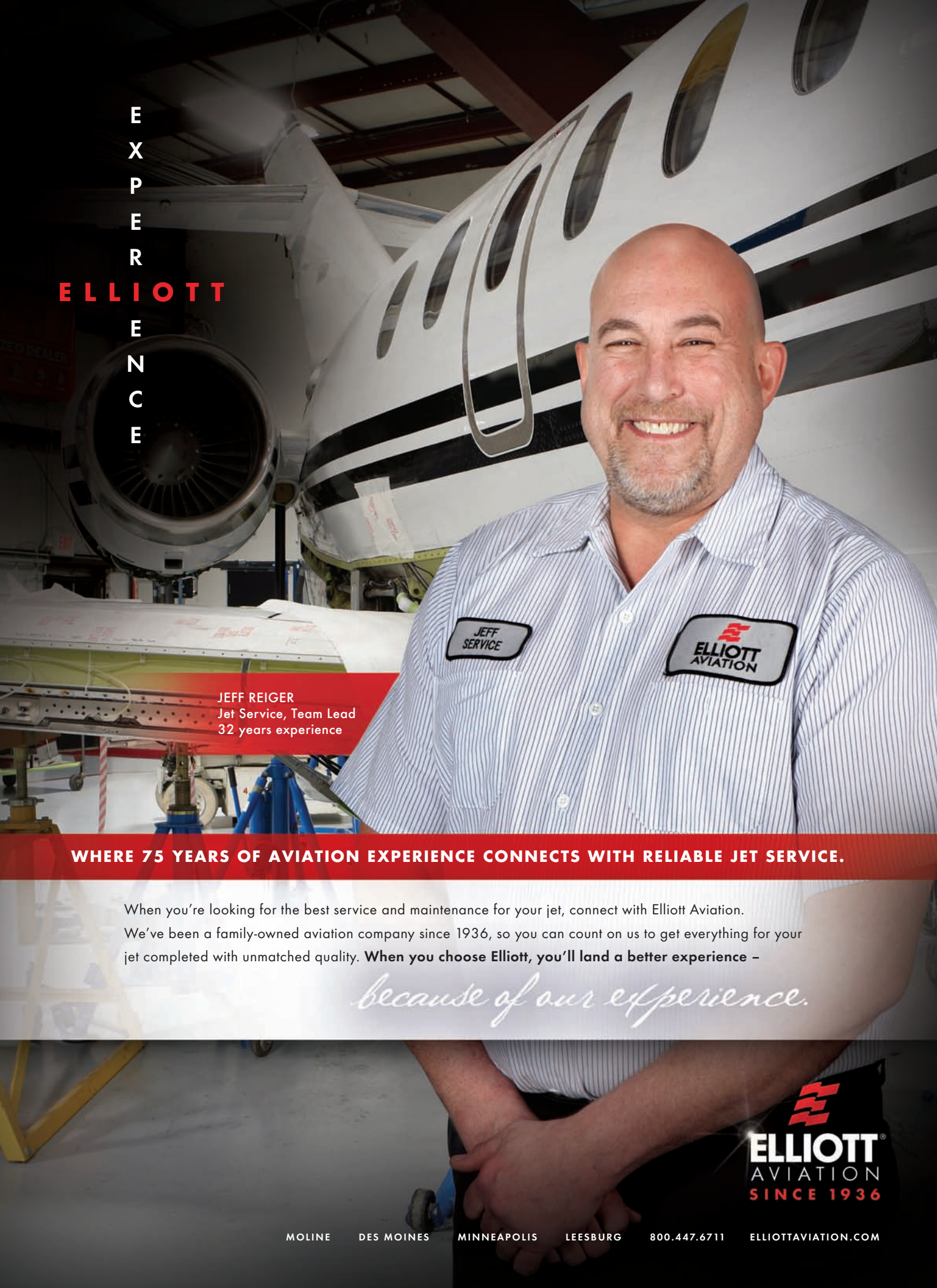
AJW Group

The AJW Group is comprised of four companies: AJW Aviation, AJW Technique, AJW Capital Partners, and AJW Leasing. AJW Aviation was started by Anthony James Walter in 1932 when he began importing the Piper Cub to the United Kingdom. Eighty years later it is the world's largest privately owned supplier of modern aviation spare components with 800 airline customers in 115 countries and about 400 aircraft under contract. It stocks a core inventory of spares with a value of about $500 million for the modern Boeing and Airbus fleets.

Photo courtesy of AJW Technique.

As a result of its 6S quality process, each work station includes a complete set of hand tools that are outlined so it is easy to see where each belongs and when one is missing. This ensures all tools are standardized, calibrated, and certified.

AJW Technique, the newest member of the family, acquired a Montreal facility in August of 2012 with the goal that within six months, it would become the headquarters of the global component repair and overhaul service and an MRO for AJW Aviation's 800 airline customers. Having been through certifying audits with the FAA, EASA, and Transport Canada Civil Aviation (TCCA), I know they can be challenging and time-consuming. So to certify work processes, associated documentation, IT systems, technician training, and a facility in six months was an extraordinary accomplishment. To understand how AJW Technique was able to fast track its certifications, I needed



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AJW Technique uses Component Control's Quantum System to manage work orders and production control, and the Q Pulse System for documentation control, quality management, corrective action reporting, and tooling and test equipment calibration control systems.

to interview Allan Pennycuick, AJW Technique's engineering and quality manager who walked me through the facility and explained.

According to Pennycuick, they began by first considering their component business model and customers, and then developing a building plan, a capacity plan, and project plan for certification. In October of 2012 they began implementing their plans and six months later were certified by three regulatory agencies, hosting a new business launch event and touring media types through their facilities. Per Pennycuick, "Certification was a team effort, start to finish."

The fast track process for certification

- Use a reduced scope process rather than trying to certify all components and the entire facility; determine what ATA Chapters and components to work and define their work processes.
- Next determine what methods and systems to use to calibrate tooling and test equipment (some decisions took two months to finalize). "We selected the Component Control Quantum System to manage work orders and production control, and the Q Pulse System for documentation control, quality management, corrective action reporting, and tooling and test equipment calibration control systems. Both were proven, robust, paperless computer systems."
- Next write the Maintenance Policy Manual (MPM). This was a "clean sheet" initiative, again using a team approach with various employees and technicians participating in the flow charting processes. After the work flow diagrams and definitions were complete, Pennycuick locked himself away for a month to write the first MPM draft. He used a top-down, practical approach, developing the high level process and then 10 working procedures for training and tooling and test equipment, etc. AJW Technique worked closely with TCCA and designed its documentation to meet TCCA's requirements, which would also meet EASA and FAA requirements.
- Pennycuick says, "We held frequent meetings to brief TCCA on design concepts, what would and would not be in the MPM and level of detail included." AJW Technique also developed their own approach to quality performance, named 6S. After reading it, it was easy to see how the Brits built an empire - it was practical, actionable, and measurable.

The primary MPM was submitted for approval in late November 2012, followed shortly by the working procedures, forms, data collection procedures for tooling and test equipment certification, and system backup detail and documentation. AJW Technique's technicians' qualifications, prior experience, and training certainly helped expedite the process. The TCCA reviewed the MPM, details were explained and clarified, and certification was awarded in January 2013.

- Next certify the facilities beginning with a restricted scope. Pennycuick adds, "We chose the galley equipment cell and the coffee makers as the test component. This approach let them present their business systems, technician certifications, work process, tooling and test equipment calibrations for a defined production unit." An example of the 6S quality process was in evidence where each work station included a complete set of hand tools that were outlined so it was easy to see where each belonged and when one was missing. Pennycuick explains this ensured that all tools were standardized, calibrated and certified, and technicians would not use their own tools or need space for personal tool boxes.
- TCCA conducted the audit and granted certification for the coffee makers at the end of January. Because of the bilateral agreements between TCCA and the United States, they also received FAA repair certifica-

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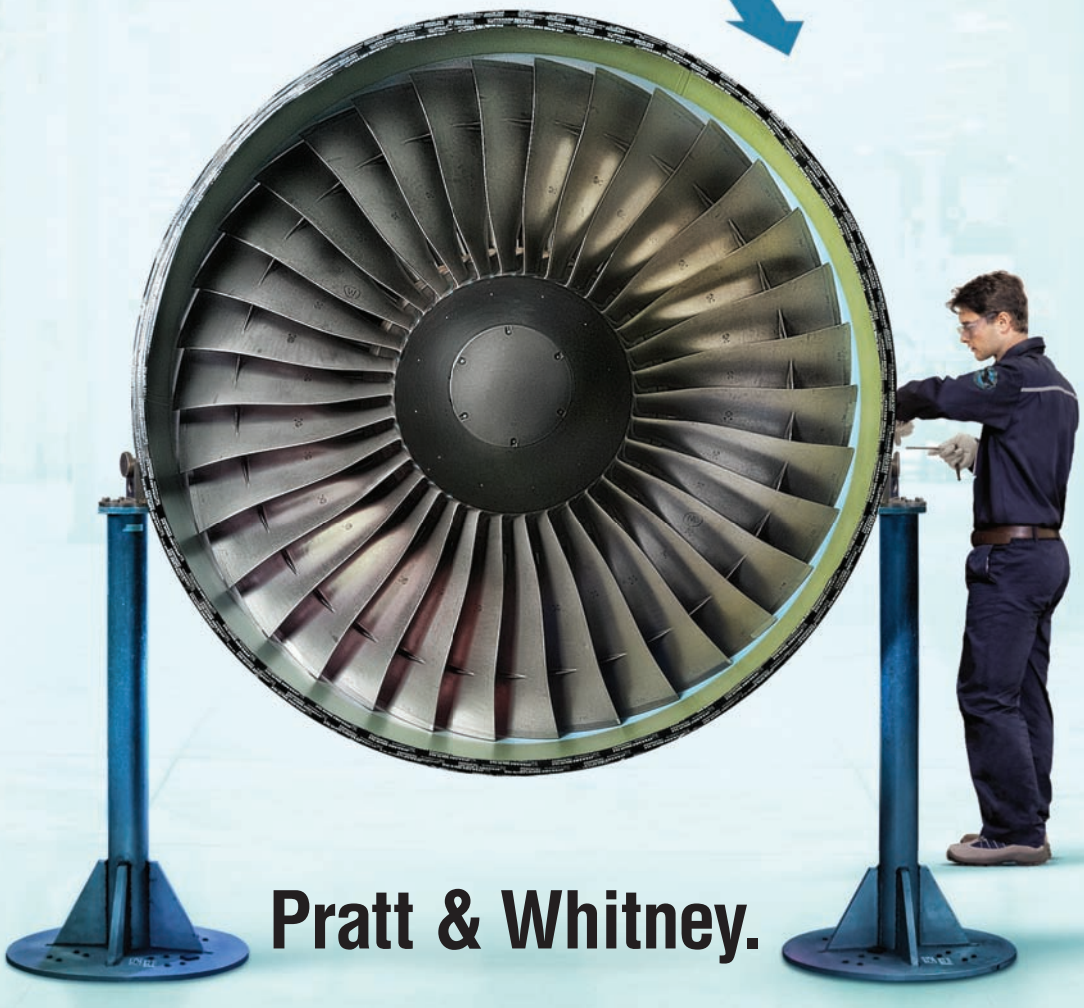

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AJW technique's 6S philosophy

Sort: You must first ask what is needed in your area. If you don't use it, get rid of it. Keep only the essentials for the job at hand.

Straighten: Everything has its own place and should be located where it is to be used and organized for a smooth flow.

Shine: Clean and inspect to keep up good quality. Cleaning every day makes it easier to see problems before quality defects occur.

Sustain: Maintain what has been achieved. Mark areas where items belong and make sure they stay tidy, orderly, and clean.

Standardize: Developing and maintaining new habits requires discipline. Use schedules and checklists to make things easier. Following standard processes ensures repeatable quality.

Safety: Always arrange work with safety in mind. Is the working environment dangerous? Is the right equipment for the job available?

6S is a natural principle for building teams who share a common work area. It is common sense and every team member benefits from it. We can all appreciate the concept of a place for everything and everything in its place. It frees us from the aggravations that hinder our work and creates a real sense of achievement and pride for everyone.

Photo courtesy of Charles Chandler.

Fuel pump overhaul station.

tion for U.S. and Canadian-registered aircraft components. Early in 2012 Europe and Canada signed a similar bilateral agreement so AJW Technique added some additional content and a supplement to its MPM to recognize and meet EASA's small differences and received EASA certification by the end of March. Pennycuick states that, "AJW's policy is always to work to the highest standard."

During the initial audits other AJW Technique employees were preparing additional component units for certification. The tooling and test equipment was getting whatever calibration maintenance or replacements were necessary to bring them to certification and production. The avionics suite of components was certified next and the electrical components were put in the queue. AJW Technique is also pursuing AS9110 certification at this time.

AJW Technique employees were gracious hosts and it was easy to see why they have grown into one of our industry's largest companies. AJW's senior managers acknowledged that Allan Pennycuick was the man of the hour and a capable and frugal Scotsman who did not waste time or resources. After our tour of the facility and their certification process discussion, it was easy to agree with that statement. We left the next morning but I remained curious as to how the new AJW family member was doing and if the next phases of the certification process had gone as well as the first. I saw the following update on www.aviationpros.com.

Paris, June 17, 2013: AJW Technique

Just seven months after acquisition AJW Technique has achieved full TCCA/FAA and EASA certification and was awarded the TCCA Design Approval Organization (DAO) status. Allan Pennycuick states: "We have worked very hard to ensure that the strictest standards of excellence have been adhered to throughout every stage of this facility start-up. Quality takes absolute priority here at AJW Technique and due to focused management and team commitment we have not missed a single deadline. AJW Technique is looking to strengthen its position as a global MRO and gain regional certification for Russia, Brazil, Indonesia, Thailand, and China." The British may have an empire of another kind in the making. AMT

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"HEY! This is Your Airplane Talking to You!"

Innovative aircraft health monitoring (AHM) systems deliver detailed data to drive predictive, customized maintenance

By Karen Berg

Karen Berg is a 27-year veteran in the aviation industry, starting at Northwest Airlines in 1986 in leadership positions before joining KLM Royal Dutch Airlines in Amsterdam, the Netherlands. More recently, she served as VP Sales North America for Air France Industries and KLM Engineering & Maintenance.

It used to be that when something wasn't working quite right on an airplane, the technician would open up the area, look in and find the part they thought was causing the trouble, replace the part, and send the aircraft back on its way. Savvy troubleshooters knew what they were looking for and the general performance diameters (cycles or life averages) causing the components to be removed and replaced were based on generic data.

Many of today's new aircraft fly with a central server on board, gathering data about the performance of various components on the plane, and putting together an interesting story for the ground engineers and OEMs to proactively and quickly troubleshoot before an event happens that could take that aircraft out of service.

While heavy maintenance per se will not likely go the way of the dodo bird, it is generally accepted in the industry that its footprint and type of maintenance performed during those checks is dramatically changing. Having all the performance data about a particular aircraft prior to planned downtime allows the operator to customize the check contents specifically to that tail number.

"We have a program ready which enables us to make the dynamic planning with the individual check content," says Sebastian GIljohan, teamleader innovation at Lufthansa Technik. "But this needs regulatory agency approval, so this may take a bit longer to realize" as a shift in the way we're working.

Both Boeing and many airline operators see this as an opportunity for industry members to lobby the respective agencies and OEMs to adjust their performance criteria thresholds from theoretical averages or generic hours/cycles to actual conditioned-based maintenance based on all the data being generated.

"FARs lack the technological advances available in 2013. They contain limitations and theoretical development from the 1960s," points out Frank Stevens, director of engineering at Republic Airways Holdings. "As an industry, we, (the operators), have to push this type of technology and say, "These advances are good for the industry and the public. Our regulators need to champion the efforts to provide updated regulations allowing operators and OEMs to take full advantage of new technology. The technology helps us make safer and smarter decisions. Let's learn from this and advance our maintenance programs."

Helpful innovation

"Aircraft health management was driven initially for the customer benefit," says Linda Hapgood, program manager for Airplane Health Solutions, Boeing Commercial Aviation Services. "They helped us design the system to help them minimize their operational costs and manage unscheduled maintenance." AHM started with enabling the aircraft to be the CPU and being able to have a real-time picture of how the systems were working while making real-time adjustments.

While technology exists that allows maintenance troubleshooting tradition-

ally performed onboard the flight deck to be performed now from quite a remote distance, for safety and regulatory reasons, the majority of the troubleshooting is still done in the shadow of the aircraft. "If you're opening and closing digital circuit breakers and performing BITE tests where you could be moving surfaces of the aircraft and you're not right there," to see it, Hapgood points out, "if someone gets in the way," it could potentially be dangerous.

"While the vision of a remote mechanic is becoming realized through technology, we foresee the result as an acceleration of teaming the technician on the ground with a remote team in an operations center. This teaming via the use of real-time data and remote access to aircraft information will speed up the diagnosis and decisions that get the aircraft out of the gate and on its way."

Most operators have installed WiFi at their gates to enable quick downloads of data, for regular diagnostic trend monitoring, when the aircraft is at an airport. However, there's also the possibility to troubleshoot the data while the aircraft is in flight, for certain fault conditions. Cost and data throughput volume are the main inhibitors to a constant stream of all the data from the aircraft while in flight. And while there is the ability to actually ping the aircraft and ask for specific information during flight, it's expensive and a data bottleneck. Once a cheaper communication path to the aircraft is established, all of the systems can send data as generated, including having a potential replacement of the flight data recorder.

At Republic Airways Holdings, they're creating reports to identify and connect events. "We use tools to review aircraft data against pilot/maintenance reports to confirm failure modes and to proactively address issues not presenting themselves directly," says Stevens. "In many cases, a technician focuses on the

Technicians at Lufthansa Technik analyze aircraft operating data using tablet computers, a trend the industry will see more of.

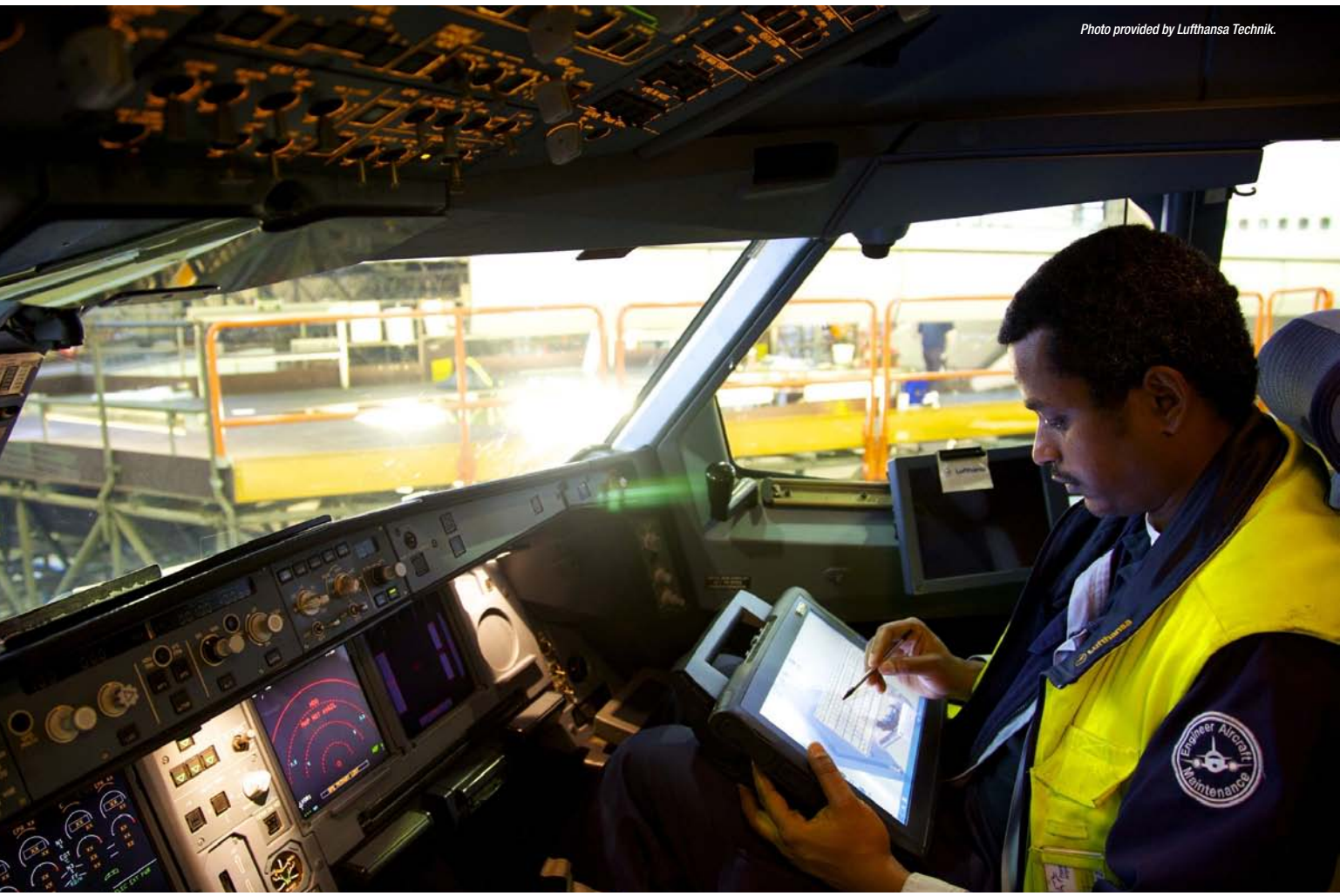

Photo provided by Lufthansa Technik.

Photo provided by Boeing.

The Boeing Operations Center assists airline customers with urgent technical problems, engineering issues, and maintenance requirements 24 hours a day, seven days a week, 365 days a year.

fault and not the reason for the fault. We use system-based data to narrow our search of the cause. We ask ourselves 'what if the valve is doing exactly what it was supposed to do?' We use this to find the hidden failure before it repeats itself. The direct fault may not be flagging on the airplane, but by sifting through the data, they can establish a possible fault chain. Technicians should not stare at the component that's failing, they need to find out what is telling the component to fail, and go there."

While some may see it as looking for the needle in the haystack, the operators and OEMs have come together to sift out the noise and decide what data needs to be acted upon. Some operators have trained their front line and engineering staff to interpret the data. Others have hired specific people experienced in interpreting flight data, who know the aircraft well.

By maximizing and using the right data, the operator can see a significant decrease of their unplanned events. "With a proactive review, we see about a 20 percent reduction in repeat write-ups and 'soon to fail' events. We also believe, through a fully implemented AHM program, we can do a lot better," Stevens adds.

Another benefit to all the data is the operators' ability to back up their operations performance "stories" for removal reasons. In this case, when a repair station returns a component as "no fault found" or the OEM indicates that the component "can't do that," the operator has data to show the repair station the fault as it occurred.

Stevens says it's been very beneficial to creating a more proactive, collaborative relationship with the OEMs, as well. "Every day I receive emails from vendors and OEMs such as Bombardier, Embraer, Honeywell, and Hamilton Sundstrand asking for the data to be downloaded and sent in for review. These OEM connections create a collaborative effort to rectify the situation or determine the root cause of the event."

Unfortunately, not all components are yet able to transmit data, but many OEMs are working toward that goal, by requiring certain components to be able to "plug and play" interface with the onboard servers. Some components, however, may never have or need that capability. "There's always a tradeoff [of cost vs. data need] when looking at what systems have the most impact," Hapgood points out. "It's not just carte blanche 'let's just increase the data available'," because the data benefit may not always be there.

Data security

With all the data hacking threats one hears in the news these days, is the aircraft of the future being set up to be another target? "Flight controls and that type of software are completely separated from the performance data," according to Hapgood. There are also a lot of regulatory and OEM requirements that are put in place and rigorously tested to ensure that hacking of the airplane doesn't happen. "And from a maintenance point of view, any of the data that comes off the aircraft today and is put into a system, like the Boeing AHM, is closely guarded and not public information."

Much of the data delivered from these aircraft can be entered into and utilized by operators' existing maintenance systems. "You do have to think carefully how you design it and who has access," says Hapgood. It's not the intent to have multiple

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systems delivering and storing the data, as this convolutes the message. The systems offered are less complex and are intended to decrease the hands-on requirement to manage and integrate the data.

Revisiting the HAL 9000

"*Dave Bowman*: Hello, HAL. Do you read me, HAL?

HAL: Affirmative, Dave. I read you.

Dave Bowman: Open the pod bay doors, HAL.

HAL: I'm sorry, Dave. I'm afraid I can't do that."

With the computers doing more and humans needing to do less onboard, some people are having flashbacks to this scene from "*2001: A Space Odyssey*," where the HAL 9000 computer takes over control of the space station. While we're not to that stage yet, many have a fear of automation. "I think people are encouraged about what the airplane can do, but are leery about letting it go," Stevens ponders. "They're still a little bit leery to say, OK, I have everybody's lives in my hands, but if I'm not watching it, who is?"

Many aircraft, particularly in the military sector, have become so automation-integrated, that they are virtually impossible to fly without computer assistance. And that goes right down to the maintenance, as well. Not only has the defense sector mandated condition-based maintenance on their new aircraft programs, they're implementing sensors all over the aircraft, including structural monitoring devices.

"With the ability to send a low current through the airframe, it repeatedly measures the aircraft to determine how or when a crack, dent, or scratch happens and returns a signal to the computer with the location and extent of the damage," Stevens says. "I would love to see this type of technology in the civilian sector. There are many maintenance tasks that require five hours to open an area for a two-minute inspection task."

While the aircraft of today have significantly changed in the past 10 to 20 years to assist the operator in predicting events, reducing downtime, and finding the true cause of a problem, many in the industry still see it as just a start. "Will the technician of the future wear Google Glasses or special contact lenses that help them see through the fuselage?" asks Boeing's Hapgood.

In an upcoming issue we'll explore this subject more in depth. **AMT**

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MORE Than Just an OIL CHANGE

There is an oil-change happening in the aviation industry, and it's leading to better engine health and longer maintenance cycles.

By Ron Yungk

Ron Yungk is a chemist with 34 years' experience in aviation fuels and lubricants. He started his career managing Pratt & Whitney's Chemistry department. Yungk also chaired the SAE committee on Aviation Propulsion Lubricants.

There is an oil-change happening in the aviation industry, and it's leading to better engine health and longer maintenance cycles. Air BP Lubricants' Ron Yungk explains what maintenance professionals need to know as more fleets convert from standard to high performance capability (HPC) class lubricants.

Over the past 15 years, while the number of civil jet engines in operation has increased by 22 percent overall, the number using high performance capability (HPC) class oils has increased by a massive 150 percent.

That relative proportion seems set to increase significantly for the remainder of the decade, as next generation engines emerge with increasingly high temperatures. This trend is demonstrated in Figure 1 (on page 20), which shows GE's new engine launches and their respective exhaust gas temperature (EGT) data.

This trend is even prompting some OEMs to require exclusive use of HPC oils in these engines. For example, both of Rolls-Royce's latest engine designs, the Trent 1000 and Trent XWB, are only certified to use HPC oils. This is expected to extend to further engine types in the Trent family either requiring HPC class oils or strongly recommending HPC class oil use.

What this trend means for us in maintenance terms is that it is more important than ever to understand the differences between HPC and standard performance capability

(SPC) class oils, the characteristics of both, and the economic and technical implications of converting a fleet to HPC lubricants.

What is an HPC oil?

The core requirement specification AS5780 has become the new industry standard, particularly for lubricants used in civil aircraft engines. Under the auspices of the SAE, it was developed jointly by engine manufacturers, military specification authorities and lubricant manufacturers and first issued in late 2000. This aerospace standard combines requirements from the MIL-PRF-23699 specification with specific requirements from the major aviation OEMs. The AS5780 standard specifies two classes of turbine engine oil – SPC and HPC.

How do HPC and SPC differ?

In principle, the chemical building blocks for these oils are inherently similar and, as such, the limits for physical and chemical properties such as viscosity, acid value (TAN), flash point and pour point are the same for both classes.

Differentiation begins with the improved

Above: Technologists review operational profile for the "Coker Mister™"
Left: Example of tube deposits from a Vapor Phase Coking Test

Comparing the value of HPC oils

Determining the value of switching to HPC oil can be a complex process involving calculations of both oil purchasing and maintenance costs. For this reason, Air BP Lubricants has developed a value comparison tool to help airline engineering and procurement teams consider the economics of switching to HPC lubricants.

Air BP Lubricants' tool uses current industry data and takes into account individual airlines' operations, including fleet composition, route patterns, and maintenance practices. After inputting this data in a free consultation, airlines can predict how oil costs and maintenance frequency will be impacted by a fleet oil change, thereby calculating the bottom-line impact of an HPC conversion.

To arrange a value comparison consultation, email airbplubes@bp.com

oxidative stability for HPC oils, which translates to reliable oil life, allowing engines to comfortably reach shop visits while reducing the need for disruptive oil condition monitoring programs or oil changes.

Oil life is becoming an increasingly important consideration in civil aviation as new engine bulk oil temperatures are increasing at the same time oil consumption is decreasing. The AS5780 specification distinguishes between SPC and HPC oil oxidative capability through several oil stability test method requirements. The Def Stan 05-50 (part 61) Method 9 Resistance to Oxidation and Thermal Decomposition is a good example of how HPC oils can demonstrate greatly improved effective oil life. The 250oC requirements for HPC class oils for viscosity increase, acidity increase and volatilization loss are all roughly double that of the SPC requirements.

Another critical differentiator between classes is improved thermal stability, or the ability to resist "coking". Coking is essentially severe degradation of the lubricant down to solid carbon deposits. The use of standard class (SPC) lubricants in modern large turbofan engines has led to many incidents of coking, with the buildup of these carbon deposits being exacerbated by the lubricant's intolerance of very high temperature regimes.

Figure 2

Coke deposits can cause the blockage of oil feed pipes leading to starvation of mainline bearings (see Figure 2). Coke can also block scavenge tubes, which leads to flooding of bearing chambers and possible leaks into high temperature areas of the engine which can potentially lead to engine fires. Oil starvation can also lead to poor lubrication of shaft spline connections causing wear and possible disengagement of these important mechanical connections.

The formation of these potentially harmful carbon deposits requires airlines to regularly inspect, clean or replace critical lubrication system components,

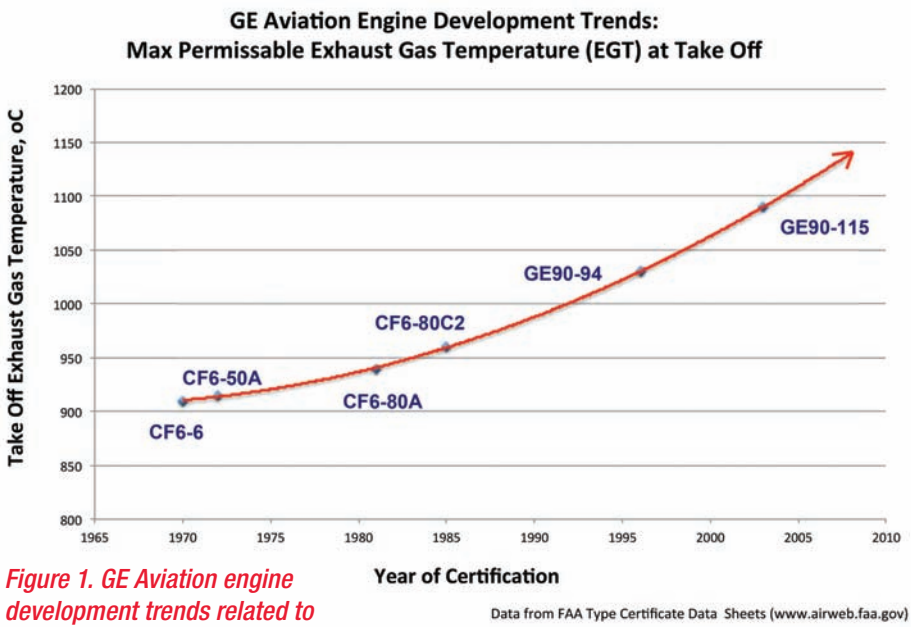

Figure 1. GE Aviation engine development trends related to exhaust gas temperature (EGT).

significantly adding to the line maintenance workload and risk to aircraft downtime.

To ensure HPC oils provide improved coking resistance, AS5780 requires HPC oils to be able to perform in two test rigs for twice the duration of SPC oils while producing half the amount of coke deposits. These rig tests are the U.S. Navy ERDCO Bearing Deposition test (FED STD 791 Method 3410) and the Hot Liquid Process Simulator (HLPS) SAE ARP5996 coking propensity test. Figure 3 shows the performance differentiation in the HLPS test.

To meet the HPC performance requirement, oils need to combine a thermally robust ester base stock with an optimized blend of performance additives. When designing lubricants, manufacturers will always look to exceed, rather than meet, the specification requirement to provide OEMs and airlines with confidence of extra thermal and oxidative protection.

By offering improved high temperature performance, today's HPC lubricants are augmenting the on-wing life of the engine by reducing scheduled and, more significantly, unscheduled maintenance activity.

According to American Airlines repair/part development engineer, Dan Foust, commenting on the airline's conversion to BP's HPC lubricant 2197, the maintenance implications can be significant.

"Since introduction of BPTO 2197 oil into AA's CF6-80C2 Boeing and Airbus fleets ... we have experience far less coking buildup in our turbofan engines," Foust says.

"It has eliminated two field trips per year to replace excessively coked oil tubes. This has translated into better system reliability and reduced maintenance costs."

Making the decision to convert

The decision to change to a higher performing oil involves both technical and economic considerations, and can sometimes instigate a divergence between engineering and procurement decision-makers. Often, the cheapest AS5780-approved oil is procured to secure immediate financial benefit, but at the risk of increasing

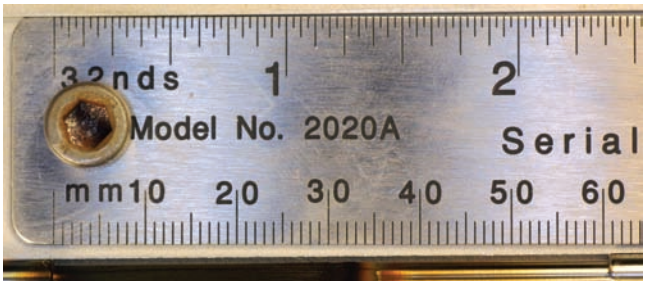

Figure 3 HPC oil in top figure, SPC shown below
HLPS data contrasting coking performance for HPC and SPC oils.

scheduled and nonscheduled maintenance action and thus increased cost in the long-term.

The cost of fleet engine oils represents a comparatively small proportion of an airline's operating costs, and can account for less than 0.01 percent of the annual operating cost for a twin-engine, single aisle, standard body commercial aircraft. In contrast, engine and aircraft maintenance represents a significant percentage of an airline's annual operating costs. The implication of this is that, to obtain noteworthy cost savings, commercial airlines need to use oil that will support long-term engine performance and reduce maintenance costs both directly and indirectly.

Airline turbine oil procurement practices will differ depending on the airlines themselves as well as the financial climate that may exist at a particular time. In turn, the relevant drivers used by the key decision-makers may well change. Should turbine oil be purchased on a simple tender basis to derive the cheapest

product or should it be viewed as a critical engine component requiring more strategic considerations? Air BP Lubricants has recognized that these two contrasting "engineering vs. procurement" viewpoints may exist within many commercial airlines and has developed a 'value comparison tool' to assist airline customers in their decision-making around oil procurement (see box on page 19 for more information).

Any decision to convert to a new turbine oil is generally made on the basis of technical benefits, and evaluated in terms of the financial implications during the later stages of the decision. The decision to convert to an HPC oil should be strategically influenced by both commercial and technical considerations during the planning phase. By determining the value of HPC oil to both the "operational health" of the fleet and to the business, decision-makers can ensure the long-term procurement goals of the airline whilst achieving improved performance for their fleet.

Making the conversion

Brazilian airline GOL Linhas Aereas Inteligentes SA recently converted from an SPC oil to an HPC oil and, according to maintenance director Alberto Correnti, has experienced improved operations as a result of the switch to BPTO 2197.

"The transition to a high performance capable oil was part of the airline's strategy to maintain its low-cost position while improving operational performance and safety," Correnti says.

The Air BP Lubricants Technical Service team provides a comprehensive transition program to make the conversion process as seamless as possible. This experienced team has guided many operators through the conversion process, which is consistent with OEM requirements. A disciplined change management process is required including the preparation of appropriate Engineering Orders and provision of placards identifying the HPC oil to be used. As part of ABPL service, we also offer customers post-conversion support to ensure engineers maximize the benefits of a HPC oil and have access to the BP's on-line Turbine Oil Academy – an exhaustive knowledge database and modular learning tool.

Inside the Air BP Lubricants lab.

The future is here

The future for HPC class oils is looking certain as increased thermal regimes within new generation engines continue escalating, while incentives for developing new SPC class oils all but fade away. In evidence of this increasing usage, BP recently announced that our 2197 turbo oil had accumulated more than 250 million hours of on-wing experience and was chosen by Airbus for the first test and public flights of the A350 XWB.

So, more than ever before, it is critical for maintenance teams to consider the oil needs of their airlines with HPC oils top-of-mind, as they become the standard in meeting the demanding lubrication needs of modern engines, now and into the future. AMT

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Benefits and Programs

Take a step back to consider what members and industry partners want from an organization such as ours

AMTSociety has taken the past few months to step back and review many aspects of our organization.

Some of the recent activities of *AMTSociety* have included establishing a plan to continue with the *AMTSociety* Roadshow Consortium. *AMTSociety* also has reviewed online training offerings, current member benefits, and current corporate sponsor programs. Progress is being made.

In the near future, we will be sending a survey to our members and partners to understand what you feel is important.

One additional initiative has been outreach to other industry organizations. Establishing relationships with other industry organizations is one way of better understanding our industry. This also provides the ability to potentially collaborate on initiatives beneficial to not only our members but the maintenance community and the industry.

Here's a short update on a few of the previously mentioned initiatives.

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CAE	Honeywell		

Member Benefits

One of the important functions of an organization such as ours is to offer benefits to its members. A few of the member benefits currently offered range from discounted automobile rental, a subscription to *Aircraft Maintenance Technology* magazine, access to Avjobs.com and the NCATT database, a free Snap-on screwdriver for new members, and more. We are in discussions with additional aviation companies and organizations, and are looking for ways in which *AMTSociety* can provide its members with additional high-value benefits aimed at advancing the role of the aircraft maintenance professional. There's more to come.

Training and Education Update

We're pleased to announce a few enhancements to our training offerings. As you likely know, both the online and live education offerings are accepted by the FAA for Inspection Authorization renewal and for the FAASTeam AMT Awards. We are finalizing agreements with additional speakers for all the live IA renewal events in an effort to provide attendees with some new, high-quality educational sessions.

We've taken a hard look at determining exactly where and when to hold our live training events, as well as the number of events. Many factors are considered when establishing these live events, affectionately known as the *AMTSociety* Roadshow Consortium, including speaker availability, facility availability, and historical attendee information. We've had to face the reality that not all of the past locations where *AMTSociety* historically offered education will be continued in the next series of training events.

New and additional online training courses will also be made available in the months ahead on the *AMTSociety* website. Our goal at this time is to enhance all the training offered by providing a greater selec-

tion of online offerings while providing live events of greater value at select locations around the country.

The following dates and locations are confirmed:

- Houston, Texas, November 20, 2013
- Atlanta, Georgia, January 8, 2014
- Kansas City, Missouri, February 12, 2014
- Aurora, Colorado, (Denver area), March 5, 2014

The *AMTSociety* website will soon have updated information and registration details available, and we'll announce other locations and details as they become available.

GA Awards Program

This summer I attended the 2013 AirVenture in Oshkosh Wisconsin. Representatives from numerous organizations and industry associations participated providing well-deserved recognition for the General Aviation Awards recipients. This awards program is a cooperative effort between sponsors from the aviation industry and the Federal Aviation Administration (FAA).

The selection process begins with local FAA offices, and panels of aviation professionals from within four fields then select national winners from the group of regional winners. The winners of this year's GA Awards were:

- ***AMT of the Year:***
  William "Bill" Fifles of Honolulu, Hawaii
- ***Avionics Tech of the Year:***
  Bruce Allen Lundquist of Willis, Michigan
- ***CFI of the Year:***
  Dean Wesley Eichholz of Soldotna, Alaska
- ***FAASTeam Representative of the Year:***
  Mark Edward Madden of Anchorage, Alaska

The nomination process for the 2014 GA Awards Program is open and nominations must be submitted by the end of September 2013. *For more information visit www.generalaviationawards.com.*

Thank you,
Ronald (Ron) Donner,
AMTSociety Executive Director and Business Manager
ron.donner@aviationpros.com

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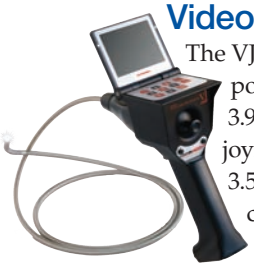

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The ABC's of Composite Repair

Strict adherence to the individual OEM-approved data, materials, and processes is imperative

By Tim Wright

Tim Wright has been working with aerospace composites for 16 years as a technician and technical trainer. As a technical instructor for Cirrus Aircraft in Duluth, MN, Tim Wright trained more than 250 technicians, engineers, A&P instructors and regulatory agents on Cirrus Aircraft composite damage assessment and repair processes.

In selecting a title for this article, I wanted to convey the perception that composite repair is not that difficult, or at least no more difficult than sheet metal repair. To be certain, it requires training, practice, and experience to become truly proficient at producing well-crafted, airworthy composite repairs, but then so too does sheet metal repair. The main difference is that composite repair technology most likely represents a new set of skills, processes, and materials to which most technicians have not been exposed.

Should you make the effort to acquire these skills? I will let you be the judge of that, but consider the following: Boeing, Airbus, Gulfstream, Pilatus, Hawker Beechcraft, Dassault, Bombardier, Cessna, Diamond, Cirrus, (to name a few) all rely on composite materials in primary structural applications. In a paper written by the National Institute of Aviation Research, it is projected that the use of composites in aircraft construction will quadruple over the next 20 years.

This rapid growth in aerospace composites will not be without problems. There is and will continue to be a gap between the manufacturers' (OEMs) development and production of these aircraft, and the maintenance industry's ability to maintain them. This gap has two aspects: numbers and technology. There are simply not enough technicians trained and experienced in composite inspection and

Photo by Tim Wright.

Proper use of the hot bond machine is an important part of the specialized training needed to properly accomplish hot bond composite repairs.

repair to meet the anticipated needs. New inspection and repair technology skills will need to be acquired by maintenance organizations and personnel. Compounding these issues is the fact that there is very little standardization of repair processes among the manufacturers. To overcome this gap, many OEMs have developed and offer training specific to their types.

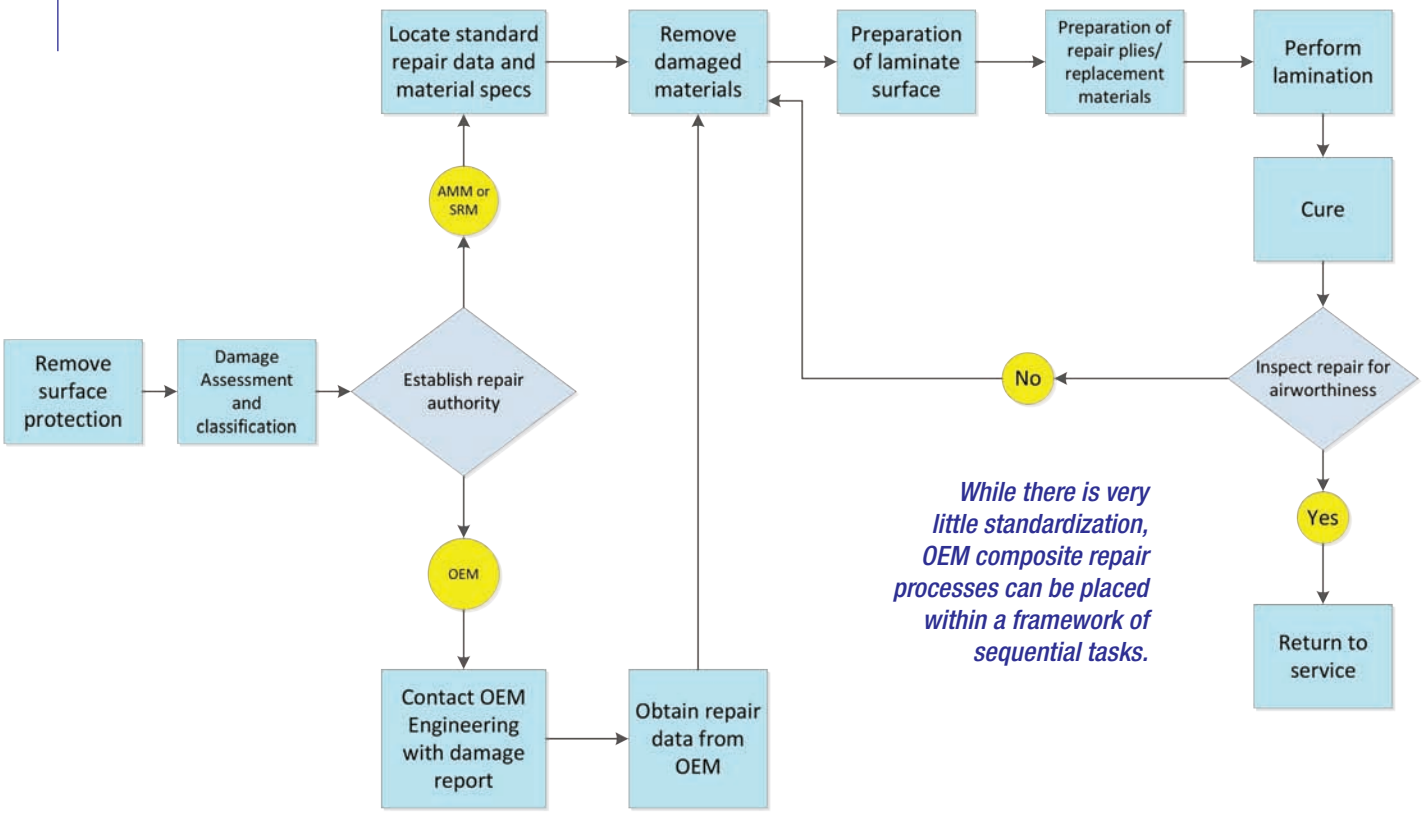
While this may satisfy the needs of the OEMs, it does not lead to any standardization of the composite repair process. But upon closer examination, we can place the OEM processes within the framework of a series of sequential tasks, recognizing that each OEM may utilize different procedures for completing the task. I have identified the following tasks in outlining a standard composite repair:

Inspection/damage assessment. Each OEM provides inspection and damage assessment criteria in their publications. For the most part, they are consistent on inspection criteria: visual inspection of the structures followed by a detailed inspection of known or suspected damage. On a glass fiber structure, this may involve paint removal (glass fiber reveals damage well visually), tap testing, or NDT inspections. Known or suspected damage to carbon fiber structures usually requires NDT inspection.

Determine repair authority. What is damaged, where it is damaged, and how large is the damage are all criteria manufacturers use when providing standard repair data in their publications. You will find much variation among them. Some are very generous and some are very restrictive in what repairs the publications authorize, but in all cases, there is a point in which you must contact their engineering department for repair support. You need to know where that point is.

Obtain repair data and materials. Whether you are using standard repair data from the AMM/SRM (Structural Repair Manual) or an OEM engineered repair, you need to fully understand the repair before proceeding. I refer to this as "Getting your head around the repair." If you do not "see" the finished repair, call the OEM help line for assistance. Use only OEM-approved materials within shelf-life limits for accomplishing the repair.

Removal of paint and damaged material. While it may be necessary to remove



While there is very little standardization, OEM composite repair processes can be placed within a framework of sequential tasks.

paint for assessment purposes, you will now need to remove enough paint to accommodate the repair. I am aware of no OEM that allows the use of chemical strippers for paint removal. Repair data will tell you how much damaged material to remove, but generally less is better.

Preparation of laminate surface. With most OEMs, there are two aspects to this task. The mechanical abrasion of the repair area creates a heightened level of molecular activity on the laminate surface, ensuring a stronger chemical bond with the repair materials. The second aspect is the scarfing or stepping down of the damaged laminate to the full depth of damage. This not only effectively reduces the height of the repair, but ensures a better interface between the repair materials and the damaged laminate. Each OEM has their preference here, but both require high levels of technician tool skill and practice.

Preparation of repair materials. This task contains several processes that will vary among the OEMs.

1. The OEM will specify wet lay or pre-preg materials. With pre-preg, the resin has been incorporated into the fabric and dried and requires a bonding machine for curing. Consult the AMM/SRM for the list of approved materials.

2. The number of repair plies specified is generally a function of the number of damaged plies.

3. The repair ply overlap is how much larger or smaller each ply must be relative to the damage and the previous ply.

4. When the fabric is woven, the dominant yarns, called warp, run in one direction and are crossed by lesser fill yarns. The OEM designers specify which direction the warp fibers must run relative to the structure. This is referred to as ply orientation (0-, +45-, -45-, and 90-degree orientations are typical).

5. Some OEMs require plies be stacked from smallest to largest, while others require the opposite stack.

6. If the repair requires replacement of damaged core material, consult the AMM/SRM for approved core type and thickness (as well as ribbon direction if honeycomb).

Laminating. Most OEMs have restrictive laminating environmental conditions in regards to airborne contaminants and temperature/humidity limitations.

OEM publications will include information on correct resin to fabric ratio and avoiding entrapped air (porosity) in the lamination. While these conditions are easiest to maintain by applying the lamination one ply at a time, the repair location may dictate that you prestack the plies and apply the lamination as one unit (to maintain ply overlap and orientation).

Curing. Pre-preg repairs require a schedule of vacuum bagging materials as well as a bonding machine. While you can use this equipment on wet lay repairs, due to their expensive nature, many OEMs allow less expensive and less complex curing options. Heat sources may include heat lamps, heat guns, or hair driers so long as cure temperature is monitored and controlled (recording cure data is also a good practice). The actual cure parameters are more a function of the resin manufacturer than the aircraft OEM and include minimum/maximum temperature and time requirements as well as temperature ramp rates and scheduled hold periods or dwells.

Inspection. Some of the criteria set forth by the OEMs include inspecting the repair for proper curing of the resin, complete bonding between the repair and the structure, voids or porosity in the repair, and evidence of correct resin content.

While organizing OEM procedures into a set of related tasks may help in developing a sense of a standard composite repair process, it must be emphasized that strict adherence to the individual OEM-approved data, materials, and processes is imperative. If, for example, you find you prefer the method of stacking plies that OEM A uses more than that of OEM B, you must use OEM B's method when repairing an OEM B aircraft. There is no substitution of material or procedure allowed without OEM approval.

Like them or not, composites have earned a place in modern aircraft design and chances are you may end up in a position where you will be faced with the prospect of inspecting or repairing them. Will you be ready?

Tim Wright most recently developed and launched aerospace composite programs at Northland Community and Technical College in Thief River Falls, MN, and Wisconsin Indianhead Technical College in Superior, WI. He is currently on the faculty of Wisconsin Indianhead Technical College. AMT

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Support for Human Factors Training: Look Down Under

The Australian Civil Aviation Safety Authority (CASA) has set a new international standard for high-quality human factors training materials

By Dr. Bill Johnson

Dr. Bill Johnson is the FAA Chief Scientific and Technical Advisor for Human Factors in Aircraft Maintenance Systems. Johnson is a member of the Human Factors Advisory Group to the European Aviation Safety Agency (EASA). The group worked with EASA to define human factors aspects of the proposed Safety Management System regulations.

Maintenance organizations are always looking for the "latest and greatest" to improve their basic human factors training, or to supplement recurrent training. Well, look no further. The Australian Civil Aviation Safety Authority (CASA) has set a new international standard for high-quality human factors training materials. CASA calls it *Safety Behaviours – Human Factors for Engineers*.

Over the years I have developed, observed, and delivered a lot of maintenance human factors training throughout the world. I have also advised government and industry about the availability of products and services that can not only meet requirements, but also ensure continuing safety and efficient performance. There is an abundance of quality information available, as evidenced by a Google search using the term "maintenance human factors". The links lead to many excellent service providers for training delivery. It is difficult to sort through the information to find the product/service that works for your organization. There is something for everyone in the CASA package.

One size does not fit all

Organizational requirements for HF training materials are varied. The variance comes from the differences in organizations' size, national aviation authority requirements, nature and time of work performed, industrial agreements, stability of workforce, qualifications of local training personnel, and level of commitment from management. Some organizations try to do as much as possible with computer-based training (CBT). Others have found that the blend of technology-based training and resident training, with an instructor, works best. When tied to a learning management system, the trainee must complete the CBT before participation in the instructor-led training. Some authorities, like Transport Canada, insist that CBT is not an acceptable human factors training alternative.

Organizations should strive for excellence and test to ensure that the training delivers a specified level of competence and, hopefully, lasting behavioral change.

Time is money in aircraft maintenance. Thus, some organizations strive to complete the training as quickly as possible. There are not many requirements for a specified training time. There are many guidelines on the topics that should be included for initial as well as continuing/recurrent training. Organizations should strive for excellence and test to ensure that the training delivers a specified level of competence and, hopefully, lasting behavioral change.

The capability of the organization's training department affects training

design and delivery. The May 2013 *AMT magazine* covers the newly proposed EASA requirements for a human factors trainer. Small companies may choose to send personnel to off-site classes offered by external training services providers. Such courses likely ensure an experienced trainer who will bring a variety of industry stories to the class. The trade-off with external vs. local trainers is the extent to which the content can be matched to organizational challenges and culture. Many human factors issues are common to the entire industry. Thus, most externally provided information is relevant.

What's on training organizations' HF wish list?

HF training has been around for nearly 20 years. Therefore the wish list is asking for fresh ideas, new graphical depictions, new event scenarios, and improved multimedia. Concepts like PEAR, Dirty Dozen, and Swiss Cheese still have high value, but trainers and learners want the tested concepts to look new. Worn-out graphical depictions from the '90s are insufficient. The same holds true for videos. The Canadian Defense film, about the C-130 and the Dirty Dozen, has a great message, but can an organization expect today's learners/gamers to accept old-school edutainment?

Figure 1: The CASA Safety Behaviours: Human Factors for Engineers Kit

There are newer videos. Some are free on YouTube and others at a fair and reasonable cost. Some organizations, mostly large ones, have produced videos focusing on local maintenance events. Delta Air Lines and Lufthansa Technik, for example, have produced effective videos. However, it takes a deep pocket ($10-

Figure 2: Improving the PEAR model

15K USD for every finished quality minute) and a high level of commitment to produce quality video within an airline training organization. I suggest that such endeavors are for video production companies, with appropriate HF technical support.

Human factors trainers use accident or event sce-

narios to emphasize a point or to permit students to find the human factors contributing factors. Such learning experiences should probably not predate the students' birth. While accidents and events are infrequent, those used for HF training should be current. New scenarios are on the trainers' wish lists.

Finally, when there are regulations, they must be met. Therefore, organizations want to be sure that the chosen training methods and content meet the requirements. Many organizations do not have HF training requirements, but are committed to continuing safety and efficiencies. That goal is fulfilled by the regulatory requirements.

Safety Behaviours – Human Factors for Engineers

CASA's safety promotion team, with technical leadership from human factors specialist Gareth McGraw, has just released the *Safety Behaviours* kit. It is a substantial package that includes: a 200-page resource guide for engineers; a student workbook; a facilitator's guide; a packed DVD with a superb portrayal of a maintenance organization, as well as observations by human factors specialists; and a CD-ROM containing materials produced by CASA, and other National Aviation Authorities, including the FAA. It checks and exceeds every wish-list requirement.

See Figure 1 for a view of the materials, which are available for download free of charge at www.casa.gov.au/hf. International individuals/organizations can obtain a hard copy of the kit, with DVD and CD included, at www.casa.gov.au/onlinestore. The cost is about $100 USD, including postage and handling.

The content for the CASA training package is more than a repackaging of old ideas. The developers added value to the Dirty Dozen, to Dr. Jim Reason's models of error and to the PEAR Model that this author created with Dr. Mike Maddox. For example, they enhanced the People, Environment, Actions and Resources in many ways. CASA subdivided People into Doing, Thinking, and Interacting, shown in Figure 2. That brilliant subdivision makes me ask "Why didn't we think of that?"

The developers note that the content is in 100 percent alignment with the training requirements recommended by ICAO, EASA, and CASA. It appears

Figure 3: A Deck of HF Challenge Cards

that the content and excellent graphical layout exceeds the intentions of any current regulations. An example is Chapter 7, titled Alcohol and Other Drugs (AOD). It has 15 pages of information on this relevant topic. Like all chapters, it follows a format that includes: an introduction; overview, specific details; points; and further information.

And then there are the support materials

CASA does not stop with an excellent eight-minute video integrated with the *Resource Guide*. *The Workbook for Engineers* has numerous activities for each of the 12 chapters. Many of the activities are focused on the video. The *Facilitator's Guide* helps trainers to maximize the impact of the video as well as the printed materials. It ensures that the video is considerably more than an eight-minute show before break time. If the trainer wants more expertise, the DVD contains explanations/comments from a panel of 12 notable HF specialists. There is more. The deck of eight cards, shown in Figure 3, is a great pictorial reminder of engineering human factors challenges and solutions.

At the outset of this article, I mentioned that I have seen a considerable amount of HF training materials over the years. I have never seen a more professional and comprehensive package than CASA's *Safety Behaviours: Human Factors for Engineers*. It is the new international yardstick (or metric ruler) by which other human factors training programs will be measured.

I have never seen a more professional and comprehensive package than CASA's *Safety Behaviours: Human Factors for Engineers.* It is the new international yardstick (or metric ruler) by which other human factors training programs will be measured.

Dr. Johnson is grateful for the information provided by Margo Marchbank, Section Head Safety Promotion Communication & Managing Editor, Flight Safety Australia, Civil Aviation Safety Authority.

For further information contact margo.marchbank@casa.gov.au. AMT

Composite Aircraft Damage

Assessment and maintenance require specialized training

By John Goglia

John Goglia has 40+ years experience in the aviation industry. He was the first NTSB member to hold an FAA aircraft mechanic's certificate. He can be reached at gogliaj@yahoo.com.

Lithium ion batteries have grabbed most of the headlines regarding the world's leading composite aircraft, the Boeing 787. First, there was the fire aboard the parked JAL aircraft at Boston's Logan Airport, then the smoke emanating from the batteries of an ANA aircraft that forced the crew to make an emergency landing. And now, most recently, the fire caused by a different type of lithium ion battery in the ELT transmitter of an Ethiopian airliner at London's Heathrow Airport.

But, notwithstanding these battery-related headlines, most of the concerns in maintenance circles, before these thermal events arose, centered around the difficulty of assessing damage to composite aircraft, much of which might not be visible on the surface, and the specialized training mechanics needed in order to be able to properly assess aircraft damage and make appropriate repairs.

Concerns about the training needed to assess damage to composite surfaces continue. Composite aircraft are still new and their repair histories are relatively short, certainly when compared to aluminum aircraft. A lot of work is being done to help mechanics identify and assess damage to composite aircraft. At this time, mechanics who routinely work on the 787 and other composite aircraft will receive the specialized training they need to help them identify and assess damage from the airlines or repair stations that employ them.

Don't make a wrong call

However, as composite aircraft become more and more common in airline fleets, I am concerned that mechanics who do not routinely work on these types of aircraft will be called upon to make decisions that they are not trained to make. For example, a mechanic at an out station is called to look at an aircraft after a ground vehicle has struck it. Or a pilot calls a line mechanic out to look at what appears on the surface to be slight damage. Unless a mechanic is aware that specialized training is necessary, he or she may make a wrong call and fail to identify significant damage just because it is barely visible on the surface.

The only way to avoid problems is for mechanics to be aware that only those people with specialized training in composite damage assessment are qualified to make maintenance decisions on these aircraft. These are situations where mechanics just need to know what they don't know, to stay out of trouble and keep themselves from making potentially bad decisions.

Damage not just on the surface

Most mechanics know that there is a difference between the way damage shows up on aluminum skinned aircraft as compared to composite aircraft. Evidence of a strike against aluminum skinned aircraft is likely to show up as a dent or other mark; the same strike against a composite aircraft could well leave no mark or a difficult-to-see mark.

Mechanics who have not received specialized training may not fully appreciate how a slight marring of the surface could hide significant damage below the surface. Unless and until they receive composite-specific maintenance training, my advice is that mechanics avoid damage assessments to these aircraft. **AMT**

Where Am I Going and How Do I Get There?

Advances in our career will happen in one of two ways: by default or by design

By DeborahAnn Cavalcante

DeborahAnn Cavalcante earned her Masters in Aeronautical Science, with a specialization in Safety Management from Embry-Riddle Aeronautical University in Daytona, FL, and her Bachelor of Science from VA Tech in Business and Risk Management.

A wise person once said, "If you don't know where you are going, any road will take you there". This is especially true with respect to our personal career. Advances in our career will happen in one of two ways: by default or by design. If it is your choice that it is by design, specifically your design, and not that of someone else, here are some strategies to help map the way.

Before anything, know where you are going. Define your objective based on the values that are most important to you. What roles do wish to play? How far up the hierarchy do you wish to go? Are you climbing the management ladder, or headed down the entrepreneurial path? Do you need further education? What is your desired income, now, five years from now, and 10 years from now? These are just some of the questions that will enable you to define your objective and search your heart and soul for where it is you wish to go. Now that you have a destination, you need an action plan to take you there. Allow me to share what I believe to be some of the critical elements of an action plan.

Assess your communication skills.

You will need the ability to translate your knowledge across many audiences. Know how to state your message so it will be received as intended. That may mean you coming out of your comfort zone and tailoring the message to the knowledge level, personality traits, and values of the receiving party. Positive messages usually result in positive responses. Developing versatile communication skills will lay the foundation for the balance of your action plan and bring benefits to you both in your business and personal life.

Create your own brand.

How do you want others to see you? Think about your personal brand as your reputation. Others will recognize your name, what you offer and what you are about. Your personal brand will persist as you move from project to project and position to position, even through changes in employment. Your brand is who you are all the time, on the job and off the job. If your brand is strong, people in general, customers, and colleagues will follow you making you personally a valuable human asset, thereby enabling you to write your own ticket and steer yourself down the road you wish to go.

Build relationships with contacts that last beyond where you are now.

Do anything in your power not to burn bridges. You never know who may be your future boss, or whose boss you may turn out to be. Strong relationships with co-workers, peers, customers, suppliers, and vendors will prove their weight in gold when meeting deadlines or working through challenges. Be willing to give, as the best business relationships are mutually beneficial. Today, with instant communication and social media it is easier than ever to connect and maintain an ongoing network.

Continue to learn throughout your career.

Regardless of your area of expertise, we do not live in a vacuum; all things change. Technology has become an integral part of doing business, and those who resist being a part of it will certainly fall behind the power curve. Take advantage of in-house training opportunities. Stay abreast of industry press

releases, events, and innovations. Hone your skills or advance your education through online training. Express your desire to be involved in new projects. If nothing else, it will keep you young and keep your brain sharp.

Learn to handle stress, as it is a part of life.

Just as rain nourishes the plants to grow, the challenges in our life are nothing more than opportunities to grow. We cannot stretch our potential when we are too comfortable. Identify the source of stress. It may not always be possible to eliminate it, but there are certainly actions we can take to manage it. Sometimes it can be as simple as changing how you see the situation.

If it is something totally out of your care, custody, and control, and there is nothing you can do to change the situation, what good does it do to worry or get upset? That can be wasted energy. Move past it and look for opportunities to be productive in other ways. Energy flows where attention goes; so the more attention you pay to the negative, the more energy and power you give it.

Get plenty of rest, learn to allow yourself downtime to decompress whether it be doing something you love or just nothing at all. Prioritize; get the most difficult projects, or those with the closest deadlines completed first so you will feel a great sense of accomplishment. The remaining tasks will seem like a piece of cake by comparison.

Manage your assets; time, money, resources, people.

We often overlook others who can assist or to whom we can delegate responsibilities. How you allocate your time, and time management can work for or against you. Others will control your time if you allow them to do so. Be polite but open and honest with people who are time wasters. If money management is an issue, seek advisors who can offer advice or direction. Maximize your available tools and resources for efficiency. Often the simple answers are right in front of our eyes and all we need to do to see them is focus.

Set goals that you can achieve.

Lofty goals are admirable, but if you cannot ever reach them and have cause to celebrate, you may be sabotaging yourself. Write down your goals. Tell others what they are. When taking these actions, you are affirming your continued commitment to the goal. Keep the goal in your vision, obtain an image or picture if it is something you want. Focus your thoughts on your goal when you are in the shower in the morning or driving to work so it will be in your consciousness for the day. Take one action step at a time. As Dr. Martin Luther King Jr. said, you don't need to see the whole staircase, just take the first step.

These elements will evolve into an action plan. Think of the action plan as being the vehicle that you drive to the road you have chosen to go down. Just as you may change the car you drive over your lifetime, you can change the action plan; it is not etched in stone. The action plan should identify and include action steps necessary to move in the direction of your long-term goal. Should your long-term goal change, revise the action plan to take you to the new destination.

Keep your employer apprised of your career advancement desires. Most will applaud your motivation and initiative toward pursuing your goal. If you can position yourself as an effective communicator, an astute asset manager, a realistic goal setter, and someone who can build relationships and stay the course, one morning you will wake up and realize your career is exactly where you dreamed it would be. **AMT**

DeborahAnn Cavalcante leads Diversified Aviation Consulting (DAC) and along with her associates has firsthand experience in air carrier operations, private charter aircraft, general aviation operations, military/civilian interface, FBO management, maintenance repair station training, safety training, human factors training, and customer service training. For more information on DAC visit http://www.dac.aero.

NBAA2013

Oct. 22-24, 2013, Las Vegas Convention Center

The 66th NBAA annual meeting and convention will be held at the Las Vegas Convention Center. Static displays will be at the Henderson Executive Airport. Visit Cygnus Aviation at booth C11036.

Numerous aircraft maintenance, safety and management sessions are scheduled for the week. Here are some of the sessions and events planned:

Sunday, October 20

Capitalize on Human Resources
7:30 a.m. - 5:00 p.m.
Presented by ServiceElements
This course is designed to get participants thinking differently about a flight department's most valuable resource: its people. $550 for NBAA members and $700 for non-members.

Emergency Response and Family Assistance Planning for Business Aviation (Day 1)
7:30 a.m. - 5:00 p.m.
Presented by Aviem International and the Family Assistance Foundation
Participants will take away important skills and materials needed to develop or enhance their organization's emergency response plans. $1,300 for members and $1,475 for non-members.

Human Factors in Corporate Aviation (Day 1)
7:30 a.m. - 5:00 p.m.
Presented by Grey Owl Aviation Consultants
This course meets FAA IA 8-hour renewal. $950 for NBAA members and $1,100 for non-members.

Tax, Regulatory & Risk Management Conference (Day 1)
7:30 a.m. - 5:30 p.m.
NBAA's Tax, Regulatory & Risk Management Conference provides business aviation professionals and their advisors practical knowledge to help ensure compliance with the myriad of federal, state and local regulations and tax changes. Registration is $1,175 for members and $1,475 for non-members.

Monday, October 21

Inspection Authorization (IA) Renewal Course
7:30 a.m. - 5:00 p.m.
This Inspection Authorized Renewal Course meets the requirements of FAA Part 65.93,a,4. FAA Course Acceptance Number: C-IND-IM-121126-K-006-001. Expires 02/28/2015. Registration fee: $225.

Human Factors in Corporate Aviation (Day 2)
7:30 a.m. - 5:00 p.m.
Presented by Grey Owl Aviation Consultants

Tax, Regulatory & Risk Management Conference (Day 2)
7:30 a.m. - 5:00 p.m.

Tuesday, October 22

Opening General Session
8:30 a.m. - 10:00 a.m.

IS-BAO, The Gold Standard
10:30 a.m. - 12:00 p.m.
Presented by Jim Cannon, International Business Aviation Council (IBAC)

NBAA Safety Town Hall Meeting
10:30 a.m. - 12:00 p.m.
Presented by Eric Barfield, Hope Aviation Insurance and James Lara, Gray Stone Advisors
The NBAA Safety Committee shares its updated Top 10 Safety Issues for Business Aviation.

The Perfect Storm: Continuing to Address the Business Aviation Talent Shortage
10:30 a.m. - 12:00 p.m.
Presented by Sheryl Barden, Aviation Personnel International

An Immediate Post-Accident Time Bomb: Properly Completing NTSB Form 6120.1

1:00 p.m. - 2:00 p.m.
Presented by Paul Lange, Law Offices of Paul A. Lange, LLC

Ensuring the Highest Resale Value of Your Business Aircraft
1:00 p.m. - 2:00 p.m.
Presented by Jeremy Cox, JetBrokers, Inc.

Meet the Regulators
2:30 p.m. - 4:00 p.m.

Mitigating a Hazard: Our Humanness
2:30 p.m. - 4:00 p.m.
Presented by Gene Benson, Bright Spot, Inc.
This presentation takes a lighthearted look at our human nature and provides some practical takeaways on how we can reduce our own human errors.

Operating and Doing Business in China
2:30 p.m. - 4:00 p.m.
Moderated by Jay Mesinger, J. Mesinger Corporate Jet Sales
Presented by Jeff Lee, The American Express Company

Wednesday, October 23

Leadership - The Soft Stuff Doesn't Have To Be The Hard Stuff
9:00 a.m. - 10:00 a.m.
Presented by John Slieter, Duncan Aviation; Steve Gade, Duncan Aviation; and Jeannine Falter, Ph.D., Duncan Aviation

Six Shades of Gray – FAA and DOT Regulatory Compliance
9:00 a.m. - 10:00 a.m.
Presented by Gary Garofalo, Garofalo Goerlich Hainbach PC; Aaron Goerlich, Garofalo Goerlich Hainbach PC; and Al Mann, Reynolds Jet Management

SMS - Not Just for Pilots!
9:00 a.m. - 10:00 a.m.
Moderated by Dodie Thomas, Altria Client Services, Chair of NBAA Flight Attendant Committee.
Presented by Sunshine McCarthy, Baldwin Aviation

NBAA2013 Second Day General Session
10:30 a.m. - Noon
At this Second Day General Session, the NBAA Meritorious Service to Aviation Award and the National Aviation Hall of Fame Combs-Gates Award will be presented.

Ask the IS-BAO Auditor
1:00 p.m. - 2:00 p.m.
Presented by Walter Kraujalis, AeronomX LLC
Ever wonder how to comply with some of the requirements of the International Standard for Business Aircraft (IS-BAO) or whether your current procedures are adequate?

Fatigue Countermeasures for Business Aviation
1:00 p.m. - 2:00 p.m.
Presented by Leigh White, Alertness Solutions

Understanding FANS
1:00 p.m. - 2:00 p.m.
Presented by Justin Vena, Duncan Aviation
This session will brief attendees on the evolution of FANS, how FANS operates, certification and upcoming mandates.

Working with Training Providers and Your FSDO for Part 135
1:00 p.m. - 2:00 p.m.
Moderated by Al Mann, Reynolds Jet Management
Presented by Ashley Smith, Jet Logistics; Dave Hewitt, Hewitt and Company, LLC; and Rick Bedard, FlightSafety International
In Part 1, working with training providers to maximize your training program and ensure regulatory compliance will be covered. Part 2 will cover working with your FSDO and will detail best practices to managing the regular interactions that occur with your FSDO as a Part 135 operator.

Safety Management Systems: Energizing Your Safety Assurance with Tools and Guidance for Small Operators
2:30 p.m. - 4:00 p.m.
Presented by Neil Brackin, General Mills, Inc.; Jim Cannon, International Business Aviation Council (IBAC); Leland Blake, Cummins, Inc.; and Sunshine McCarthy, Baldwin Aviation
Guidance, tools, resources for small operators, and direct benefits of implementing an SMS will be shared.

NBAA/CAN Soiree, an Evening with Angels
6:00 p.m. - 11:00 p.m.
Wynn Las Vegas

Thursday, October 24

Careers in Business Aviation
8:30 a.m. - 9:45 a.m.
Presented by BuildAPlane and Honeywell
Presentations will be given on materials available that expose students to all aspects of aviation,. Advance registration is required. Contact NBAA's Sarah Wolf at swolf@nbaa.org.
General Session for students or workshop for teachers
9:00 a.m. – 9:45 a.m.

NBAA/UAA Career Seminar for College Students
10:00 a.m. - Noon
Presented by Sarah Wolf, NBAA
Contact NBAA's Sarah Wolf at swolf@nbaa.org for complimentary registration.

U.S. Constitution Dead or Alive?

Recent events threaten the 4th Amendment

By Stephen P. Prentice

Stephen P. Prentice is an attorney whose practice involves FAA-NTSB issues. He has an Airframe and Powerplant certificate and is an ATP rated pilot. He is a USAF veteran. Send comments to aerolaw@att.net.

Recently I helped a mechanic-pilot friend repair an older private aircraft. He had purchased it from an owner who had just about abandoned it at a local FBO shop after they had told him how much it would cost to make it airworthy after they inspected it, a common event these days it seems. He spent a week or so working on the aircraft, doing the usual annual work. He got it flyable, flew it around locally to check it out, and after that was satisfied and proceeded en route to the East Coast. The following stories deal with pilots but since many pilots are also mechanics, like myself and my friend, I offer this piece as an alert to all.

His first stop was in Texas at the major airport and he parked at the FBO for servicing. He told me that just after he parked he was immediately set upon by people who said they were U.S. officers and they were inspecting him and his aircraft for contraband. They said they were Department of Homeland Security (DHS) officers and they were soon followed by local sheriffs and other police. The FAA also showed up. Needless to say our pilot was terrified of these very intimidating guys. They said that he somehow fell into the profile trap.

The pilot did not know how he was singled out in this "profile" for an inspection…there were other aircraft coming and going. He had not filed an IFR flight plan so that ruled out a tip-off from ATC. He may have been on flight following, but it is still a mystery. He was subsequently detained overnight at his own expense in a motel because he had neglected to have a copy of his sales document with him. His aircraft was otherwise legal.

He voluntarily permitted a casual look-around search. They expected him to roll over and allow them to take his airplane apart to search. That did not happen. My friend knew his rights and refused to be intimidated. He got safely on his way the next day after he showed the FAA his paperwork pertaining to the sale, which had arrived overnight by fax.

I read another similar story about a guy flying his Bonanza from the West Coast to the East Coast not too long ago. He was similarly questioned when he landed for servicing en route and asked if they could search his aircraft. He refused. These guys also were DHS guys, black SUVs, no markings, common license plate. They were armed when approaching the pilot but did not draw their weapons.

They were also backed up by the sheriff and other local cops who also showed up at the scene.

The third case I ran into was a another similar story from a local pilot who I knew who was en route to Oshkosh. He was on his way in his C182 to a Midwest city and was treated in a similar fashion at a remote small airport where he stopped for fuel. He was also flying East to West, which seems to be a "profile" item for an automatic stop, when other unknown profile items are present. Again these were DHS officers. These people are all new at this game and are obviously learning their trade at general aviation pilots' expense and inconvenience.

The pilot also pointed out that they are also very uninformed about general aviation flying and the rules we fly by, but he said they fake it and try to appear knowledgeable but turn out to be in error when it comes to the rules. He said further that they are ill-informed about the paperwork and details of private cross country flying. We can only speculate on the number of aircraft en route to Oshkosh that have been investigated this year.

Finally, the most recent story I ran into was written up in a popular publication. It has been traveling around the internet and is another real scary episode for the pilot concerned. Find it on the internet and read it. He

also refused to allow DHS officers to search his airplane; they did not have a warrant. Keep in mind that the 4th Amendment to our U.S. Constitution is still black letter law.

The Fourth Amendment

"The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."

Some pilot organizations including AOPA, are presently attempting to put a stop to these type of random attempts to investigate and search general aviation aircraft whenever they see fit. I have been informed that these officers, whether they be Homeland Security, DEA, Border Patrol, ICE, FBI, FAA, sheriff department, local police, (did I leave out anybody?) all have a general right to ask for your pilot documents and medical certificate and to see the aircraft registration.

However, when you address them, you should ask whose authority they represent and demand to see their badges and identifications. If possible, you should also ask for names, phone numbers of the agencies, and their immediate supervision. Many recommend that you take pictures with your camera although they may object and attempt to take your camera away. Don't fight with them, you will lose, just try to make a good record for future use. And by the way, they will not allow you make any phone calls.

Above all keep your cool, be polite, calm, and answer their questions as best you can, when and if they ask if they can search your aircraft simply say no. They know better and should not pursue it any further. They will also ask for your voluntary permission to search and you can obviously say yes or no; under the law they can't force you. If they have evidence of contraband on your aircraft, they will have already procured a search warrant from the appropriate authority and show it to you.

They may also ask if they can look into your aircraft from outside, and they most likely have done that already without asking you and/or search around it with the aid of dogs. Simply say that you do not consent to any kind of a search visually, or with dogs, or any other detection devices.

Administrative inspections

Keep in mind that administrative inspections, e.g., health departments, housing authorities, Federal Aviation Administration, and similar organizations also have a type of right to inspect. We can usually expect some sort of ramp inspection during our flying career by FAA people but certainly not DHS swat officers. Inspection without a warrant as an adjunct to a regulatory scheme, such as FARs, for the general welfare of the community and not as a means of enforcing the criminal law, is well established.

You should contact one or more of the pilot organizations and through your Congressman, or woman, the various aviation committees and inform them of as much of the details as you can recall. Above all, include the time and place of the incident and who was present.

With enough pressure brought to bear on this rogue organization, that is just learning its trade at your expense, maybe these random inspections will cease, and they can hone their policing skills some other way. We don't need anymore black-suited swat teams harassing our citizens. Keep in mind that the Homeland Security team has only recently been established by the President and is a growing army of people with extensive equipment to conduct full-scale military actions.

One final important point when you're flying East to West or West to East, across portions of our wonderful country, or North to South or South to North, close to the U.S. border, try to avoid stopping at any "international" airports. The reason being that no matter how close or far from a border, that airport is considered as a "functional equivalent of a border" and that it is assumed you crossed it. There is practically no way to prevent a search at a border.

Legal searches

We also have to keep in mind that not every search without a warrant is invalid under the Fourth Amendment. Actually, a moving vehicle (aircraft that can be moved quickly) can be searched and in fact seized without a warrant, if, and it's a big if, there is probable cause for the search.

For example, if a pilot was detected with alcohol on his or her breath (DUI), a limited search incident to a valid arrest for the DUI or any other alleged crime is permissible, but there could be difficulty with the scope of such a search. If the search showed evidence of a crime in "plain sight," it could also be seized at the time of the arrest and search.

Border crossing inspections and search as mentioned above are all legal with little argument to be made against them; i.e. stay away from international airports for fueling or overnights, unless weather or other problems exist.

The Fourth Amendment created a huge body of law surrounding it; there are many interpretations of the various parts of the 4th Amendment. It keeps armies of lawyers working. **AMT**

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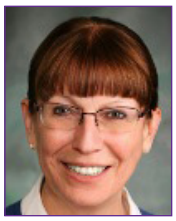

By Sarah MacLeod

Sarah MacLeod is executive director of the Aeronautical Repair Station Association (ARSA), an organization she helped found more than 25 years ago.

As the operational side of aviation safety struggles with NextGen positioning technology, maintenance is struggling with highly complicated and interwoven design standards used to substantiate composite and special coating technologies.

In order to fix a degraded condition, one must understand the certification basis and the impact maintenance actions might have on the original and continued in service condition. The ability to withstand "damage tolerance" can only be "tested" in the field, and then only after potential mistakes have been made in "fixing" damage that instead impacted continued operations.

As the engineering departments in airlines decline and the sophistication of the design standards increase, maintenance of composite structures and articles that have special coatings become more and more the purview of the designer. Unfortunately, designers are not always familiar with operational impact, nor are the regulators — witness the "design changes" required to bring the Dreamliner out of its nightmare. These design changes basically said when the fix is developed, we will let you know; the type certificate holder did develop a fix acceptable to the regulators. Only time will tell if the design change fixed the issue or created another one.

The regulator is on the horns of a dilemma; how does it determine if the applicant met the burden to show compliance with the regulations if it is unfamiliar with the technology being used? How does the certificate holder show compliance when the regulations have not caught up with the technology being used? The number and amount of "special conditions" attached to new aircraft are evidence of gaps in design requirements. If these gaps exist, how do maintenance providers establish their action to return the article (in this case the aircraft) to at least its original condition?

The regulations require the designer to ensure the gaps can be addressed when creating fixes for damage to composites or contemplating replacing special coatings during the maintenance process. The air carrier and its maintenance provider must have an understanding of the design requirements, special conditions, and the technology before creating maintenance or alteration actions of their own. The technology must not outstrip the ability to ensure continued operations; the standards for the new generations of materials (composites) and coatings must be decipherable by airlines and their maintenance providers. **AMT**

The maintenance provider must have an understanding of the design requirements, special conditions, and the technology before creating alteration actions.

Sarah MacLeod is a managing member at the law firm of Obadal, Filler, MacLeod & Klein, P.L.C. and is engaged in the legal representation of foreign and domestic air carriers, aircraft maintenance and alteration facilities, distributors, pilots, and other individuals and companies in federal court and before federal administrative bodies. She also serves as assistant chair for Air Carrier and General Aviation Maintenance of the FAA's Aviation Rulemaking Advisory Committee, a post she has held since 1996. A globally recognized expert in aviation regulatory compliance, Ms. MacLeod is a sought-after speaker and has appeared a numerous aviation and MRO events. She is admitted to the bar in Virginia.

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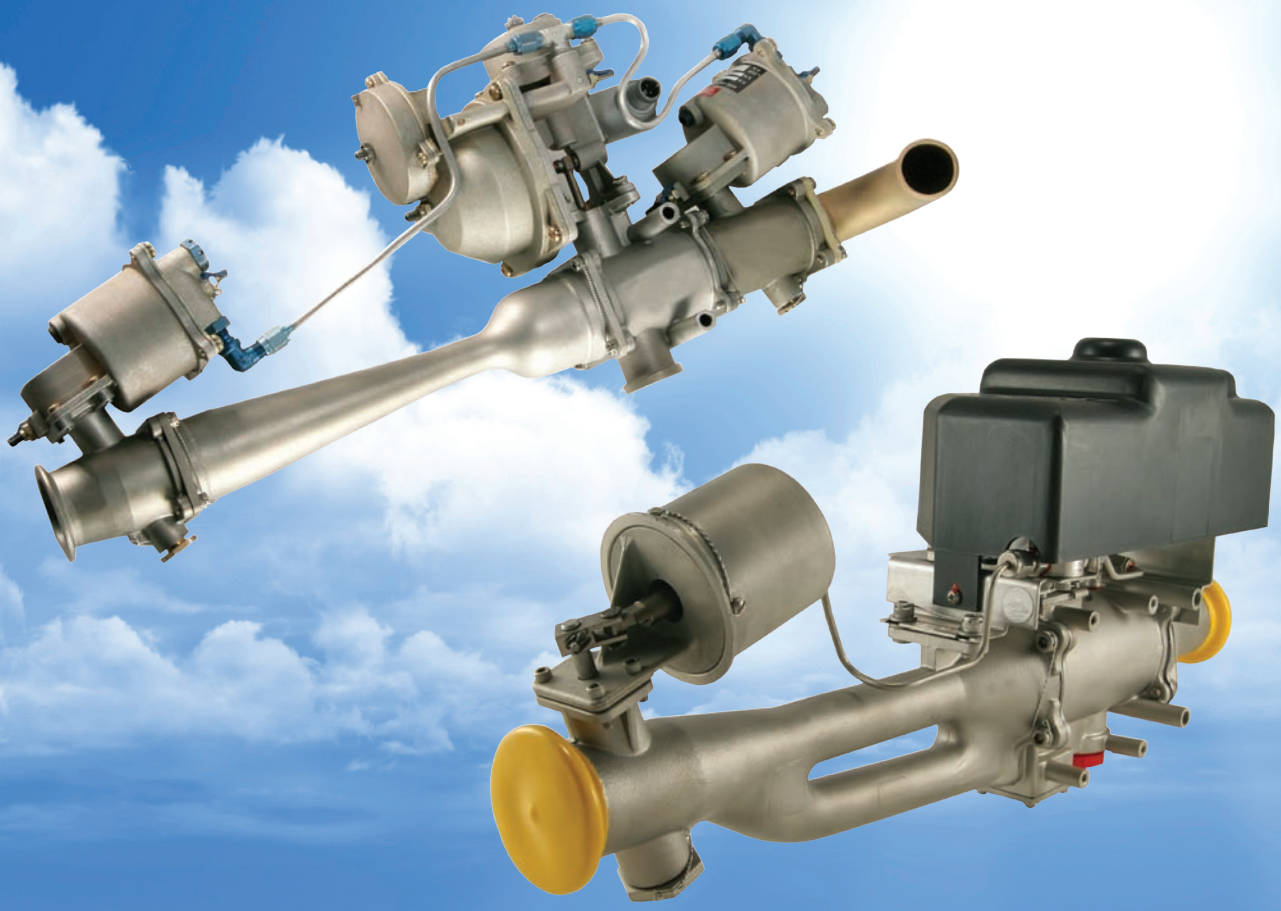

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