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AMT

Aircraft Maintenance Technology

Written by aircraft maintenance professionals for the professional maintenance team

Official publication for AMTSociety

April 2011

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A380 Maintenance

with Lufthansa Technik

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LHT technicians inside the cowling of the No. 1 engine.

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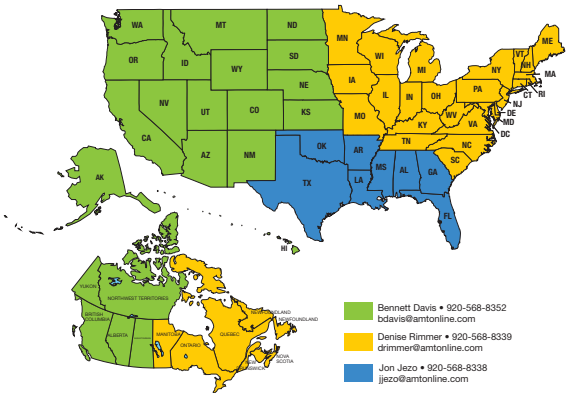

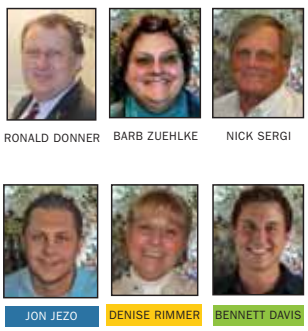

IA Renewal - In Europe

Operators, manufacturers, businesses, MROs, and authorities around the world continue to work more closely together

Ron Donner, Editor

As a U.S.-based publication *AMT* has a natural focus on aircraft maintenance activity relating to North America. Yet travel most anywhere in the world and you will soon find both long-established and emerging aviation industries.

The International Civil Aviation Organization (ICAO) with member nations around the world establishes civil aviation standards for safety and other operating matters, including the much discussed safety management system (SMS) requirements. The European Aviation Safety Agency (EASA) was born as a result of the European Union's desire for a common regulatory and administrative body relating to civil aviation safety matters within its member states.

Last month the U.S. and the EU completed a final step in an agreement aimed at more cooperation, a reduction of redundant activity and approvals, and streamlined processes relating to certification and maintenance. Regardless of which side of the world you live or which side of the many bilateral issues you stand, the fact remains that operators, manufacturers, businesses, MROs, authorities, and aviation professionals around the world continue to work more closely together and many industry activities are becoming more aligned.

The Federal Aviation Administration (FAA) has had for many years international field offices (IFO) with a variety of responsibilities. In February I attend the Inspection Authorization (IA) renewal seminar held by the FAA IFO in Frankfurt, Germany. I was told there are approximately 170 A&P certificated aircraft technicians who hold an IA throughout Europe, Africa, and the Middle East countries, excluding the U.K. In attendance were 66 of these aircraft maintenance professionals, a mix of general aviation technicians, business aircraft operators, ex-patriots from the U.S. working overseas, and MRO and airline technicians.

FAA inspectors spoke on topics from proper use of FAA Form 337 to the definition of major/minor similar to any FAA seminar I've attended here in the states. John Benning, the IFO manager, opened the session by reading the Aircraft Mechanic's Creed and spoke of Charles Taylor and the Master Mechanic's Award program. Benning stressed to the audience, "Don't underestimate the value of these seminars. There are many options today for IA renewal but the value that is gained from networking with others during a session like this is priceless."

I couldn't agree more and am honored to have spent the day with these aircraft maintenance professionals. By the way, two of the people in attendance were current *AMTSociety* members.

Articles in this issue include Stephen Carbone on the Maintenance Implementation Procedures under the Bilateral Aviation Safety Agreements; MRO Operations describes the new Lufthansa Technik (LHT) A380 maintenance facility; and Majella McDonald on SMS. On the technical side, Larry Jackson offers his best practices tips relating to weighing aircraft, and *AMT* field editor Charles Chandler talks about the old reliable Pratt & Whitney R985 radial engine.

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Harmonization

The good, bad, and the ugly

By Nick Sergi

As we come to press, another EBACE, (European Business Aviation Conference and Exposition), will soon be taking place. Having attended just once in my career, I can report that I witnessed a prevalent interest in business aviation. It is also clear that appeal is continuing to grow as the world globalizes, with nations, industries, and professions evolving closer together. And, although business aviation is just one aerospace sector, as it grows overseas, especially in the European community, the importance of harmonization cannot be understated.

As we all know from our everyday lives, events happen faster and faster. Look at the recent revolts in the Middle East and how the new social Internet programs fostered the rapidity of these uprisings. Similar to this, harmonization is quickly becoming a reality. And, like a spaghetti western, there is gunfire and onslaughts from all sides, some good, some not so good.

The good is that harmonization is necessary, if not essential for doing business on a global basis. Seeing it become a reality means that businesses such as airplane manufacturers can rely on improved regulatory standards. I just read this week that a EU/US air safety pact is about to be ratified. This agreement has been languishing at 800 Independence due to congressional opposition to some of its provisions. With a new congress and the departure of defeated Rep. James Oberstar, the agreement is ready for enactment. No longer will OEMs in the United States need to submit redundant paperwork on both sides of the Atlantic to some 27 separate European states. The new pact will suffice in substituting just one certification approval request for all 27. That will save a lot of time and energy, which translates to cost efficiencies. The end result will mean more aerospace jobs in the U.S. This is good.

There are other profound benefits to this pact, including the enhancement of air safety systems with two competent regulatory bodies overseeing operations. This should mean consulting with one another on systems that improve all aspects of air operations from pilot training to repair station operations.

What then may be bad? Well, for one thing Rep. Oberstar was the champion of standardizing the inspection process for approved repair stations overseas. Now that he is gone it appears that when this pact is ratified mutual recognition of safety inspections will be a fact. Left as is, there will be no alcohol or drug testing required in the overseas counterparts. Nor, do I believe, will these operations be subject to the same scrutiny and oversight done by our friendly FAA inspectors in this country. That's just not fair and it will cost jobs here. That's a bad thing.

The good is that harmonization is necessary, if not essential for doing business on a global basis.

Finally, what's ugly is the lack of maintenance participation in the whole harmonization process. Tell me where the technician and the requirements of his or her job have been placed on the table and reviewed by those amassing this agreement. The maintenance worker just does not have an organization that provides this necessary presence and voice. I congratulate Sarah MacLeod and ARSA on forcing the FAA to do the mandatory drug testing. It took a legal action to get this done, but ARSA fought for its small business constituents and succeeded in making the FAA follow court rulings. The fact that there is no body to do this kind of thing for the maintenance worker is a travesty. It's ugly. It should not go on either. Get together. Harmonize among yourselves and protect and promote your profession before you are left behind in the global swirl.

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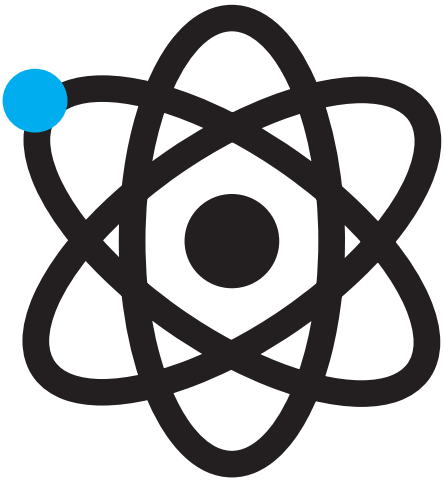

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The de Havilland DHC-2 Beaver aircraft powered by R-985 radial engines in Alaska. Photo courtesy of Robert Scholl, www.schollphoto.com.

Did I Hear a Radial?

Who maintains the R-985 radial engines?

By Charles Chandler

Last August while fishing in Katmai National Park, Alaska, two brightly painted de Havilland DHC-2 Beavers flew over and landed on nearby Naknek Lake. They taxied up and I heard those beautiful R-985s clatter to a stop. In about 15 minutes the bush pilots had off loaded the tourist, repositioned the Beavers and were taxiing out for a takeoff.

As I watched them lift off some maintenance thoughts came to mind. I knew that Pratt & Whitney Canada (P&WC) had stopped producing the R-985s in the early 1950s, so who maintains and overhauls those old workhorses? What are the specifications now and where do they get parts? If someone was operating aircraft powered by radial engines then there were mechanics out there trying to find an oil leak, measuring cylinder wear, or timing a magneto.

The operator

Some of those AMTs work for Rust's Flying Service in Anchorage, AK. Its fleet of aircraft includes five DHC-2 Beavers used by experienced bush pilots to take clients bear watching, on fishing and hunting trips, and to fly-in lodges. I contacted Colin Rusts, owner and operator, and asked if he would like to talk about radial engines. I quickly learned that anyone that has any experience with these engines loves to talk about them. Colin says that the Beavers powered by R-985s were ideally suited for the Alaskan environment and the day charter business. They are safe and dependable, with very few maintenance problems.

He says that "when Pratt & Whitney designed these engines, they got it right the first time." Rust's has a staff of five to six experienced A&Ps that maintain its fleet of aircraft. "They like to maintain the R-985s because they are classics. Up here, a lot of nostalgia and prestige are associated with maintaining bush planes and these engines. They are like Harley-Davidsons. Our maintenance guys take good care of the engines and are especially careful with oil leaks. We fly into the National Parks and other environmentally sensitive areas where any fuel or oil contamination is forbidden. We will continue operating the R-985s as long as we can get parts, low lead 100 octane aviation gas, and the engines overhauled."

I contacted P&WC and asked about engine overhauls. I was surprised to find that Pratt & Whitney R-985 and R-1340 radial engines are still performing vital services in the agriculture industry, backcountry charters, and light freight forwarding. They

Photo courtesy of Wipaire.

are mounted on aircraft flown by the military, state, and local agencies and hobbyists that you see at Oshkosh AirVenture. P&WC stopped supporting the R-985 in the late '50s and the R-1340 in the late '60s however it recommends Covington Aircraft in Okmulgee, OK, for maintenance, repair, and overhaul (MRO) work.

Covington Aircraft, the MRO

The Abbott family operates Covington Aircraft with a strong personal faith and through the four core values of integrity, dependability, quality service, and affordability.

Covington Aircraft's Radial Engine Division is the largest R-985 and R-1340 overhaul facility in the world. It has about 30 employees that include A&Ps, engine overhaul technicians, welders, machinists, NDT and quality control inspectors, and supply specialists that perform all overhaul functions except chrome plating. I spoke to Rob Seeman and Blaine Abbott. Blaine manages the QA function and is the company historian and resident expert on most things R-985 and R-1340.

I asked why radial engines? "If you recall, in the mid '70s before UPS and FedEx, there was a good number of small freight and agribusiness operators flying aircraft with radial engines. Servicing this diverse customer base was good business."

Covington has been doing this for about 40 years and I was curious as to what had changed with the OEM, the customers, and the radials. They said that the FAA certifications were easy to get and the OEM authorization had developed over time. The staff at Covington is very proud that they are a P&WC certified distributor and designated overhaul facility (DDOF).

That expertise and customer care attitude is valued by Covington. It has very low turnover and its story is very similar to Rust's Flying Service up in Anchorage. Some mechanics really like to work on radial engines. Blaine Abbott says, "We have a great in-house training program.

Technicians at Covington Aircraft assemble a radial engine. Photo courtesy of Covington Aircraft.

Usually a mechanic will start out in teardown and work through our OJT program. We encourage our mechanics to get their A&P or repairman certificates. We have mechanics trained and developed with the skills and confidence to go out in the field and work at the customer's location."

Overhaul customers

They explained that in the past 40 years the customer base has flipped because most of the light freight haulers are gone. Now about 80 percent of their customers are in the agribusiness flying AgCats, Weatherly, Air Tractors, and Thrushes. Another 15 percent are in the air taxi business and the rest are hobby customers. They generally fly Beavers, Otters, Harvards, SNJs, Stearmans, BT 13s, and AT6s.

Seeman says, "Our radial overhaul business is still pretty good. Covington is now a global company and has a worldwide customer base. About 40 percent of the business is export. We estimate that about 8,000 to 10,000 R-985s and R-1340s are still operating. These engines can generally operate between 1,200-1,600 hours of time between overhaul (TBO). Radials come in for overhaul because of high oil consumption, propeller strikes, Airworthiness Directive 68-09-01 compliance, or they have timed out." The AD must be accomplished at 1,200 or 1,600 hours depending on propeller installation. To accomplish this, the engine must be disassembled to the point it is more economical to overhaul than to just comply with AD 68-09-01.

AT6 World War II trainer powered by a Pratt & Whitney radial engine. Covington Aircraft's Radial Engine Division overhauls R-985 and R-1340 engines. Photo courtesy of Covington Aircraft.

Tools, fixtures, and parts

I asked about the production side of the overhaul process, especially about their tools and fixtures and parts inventory. Seeman says that they are "currently overhauling around 180 R-985s and R-1340s a year. If we have the parts on hand we can overhaul a radial in about 30 days."

Abbott says that "a huge number of radials were produced during the war years. About 39,000 R-985 Wasp Juniors were produced between 1929 and 1953, and 35,000 R-1340 Wasps were produced between 1925 and 1960. Many of these engines and parts were offered on lend lease agreements to other countries. Also, a lot of surplus left the United States and went to third-world countries. Parts suppliers have been buying up that surplus from those countries and putting the inventory back on the U.S. market.

"There are parts manufacturing approval (PMA) businesses that are manufacturing radial engine parts and accessories. Covington is a (PMA) holder and manufactures gaskets and seals for the Wasps. We bought many of our tools and overhaul equipment on the surplus market. Those we could not get, we redesigned and built better ones."

Future of the radial engines

I asked Seeman and Abbott for an opinion on the future of the R-985 and R-1340 radial engines. They say that "for engines designed in 1920s, they are still very reliable, probably more so today. Improvements in the design and materials for seals and gaskets have reduced oil leaks and dried the engine up. As for longevity, it is all about economics. The agribusiness operators will fly these engines as long as it is profitable to do so."

Pratt & Whitney no longer produces its famous Wasp engines but there are at least five companies building radials today. Rotec Engineering Pty. Ltd. in Victoria, Australia, is producing the Rotec R2800 (a 110-horsepower seven-cylinder engine) and the R3600 (a 150-horsepower nine-cylinder engine). And, Verner Motors in the Czech Republic is building a modern five-cylinder radial.

It appears that these remarkable engines will be around for some time. There are operators using them, hobbyists flying them, and mechanics taking pride in maintaining them. This is very good news for the romantics among us. There are some sounds that we hope never fade away, like birds singing in the spring, straight pipe Harleys, 440 hemis, and radials turning over on a cold morning. **AMT**

Charles Chandler is an A&P based in Michigan. He received his training from the Spartan College of Aeronautics.

1.2

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Airbus A380 being moved from the Lufthansa Technik A380 maintenance facility in Frankfurt, Germany. Photos by Ronald Donner.

A380 Maintenance

Lufthansa Technik describes its new A380 maintenance organization

Ronald Donner

Aircraft technicians around the world have been maintainers of Airbus aircraft for decades. However only a select few have yet to turn a wrench, or more appropriately analyzed an electrical fault, on the largest of them, the Airbus A380. One of these groups is the technicians from the new Lufthansa Technik (LHT) A380 maintenance facility located in Frankfurt, Germany. Inaugurated in 2008 this facility is more than just another large hangar, it's a culture born to maintain this largest of the latest generation of aircraft. Some of the words I heard from technicians and managers alike describing this organization were innovative, proactive, lean, spirit, flagship, and technology.

Innovation in an organization

Thomas Spriesterbach, head of A380 maintenance for LHT, describes the facility as "Innovation in an organization." He explains that when it came time to build the facility because the aircraft was new technology LHT decided the best approach

Lufthansa Technik technicians at a mobile work station prepare to release an A380.

was to build an entirely new maintenance organization to support it. Spriesterbach explains, "We approached this with a clean-sheet not only with the facility design, but the technology, the organization, processes, and leadership." One of the many examples of what he called "in-housing" was rather than using the centralized maintenance planning group, they developed their own group dedicated to only the A380. An A380 maintenance control group is located right near the facilities duty managers. Also located in the facility are technical representatives from Airbus, Rolls-Royce, and Aircell. The facility will house two A380 aircraft tailed in with one nosed in-between.

Technician training had to be innovative and LHT asked the question early on what subjects the technicians needed to be educated on other than the traditional technical type training.

The LHT A380 maintenance organization currently consists of approximately 55 people responsible for maintaining the airline's young fleet of four (at the time of this article five) A380 aircraft. The organization consists of himself as the responsible manager, maintenance duty managers, planners, maintenance controllers, engineers, technicians, and a few others. Spriesterbach shares, "It's very important to have a high team spirit when you are working a flagship aircraft. Everyone here was chosen and is highly motivated. We have a small group of highly skilled and highly trained technicians."

The German Aviation Authority (the LBA) and the European Aviation Safety Authority (EASA) were involved early on in the planning process. The LHT MRO holds EASA approval for line and base maintenance on the A380.

New philosophy and proactive approach

Spriesterbach says, "Maintenance on this aircraft is very much about fault code analysis." One aspect of the proactive approach to maintenance on the A380 is for technicians to have immediate access to historical operational information. The knowledge data base (KDB) was developed where all historical operational and maintenance data from the A380 fleet resides. Spriesterbach says, "If you don't start with a good knowledge data base you won't catch up."

Data analysis is important and takes place 24/7. LHT troubleshooters can see the faults and the data while speaking to the flight crews. The aircraft transmits a current flight report (CFR) to maintenance control in the facility every 15 minutes; a system snapshot every three hours, and a post flight report which is a summary of all faults during that flight segment.

"We always know what is happening with the aircraft," Spriesterbach says, "and we must have a proactive approach to aircraft ground time. The technicians stay very close to the aircraft at all times and the repair process begins when a fault first occurs, rather than when the aircraft arrives. The approach taken is to accomplish 100 percent technical dispatch reliability and always use the next ground time for troubleshooting any fault of the aircraft."

Lufthansa Technik technicians troubleshoot a No. 1 engine speed sensor fault on the A380 in Frankfurt, Germany.

Safety management was also built into the organization. LHT does not plan complex tasks to be accomplished during the night shift in order to eliminate a possible human error. Design of job cards was validated by technicians to ensure instructions were clear and not misleading and work cards are also designed to always consider having illustrations. Hyperlinks are used in all of the

troubleshooting manuals which eliminate such things as writing down a fault code incorrectly.

The aircraft

The current maintenance program on the Lufthansa Airline A380 calls for an R-module check to be accomplished daily. The S-service check is done weekly. The A-check is done each 750 flight hours. In the Lufthansa Airline maintenance program there is no C-check as the tasks are allocated by aircraft usage and are phased into the A-checks. Another new philosophy is the aircraft's minimum equipment list (MEL). The old MEL style works down to the system level. The new MEL philosophy focuses on the electronic centralized aircraft monitor (ECAM) warning rather than the component.

We all know an important step when accomplishing maintenance on any aircraft system is the need to deactivate systems. This is traditionally done by physically pulling a circuit breaker and then installing a locking collar and/or a warning tag to alert others the system is deactivated and technicians are working in the area.

The A380 has what are called remote circuit breaker systems (RCBS) where you can deactivate a system, install an electronic warning tag, reactivate, and remove the electronic warning tag, all on the power distribution page of the onboard maintenance terminal (OMT). You are not physically pulling a circuit breaker. Access to the RCBS can be accomplished from onboard terminals and external computer hookups on the aircraft.

Training

The steepest learning curve began 12 months prior to EIS. The length of the A380 type training course is 45 days. All technicians received this and the Trent 900 engine course. Most everyone received aircraft run-up training. But more importantly was the A380 fundamental technology course which went beyond the maintenance processes.

Spriesterbach explains the approach to technician training had to also be innovative and they asked the question early on what subjects the technicians needed to be educated on other than the traditional technical type training. Spriesterbach shares, "How do you manage 850 pieces of software in the aircraft that operate everything from the toilet flush control to the engine control?" The answer was

to learn about those underlying systems not traditionally taught. Courses were taught in networking of computer systems and how to interact with the onboard information system for troubleshooting.

Some training courses were accomplished in Toulouse, France, in laboratory style settings using A380 maintenance simulators with

The A380 size requires extensive use of elevated work platforms.

3-D modeling software to teach replacement of line replaceable units. Specific training was developed for items such as the aluminum wiring used in the aircraft and how to handle this type of wiring including properly disconnecting and reconnecting electrical connectors. Spriesterbach says, "Two weeks prior to the EIS of the first aircraft we held a training conference. Each technician was responsible to provide a presentation which described a specific maintenance task to entire group. These presentations were also placed in the KDB."

The people

Spriesterbach says, "You are very privileged to work in the A380 organization. 250 LHT technicians applied to work here and each one chosen is because they are highly motivated and it shows in the quality of work and everyone's attitude." The facility has a three-shift operation with a shift plan developed six weeks ahead of time.

Mike Storek, one of the maintenance supervisors, says, "I have a mixed group of electricians and mechanical technicians. The technicians do not have fixed shifts and depending on the work plan we rotate from one shift to another. Everyone is part of the planning process." Storek says his career began in 1986 doing B737 maintenance.

Of the A380 maintenance organization he says, "I became part of this organization two years before the EIS of the first aircraft. It was a new experience and all the doors were open."

He went on to say in the beginning there was some stress between the old and the new ways, and some of the technicians would joke we were playing maintenance; referring to all the planning and simulation training that took place. Many were said to be taking a wait-and-see attitude toward this new organization. "The best part is the spirit we all share," says Storek.

I was introduced to Sascha Holzer, a licensed technician for maintenance and avionics with full return-to-service (CRS) approval. Jacqueline Finkler, a new technician, was shadowing Holzer this day. Finkler recently finished three and a half years of aircraft electrician training and felt privileged to be part of this group.

They were troubleshooting a No. 1 engine N2 speed sensor fault. The fault was a Class 5 observation item with time left before correction was required. However, the fault was being addressed immediately instead of later, an example of the proactive approach to maintenance on this aircraft.

Wolfram Heidenreich, the late shift maintenance supervisor, explains his role and how he likes working the A380. Again I heard the phrase … highly motivated group of 55 people. Heidenreich says of the A380, "It's a new aircraft with new technologies and new impressions. There was so much proactive activity it made for very few surprises when the aircraft arrived." He explains that working on this aircraft is all about troubleshooting fault detections, and early and rapid reaction. Heidenreich says, "I worked a long time on the A330, A340, and now the new A380. So far maintenance is easier because of the real-time monitoring and access to data through the onboard terminals."

Maintenance data can be accessed in the A380 cockpit via the onboard information system.

What's next?

As for MRO activity on the A380, LHT has accomplished three traditional C-checks for a third- party customer so far, and it appears as though it has positioned itself for future A380 third-party MRO work as the worldwide fleet continues to grow. AMT

To Weigh an Aircraft

A look at basic practices and equipment

By Larry Jackson

New weight and balance information is regularly required for most all aircraft; small or large. Installation or removal of equipment, after repairs and modifications, or a frequent requirement of the aircraft or operators maintenance program, requires that the most accurate weight and balance data is available.

Weighing general aviation (GA) aircraft, helicopters, turboprops, corporate jets, or transport category airliners can be accomplished in two ways: top of jack load cells and platform scales. Equipment selection is dependent on the operator's needs and or equipment currently on hand, as well as the airframe manufacturer's recommendations.

A top of jack cell-based scale used on a B727 main landing gear. Photos courtesy of Larry Jackson.

Top of jack load cells, as the name implies, can be used on top of the current wing jacks or can be used under axle for larger jets. Platforms are very useful for small shops that do not have jacks for every type of aircraft. All you need is the ability to pull the aircraft onto the platforms and take your weight readings.

Equipment types

Top of jack systems:

The standard aircraft scale is a top of jack, cell-based scale, where each jack point receives a cell-based transducer on the top of the jack. This system's advantage is, it is very easy to use and level the aircraft during the weighing operation. The system is easy to transport, light weight, and easy to set up.

The operator must have a jack capable of receiving and mounting the cell. Check your jack ram tops for the 1-inch mounting hole; if you do not have the hole, adapters can be provided to assist in the interface required to mount the cells. Cells come in many weight ranges and are dependent on the weight required per point to accomplish the weighing and receiving the actual jack point type.

Platform systems:

Platforms are available in many weight ranges and sizes, these systems either use ramps or the aircraft can be jacked and lowered onto the platforms during regular maintenance. Platforms are easy to use and are a choice for many shops that do not have jacks for the many types of aircraft to be serviced.

The limiting factors for platforms are the weight range and the tire size, some aircraft have large tires and the platform may be too small for the specific aircraft tire. Always use the right size scale and platform for the aircraft type and weighing job you're doing.

Both types of scales feature new technologies using digital indication. Mechanical or analog meter scales have mostly been replaced with the new digital indicators. These indicators are very accurate and easy to use, cranking handles and thumb wheels are a thing of the past, making the weighing job faster to do and giving much higher quality in readings.

Typical platform scale system.

Weighing basics

Scales are like torque wrenches and you would not use a 100 foot-pound torque wrench to torque a 20 inch-pound nut. Why then would you use a 150,000-pound scale system to weigh a light GA aircraft, turboprop, or helicopter? We see this practice a lot where many shops and or technicians use large scale systems to weigh light aircraft, or they have the wrong size cell top to fit a large jet jack point.

There are many military surplus scale units out there, be careful, many of these units still in use are analog meter movements and may or may not be calibrated correctly. When calibrating scale equipment we always recommend using an aviation-based calibration lab with an Airframe and Powerplant certified technician on staff or returning the unit directly to the manufacturer for calibration. Some units require specific calibration procedures, software access, and or adapters; to complete the calibration properly always audit your provider to ensure that the proper procedures and equipment are being used. Primary National Institute of Science and Technology (NIST) traceable certifications and test equipment are a must.

Safety and use of the equipment is always a big factor. Always follow the aircraft or helicopter manufacturer's recommendations when jacking and or towing aircraft for weighing.

Equipment selection

Scale selection should start with the weight range needed and jack point or tire size must be considered. Small to medium aircraft will use a small cell with a 1-inch or smaller jack point. The jack points must fit into the cell concave top and be retained to prevent a cell to jack point ejection or spit during jacking. Larger cells will be used for larger aircraft weight ranges and larger jack points.

The decision point for cell and cup size will be at the medium to large jet selection. Regional airline aircraft and large corporate aircraft usually require a large cell kit to be used due to their larger jack points. We often see a small 50,000-pound cell being used for larger aircraft. In many cases this may have the weight capacity but not the retention and proper fit for the jack point.

For platforms, consider the tire size and ability to chock the tire on the platform to prevent movement. Equipment used to locate the aircraft on the platform and proper ramp selection are also important points to consider. It's tempting, but never consider using automotive-style scales or 1 percent accuracy

platform units as these units do not have the accuracy or resolution required for aviation use.

Always read and understand the scale manufacturer's manual as well as the airframe manufacturer's manuals prior to weighing and selection of the type scale to use. Aircraft maintenance personnel must understand the process, procedure, and instructions; remember to use the right tool for the right job.

Resolution and accuracy

As a general rule scales less than 10,000-pound capacity will measure in a 1-pound count and scales over that and up to 25,000 pounds will count in a 2-pound count. Large jet 50,000-pound scales will measure in a 5-pound count and so on. Always use a scale with the proper size and count resolution. The idea is to pick the right scale size and resolution for the aircraft type and accuracy needed.

Accuracy for aviation use is touted to be one-tenth of 1 percent or three indicator divisions, whichever is higher to full span. This is a release tolerance for the unit as calibrated and released from the lab and quality scales will meet this specification.

In the field tolerance is a different story. In general the tolerance expected in use would be one-fourth of 1 percent or five divisions to span. Due to the application, jacking, level of the hangar floor, and attention of the technicians conducting the job, there will always be variables in the weighing. Aircraft weights from point to point in rotation should be within range of the target weight from the old weight and balance.

Conclusions

When selecting a scale system it is important to remember to select a scale that is the correct type, size, and has the correct weight range for the application. The aircraft manufacturer's manual should always be consulted for the proper selection and directions. Some manufacturers do not recommend a particular scale or type. In these cases, look at the technical data provided to do the job, the calculations, formulas, and any charts that are provided. Many manufacturers will include the jack point locations and wheel center locations in their manuals, so it is up to you to decide which type of scale to use. AMT

Larry Jackson holds an A&P certificate with IA and has 31 years of experience in the maintenance and care of all types of aircraft and helicopters. His company www.aircraftscales.com is a division of Jackson Aircraft Weighing Service. For more information call (561) 281-6179.

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Join *AMT* Editor Ronald Donner as he talks with Robert Baron about safety management systems, what they really mean, and how they can benefit your organization.

- ✈ SMS background
- ✈ Key principles behind SMS
- ✈ What does it mean for a maintenance organization
- ✈ Getting the program going
- ✈ Lessons learned from others
- ✈ Implementation pitfalls

Ronald Donner, *AMT* Editor

Ronald (Ron) Donner is the current editor of *Aircraft Maintenance Technology (AMT)* magazine. He's spent his entire life devoted to aviation and he holds FAA certificates as an A&P/ IA, and a Commercial Pilot with Single and Multi Engine Land, Instrument Airplane and Glider ratings. Ron has worked in a variety of maintenance related roles, both technical and management in general aviation as well as with a major airline.

SPEAKER: Robert Baron

Dr. Robert Baron is the President and Chief Consultant of The Aviation Consulting Group. He has over 23 years of experience in the aviation industry. As a global aviation safety consultant, he has assisted a multitude of aviation organizations in the development of their Human Factors, SMS, CRM, and LOSA training programs. Dr. Baron is also an adjunct professor at Embry-Riddle and Everglades Universities and teaches courses on aviation safety and human factors subjects as well as research-related courses.

The Big Picture

Advancements in flight deck displays and computer graphics

By Jim Sparks

Situational awareness is a frequent buzzword in the world of aviation. From a maintenance perspective it deals with self-preservation. Knowing what is going on around us is a great way to avoid incidents or worse yet, accidents involving bodily injury.

In the flight environment there is an equally broad need for awareness. Not only do flight crews need to know what goes on with the aircraft but they require information about weather, potential traffic conflicts, and surrounding terrain.

Real-world environment

Advancements in flight deck displays and computer graphics have enabled a complete virtual real-world environment where pilots have access to information that influences the flight.

Perusing the cockpit of almost any recently certified aircraft is an eye-opening experience. In many cases, with power off, the instrument panel appears sparsely populated with perhaps four or five displays along with a few strategically located indicators and switch modules. Once energized it soon becomes apparent that significantly more information can be observed than in years past. In addition, computer animation makes it possible to blend data enabling one image to present many facets.

Advancements in flight deck displays and computer graphics have enabled a complete virtual real world environment where pilots and mechanics have access to critical information.

Even the traditional fault warning panel becomes an integral part of the display system. Once an anomaly is recognized, system software makes a determination if the malfunction should be presented to the flight crew or stored until the aircraft is either on the ground or in a less critical flight envelope. Once a crew advisory is generated, the pilot will often have the ability to select a pertinent display menu allowing synoptic viewing of the system highlighting where the perceived malfunction has occurred.

Engine indications

In addition to bringing faults to the attention of the crew many systems have the ability to retain this information in some type of central maintenance system (CMS) giving maintenance technicians the ability to review the aircraft's perspective of a reported malfunction. Even engine indications have become part of the big picture. Digital engine controllers are a natural source of data for electronic displays and may provide additional diagnostic information that can be easily retrieved by technicians.

For years fundamental navigation instruments were installed in a panel using a standard form often referred to as the "Basic T." Airspeed was in the upper left next to the attitude indicator. The altimeter was on the right and heading belonged just below the attitude. This standard is still in use today with a few variations and enhancements.

System operating software often has the ability to bias indications based on the aircraft configuration. In some cases airspeed limitations are reduced predicated on aircraft weight or fuel load and operating altitudes may be limited in the event certain automatic flight control systems are not fully operational. The visual cues delivered automatically to the flight crew provide that

extra element to ensure safe operation. New display formats are conducive to providing a moving map giving pilots a clear indication of up-to-date aircraft position complete with other air traffic.

Digital weather information

It wasn't all that long ago that the pilot's briefing was the main source for obtaining a trip weather report. Onboard weather radar is still the best way to provide storm avoidance but newer digital weather information can now be viewed real time in flight enabling the crew to anticipate altered flight paths well in advance of storm cell visual contact and this information can be applied to the moving map.

The synthetic vision system (SVS) is a computer-mediated reality system for aircraft using a representational three-dimensional format to provide pilots with a clear visual understanding of the airborne environment.

This technology was developed by NASA and the U.S. Air Force in the late 1970s and 1980s in support of advanced flightdeck concepts.

Additional navigation systems

Synthetic vision employs databases containing detailed information on terrain, obstacle, geo-political boundaries, and relative vertical navigation information. A typical SVS application uses the stored data on board the aircraft in unison with navigation information including GPS and inertial reference systems through a processor which provides position information to an image generator and on to the flight deck display. A highway in the sky (HITS) is then used to depict the projected path of the aircraft in perspective view. Pilots acquire instantaneous understanding of the current as well as the future state of the aircraft with respect to the terrain, towers, buildings, and other environment features.

The first FAA certified application of a synthetic vision system was part of the Gulfstream PlaneView flight deck introduced in 2009. This form of the synthetic vision — primary flight display (SV-PFD) replaces the traditional blue-over-brown artificial horizon with the computer-generated terrain overlay with typical PFD symbols. Since then, many newer glass cockpit systems offer synthetic terrain presentations.

Enhanced vision systems incorporate a unique imaging capability, inspired by the forward-looking infrared (FLIR) technology. An infrared sensor that operates in the shortwave infrared (SWIR) spectrum is designed to depict anything

producing heat such as runway lights, animals, or even other aircraft. The externally mounted thermal detector sends a video image to the flight deck displays, giving the pilots an accurate look at their surroundings even in low visibility.

Even at night, EVS increases visibility of runway markings, taxiways, adjacent highways, and the surrounding landscape. This feature does drastically reduce the margin for error and for controlled flight into terrain (CFIT) which is considered the No. 1 danger in aviation today.

Laptop as a new maintenance tool

New technology does provide new opportunities for maintenance technicians. The age where analog information comprised of variable voltage, frequency, and phase has been superseded by digital data and discrete signals in and out. Use of a volt, ohm meter (VOM), and test lamp and while they still hold importance are loosing ground to the laptop computer and oscilloscope. Understanding the principles of troubleshooting digital data buses and video systems are now paramount.

The nature of our trade is rapidly changing. In years past the guys "upstairs" in the avionics shop would deal with flight deck indication dilemmas and we were trained on instrument removal procedures. Today the training element, while still necessary, is being superseded by a genuine need for education on new technology.

Thorough understandings of system switching and certification requirements are essential for accurate diagnostics and dispatch decisions. Adaptability of a minimum equipment list (MEL) to a digital flight deck is not without challenge. Often when a fault message is presented an underlying cause may be the culprit. Maintenance diagnostic systems do incorporate different design philosophies where some can sense ON/OFF along with understanding valid logic functions it may not always be intuitive enough to provide accurate diagnosis without applying a significant amount of brain power.

Situational consciousness in aviation maintenance will always be an important part of what we do but with equipment used in the flight decks of today it's creating an entirely new awareness. **AMT**

Jim Sparks has been in aviation for 30 years and is a licensed A&P. He is the manager of aviation maintenance for a private company. He can be reached at sparks-jim@sbcglobal.net.

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Toolbox raffle

The Snap-on toolbox that was the raffle prize in the scholarship fund-raising event was won by Michael A. Molzahn of Ozark, MO. Molzahn is employed by American Eagle Airlines at the Springfield-Branson National Airport.

Now for the rest of the story: When I called Mike to tell him he was the winner, he replied to me, "I am donating the toolbox and all the tools to my alma mater, Spartan College of Aeronautics and Technology in Tulsa, OK." He informed me that a list of the tools they need and the color of the toolbox would be sent to me. Now the story gets even better. I received the list and called Patrick D. McDevitt, the national accounts manager from Snap-on Tools who worked with me initially to create the program, to inform him of the list of tools and the request for a Black KRA4107D toolbox. He was so much in awe of Mike and what he was doing that he immediately added another $1,000 worth of tools for the school. There are not enough words to describe the passion and generosity of these two individuals. And thank you is not adequate.

Ken MacTiernan and Joe Hawkins have more on the Maintenance Skills Competition and the scholarship winners. Stay safe.

— Tom Hendershot

2011 Maintenance Skills Competition

One hundred thirty AMTs, representing four countries, stood tall Feb. 23 – 25, 2011 during *AMTSociety*'s 4th Annual Maintenance Skills Competition in Las Vegas, NV. Competing in 12 events, ranging from safety wiring to electrical/avionic troubleshooting with composite and engine tasks thrown in, 26 teams of skilled AMTs and AMEs spoke out for their craft and profession.

Michael Molzahn, an AMTSociety member, and part of the Maintenance Skills Competition judging staff, won the fund-raising toolbox raffle. Photo courtesy of Russ Cannon.

Teams of AMEs came from China, Australia, and Mexico to compete against their peers in the United States. There are five categories to be competed in with first, second, and third place plaques and awards presented to the teams with the fastest overall scores.

This competition and professionalism is enabled not because of *AMTSociety* but because of the companies and organizations

2011 MSC SPONSORS:

AMTSociety wishes to thank the following for their support in providing challenging events and tools for this year's MSC:

- **Aircraft Maintenance Technicians Association** – Charles E. Taylor Event
- **USAF** – Rigid Hydraulic Line Event
- **Duncan Aviation** – Electrical Troubleshooting Event
- **Fluid Power Technical Institute** – Hydraulic Test Stand Event
- **FedEx** – JT9 Engine Event
- **U.S. Navy** – Composite Event
- **Embry-Riddle Aeronautical University** – Safety Wire Event
- **Nida Corporation** – Electrical Troubleshooting Event
- **Aircraft Technical Publishers** – Regulatory Research Event
- **CAE** – Avionic Troubleshooting
- **AMTSociety** – Rigging Event
- **Southwest Airlines** – APU Event

2011 MSC WINNERS:

Military
1: USN Fleet Readiness Center SW Team Gold
2: USN Fleet Readiness Center CW Team Blue
3: USAF Team McChord

Commercial
1: Southwest Airlines
2: Australian Licensed Aircraft Engineers Association (ALAEA)
3: FedEx Team Indianapolis

Schools
1: Redstone College
2: Aviation Institute of Maintenance Team Atlanta
3: Crimson Technical College

MRO/OEM
1: Association of Maintenance Professionals (AMP)
2: Boeing
3: Team Mexico

General Aviation
1: Team Colorado
2: Gulfstream

The U.S. Navy Fleet Readiness Center SW Team Gold won first place in the Military category. Photo courtesy of Russ Cannon.

First place in the MRO/OEM category was Association of Maintenance Professionals or Team AMP. Photo courtesy of Russ Cannon.

Above: Southwest Airlines won first place in the Commercial category. Shown with Ken MacTiernan, MSC Chairman on right; Snap-on Tool representative; and Tom Hendershot, AMTSociety executive director, on the left. Below: First place in the General Aviation category was Team Colorado. Photos courtesy of Russ Cannon.

that compete but also those that provide the events to be competed in as well as the tools presented.

Southwest Airlines not only took first place in the Commercial Aviation Category for the second year in a row but it also was awarded the William F. O'Brien Award for Excellence in Aircraft Maintenance which goes to the one team with the lowest overall score from among all the teams competing.

Companies that provided tools for prizes were Kennedy Tool Boxes, DeWALT, Stanley/Proto, Leatherman, NoiseBuster Headsets, David Clarke Headsets, Pan American Tools, and the biggest contributor was Snap-on Tools who gave ratcheting screwdrivers to all 130 competitors and judges and also provided tools for each first, second, and third place awardees as well as the William F. O'Brien Award recipients.

AMTSociety's 5th Annual MSC is set for March 9 – 11, 2012 in Las Vegas, NV. See you there!

— Ken MacTiernan, Director AMTSociety, Chairman MSC

2011 scholarship winners

AMTSociety scholarship programs were established to provide professional training to outstanding students and established professionals from a range of backgrounds to pursue their studies in academic and specialized environments. The winners of the 2011 *AMTSociety* scholarships:

Samantha Fowler

Charles E. Taylor Scholarship: Samantha R. Fowler. Fowler is a rising senior pursing an Associate of Applied Science degree at the University of Arkansas Community College at Batesville (UACCB) along with her Airframe and Powerplant certificates. She is already actively engaged in the industry, assisting with the repair and inspection of airplanes with several local aviation maintenance firms after class and weekends. Fowler is also a FAASTeam representative in the Little Rock FSDO.

Thomas "Tom" E. Hendershot Scholarship: Travis L. Beach. Beach is on course to graduate from Emily Griffith Aircraft Maintenance Training Center, Watkins, CO, in December 2011 with his A&P certificate. He has a strong mechanical background in auto repair and restorations and he works in a local auto parts supply store. Since his enrollment at Emily Griffith in 2009, he has achieved perfect attendance and a 4.0 grade point average in his classes.

Travis Beach received the William F. "Bill" O'Brien Scholarship; shown with Hendershot and AMTSociety Scholarship chairman and director Joseph Hawkins. Photo courtesy of Russ Cannon.

Dillon Gardner won the William F. "Bill" O'Brien Scholarship. He plans to attend Spartan College.

William "Bill" F. O'Brien Scholarship: Dillon R. Gardner. Gardner is a senior at Alamosa High School in Alamosa, CO. Active in many school activities, he is also a four-year varsity letter winner in baseball. In the fall of 2011, Gardner will attend the Spartan College Aviation Maintenance Technology AAS Degree Program in Tulsa, OK, and begin studying for his A&P certificate. His enthusiasm for aviation maintenance was first realized when he was 12, flying for the first time in his grandfather's Maule.

Military Scholarship: AMT1 Todd Grote, U.S. Coast Guard. AMT1 Grote is the inaugural winner of this program. Petty Officer Grote is currently serving at Coast Guard Air Station Corpus Christi, TX. He has more than 1,800 flight hours as a dropmaster, flight engineer, and observer. He is a flight board examiner, shop supervisor, and holds many nondestructive inspection certificates. AMT1 Grote is also pursuing a Bachelor of Science degree at Embry-Riddle.

Military Scholarship winner AMT1 Todd Grote with the U.S. Coast Guard.

How to Manage Fatigue Without a Duty Time Rule

What can mechanics and their supervisors do to minimize the impacts of fatigue on maintenance in the absence of regulation?

By John Goglia

Much as we might need one, it's unlikely that mechanics will see an air carrier maintenance duty time rule any time soon. Although the NTSB first recommended such a rule in 1997, and added it to its Most Wanted List in 1999, the FAA's position is that maintenance fatigue is too complex an issue to regulate and that training and education are sufficient. Notwithstanding the FAA's intransigence, the NTSB re-asserted in January of this year its Most Wanted safety recommendation that duty time limitations be established for air carrier maintenance workers.

I agree with the FAA that maintenance fatigue *is* a complex issue and I am pleased to have been invited to work with its Maintenance Fatigue Working Group. Fatigue in maintenance is related not only to inadequate sleep and rest but also to other factors such as light, noise, temperature, and even vibration. Repetitive tasks — especially the often mind-numbing (but critical) task of scouring large areas of aircraft skin for small cracks — can lead to fatigue. But I disagree that complexity is a reason to avoid duty time regulation; it just means that those regulations will still need to be coupled with training and education. And while I firmly believe that a duty rule is necessary, we need to deal with the current situation as it is. And pray that a fatal accident is not the catalyst that finally forces the FAA to act.

It is beyond dispute that fatigue in mechanics can affect the quality of maintenance. So what can mechanics and their supervisors do to minimize the impacts of fatigue on maintenance in the absence of regulation?

First of all, as professionals, mechanics are responsible for coming to work with adequate rest to perform their jobs. Yes, I know, with wages slashed, mechanics are working either overtime or second jobs (or both), and asking them to police themselves is asking a lot. But that's what air safety demands and the public expects. Eight hours of sleep is what is normally necessary to be well-rested and that is what mechanics should be striving to get before every workday.

Mechanics need to be aware of the symptoms of fatigue and notify their supervisors when they need a break. Shift work — particularly rotating shifts or midnight shifts — can result in chronic fatigue if not properly managed by the mechanic. I know how hard it is to have a family life when working the midnight shift; sleeping eight hours before your shift means not seeing your school-age children all day since you get home as they're heading for school and should be going to sleep as they're getting home. But just because it's hard doesn't give us an excuse to come to work with inadequate rest.

Supervisors must be sensitive to issues of fatigue among workers, they must be able to recognize the signs and pull workers off a job if they feel they are not fit to perform the job, and they must be willing to encourage workers to speak up if they feel fatigued. Sometimes a short break may be enough, other times a longer rest will be necessary.

Until a rule is issued, airline passengers will have to rely on the professionalism of mechanics and supervisors to prevent fatigue from affecting aircraft maintenance. **AMT**

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

Another Failed FAA Safety Program

Air transport oversight program (ATOS) fails to perform; do we need another one?

By Stephen P. Prentice

The Inspector General of the Department of Transportation has recently published, without fanfare, its report stating that the ATOS safety program started in 1998 has failed in its effort to implement a comprehensive safety and inspection process within the major Part 121 air carriers in our country. The report states, among other things, that FAA inspectors failed to complete more than 200 key inspections on time.

Now, one must recall that this ATOS system was introduced in 1998 as the safety system to end all safety systems. ATOS was designed to be a systematic approach to aircraft maintenance and safety. It was comprised of 96 elements, categorized as high, medium, or low in criticality. The high elements were supposed to be assessed twice a year, medium elements once a year, and low element items every three years … simple enough, but it was necessary to access the data through something called ACAT, the Air Carrier Assessment Tool, which was a system set up for the inspectors to periodically reassess all of the elements to see how safety risks were being handled and where the high risk areas were. Unfortunately, the system has never worked the way it was designed.

Final DOT audit report

On Dec. 18, 2010, DOT released its final audit report on ATOS effectiveness and in essence concluded it is a failure. It said:

1. The FAA did not perform timely ATOS inspections of policies and procedures for the air carriers' most critical maintenance systems;

2. FAA inspectors did not effectively assess whether critical maintenance systems were performing as intended;

3. The FAA finally completed including all Part 121 air carriers in ATOS in 2007, almost 10 years after initiation, but effective implementation of ATOS was hindered due to inspectors' frustrations with adapting ATOS principles to smaller air carrier operations, citing problems with redundant inspection checklist questions, air carrier staffing limitations, and insufficient data to support the ATOS "data driven" approach.

Although the IG is highly critical of the FAA's approach and the work of the inspectors in the report, it goes on to say that the FAA is hindered in its ability to effectively target inspector resources to the areas of greatest need. But, DOT will make recommendations to the FAA to improve its data, training, and risk assessment processes for ATOS, in an attempt to salvage something out of it.

Further observations by the IG

The most important items of concern include adherence to airworthiness directives (ADs), which are mandated by federal law, and major repairs and alterations. Inspectors have admitted that inspections regarding ADs for example, considered to be of high criticality, had not in fact taken place over a passage of some five to seven years! Most of us in this business consider ADs of significant importance to require almost immediate attention to determine risk and then perhaps request delays in completion.

FAA inspectors in some cases stated that they missed inspection intervals (for airworthiness directives) due to confusion over the FAA's guidance on when ATOS design assessments should be completed. Even after the confusion was supposed to have been cleared up, inspections were still not completed on time. The FAA even reduced the number of maintenance program inspections and this still did not allow inspectors the time to comply with the inspection intervals. Most observers consider ADs immediate attention items. (Unlike other mandates these are required by federal law and failure to complete them could be considered a crime. If FAA inspectors

were proved complicit in avoiding completion of ADs on time, they could be considered co-conspirators in such cases.)

If such failures had occurred in private industry, heads would roll big time. Indeed, you may recall the Southwest and American Airlines recent past failures to complete certain required maintenance items, revealed by whistleblowers. Some FAA inspectors' heads did roll within those companies. However, there was no evidence of government employee heads rolling. In some cases the most we saw was employee transfers to other locations, in order to hush up well-deserved criticism.

Other safety programs: Self-disclosures: AC 00-58

Voluntary disclosure of aviation safety discrepancies in airline operations are covered under AC 00-58. This safety program was instituted by the FAA to aid in detecting failures of airline maintenance to find and disclose errors. It is designed to encourage self-disclosure in return for immunity in some but not all cases. The key element is that the safety errors must be disclosed before the FAA detects the errors, in order to provide immunity.

In the airline cases described however, errors were disclosed after the FAA found them. In these cases the AC calls for sanctions, which were not imposed. This disclosure program for the most part receives no followup, as required in the AC, and can also be considered by many as another failure for this and other significant reasons, including airline privacy.

ASAP: AC 120-66

The aviation safety action program (ASAP) was designed to collect safety information by data collection of otherwise unobtainable information. It was designed as a voluntary program. The reason that this program met so much opposition is that it required the collection of otherwise proprietary maintenance performance information and made it available to FAA examiners and maybe other airline competitors. It became so controversial that some airlines opted out and refused to participate. With some additional guarantee of privacy some have re-joined but the doubt always remains as to who will have access to this proprietary information. Yet another failure?

For example, after the 1995 American Airlines crash in Cali, Colombia, AAL refused to disclose internal safety information to litigants in the discovery phase of the cases that had been filed to recover damages. American argued that without firm guarantees that such data be protected from disclosure to lawyers and others, all air carriers will think twice about participating in such programs as ASAP. This argument will continue to be a serious impediment to the collection of safety data by the FAA. There is no law that says airlines have to divulge their private information through the FAA in this manner.

The FAA has agreed to include such aviation self-critical data analysis in the overall protections contained in the air carrier voluntary disclosure program (AC 00-58). This program protects records submitted to the FAA by airlines from Freedom of Information Act (FOIA) requests. The FAA recognizes that such disclosures would interfere with the FAA's ability to collect such information in the future and therefore impact aviation safety efforts. However, courts have gone both ways on this issue when the self-critical analysis privilege is raised in defense of refusals to provide information in litigation.

CASS: FAR 121.373

The continuous analysis and surveillance system (CASS) has been around for a long time and requires airlines to manage and run a program that contains monthly maintenance meetings that cover every aspect of the maintenance and operations facets of the airline.

The FAR states: "Each certificate holder shall establish and maintain a system for the continuing analysis and surveillance of the performance and effectiveness of its inspection program and the program covering other maintenance, preventive maintenance, and alterations and for the correction of any deficiency in those programs …"

By itself, this is no small task. It requires a department or group of people to daily track maintenance effectiveness, discrepancies, and inspection programs and prepare a regular monthly report for submission to management and FAA inspectors.

This mandated safety program is probably the single most successful one of all and it has been spelled out in the FAR for many years. FAA inspectors are encouraged to attend the meeting and review and discuss the monthly report prepared by the CASP staff at the airline.

Other safety reporting requirements

All Part 121 and 135 certificate holders have numerous other safety reporting requirements that include among others: mechanical interruption reports, mechancial reliability reports, service difficulty reports, and NTSB accident reports. These are just some of the reporting requirements for air carriers, but the point is that with all of the above safety systems that seem to be partially or totally flawed, do we need any more? **AMT**

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BASA/MIP

A look at bilateral aviation safety agreements and maintenance implementation procedures

By Stephen Carbone

In 1982, I began working for Federal Express; it had brand new 727 aircraft to build up its domestic service. Within 30 months it's using those 727 aircraft for European flights before transitioning to DC-10s. FedEx, like many others, was expanding internationally. By 1992, you could count on one hand the major airlines that stuck strictly to domestic routes.

But the effects of international aviation weren't limited to airlines; Boeing, Cessna, and Bell began sharing the stage with international competition. As U.S. manufacturers brought in work to their fixed-wing and rotorcraft products, so did repair stations specializing in component repair both here for foreign manufactured components and across the borders and oceans for U.S. manufactured components; Part 145 repair stations that provided anything from brake assembly overhauls to instrumentation repairs were breaking from the mom-and-pop repair stations of the past.

As international travel expanded it became more efficient to perform phase checks on foreign soil; an aircraft committed to an overseas route could receive scheduled checks across the pond rather than drag the aircraft back home, thus eating up flight hours and cycles. In these foreign markets, repair stations provided a market for U.S. operated businesses by opening in foreign countries and becoming a new source of convenience providing phase checks, repairs, alterations, modifications, and on-site component overhaul. No matter where one stands on the issue of maintenance accomplished overseas, it's here to stay.

Maintenance implementation procedures

Let's speak about maintenance implementation procedures (MIP) under the bilateral aviation safety agreements (BASA) provisions; we'll reference FAA Order 8000.85A, which speaks to establishing a MIP. According to Advisory Circular 21-23B, a BASA is "a government to government agreement, consisting of one executive agreement and one or more maintenance implementation procedure, to facilitate the recognition of procedures for the mutual acceptance of" different approvals related to environmental, airworthiness, and/or operations; they replace bilateral airworthiness agreements. Simply, the BASA is the handshake between two countries agreeing to Part 145 repair stations being allowed to operate in the other's country.

Simply, the BASA is the handshake between two countries agreeing to Part 145 repair stations being allowed to operate in the other's country.

The BASA specifically provides for joint participation in the inspection of civil aviation authorities and undertakings, for cooperation and assistance in any investigation or enforcement proceeding, and on the exchange of safety data, including data on accidents and incidents. BASA also foresees mutual recognition of aviation safety certificates obtained through shortened product approval procedures and joint acceptance of product tests.

No country gives free rein to another to act with impunity on its regulated stuff. A MIP is "the procedural document authorized by the BASA executive agreement related to the performance of maintenance, alterations, and modifications on civil aeronautical products." A technical implementation agreement between the FAA and a country's national aviation authority (NAA), the MIP defines procedures to accept each authority's recommendations for repair stations surveillance. Aircraft certification also has implementation procedures with its own set of procedures for e.g. recognition of manufacturing certification. To clarify: MIPs are written arrangements two countries have to assure rules compliance; both countries agree on how to keep an eye on repair stations.

National aviation authority

A national aviation authority is a country's regulatory agency, as the FAA regulates for the United States; NAAs are specific to each country, e.g. for the United Kingdom, it's the Civil Aviation Authority. Also, the FAA recognizes that certain sections of the maintenance rules are international standards; since the FAA belongs to the International Civil Aviation Organization (ICAO), it requires, per ICAO, to have: appropriate tooling, equipment, technical data, and both trained and qualified personnel.

Once a MIP is concluded, the NAA and the FAA can decide if a repair station receives initial certification, renewal with all ratings, any amendments to a repair station's certificate, or even if the repair station is denied renewal. Additionally there will be a "reciprocal acceptance of recommendations for certification and renewal" and recording of results from surveillance when a NAA issues certificates to U.S.-based repair stations. And when the NAA refuses certification of a U.S.-based repair station, the FAA, per the MIP, accepts NAA findings and recommendations for renewal and certification.

Foreign repair stations

The FAA certifies nondomestic repair stations operating under the provisions of Title 14 CFR Part 145; these foreign repair stations maintain, modify, or alter aeronautical products per U.S. airworthiness regulations. Under each MIP, a NAA and the FAA coordinate efforts to develop procedures for surveillance, schedules for inspection, and certification programs. These international agreements allow the oversight door to swing both ways. The NAA oversees the foreign repair stations per the standards of that country, and the FAA oversees its repair stations located here as per our standards. The two countries' married policies per MIP guarantee that the repair stations in any country are receiving harmonized oversight.

To conclude a MIP, the FAA follows a four-phased process together with NAAs with a BASA (if the NAA lacks a BASA, one is negotiated while the MIP is being concluded). First the FAA familiarizes itself with the NAA system, assuring it has proper documentation and sufficient capability.

A FAA MIP team is gathered to evaluate the NAA system in the second phase; here regulations are checked for compatibility while joint assessments of the NAA's repair stations take place. In the third phase the MIP is developed; the FAA and NAA discuss differences and special conditions. In the final fourth phase, the U.S. State Department concurs with the MIP and the FAA/NAA sign off on it.

MIPs are written arrangements two countries have to assure rules compliance; both countries agree on how to keep an eye on repair stations.

Note: Some long-standing working relationships between the FAA and some countries or regions could result in limited joint assessment inspections. The European Aviation Safety Agency (EASA) and its forerunner the Joint Aviation Authority (JAA) have this kind of relationship, so assessment inspections between the two may not be necessary.

A MIP issued by the FAA and NAA for a particular repair station is based on evaluations of 14 CFR Part 145 and foreign NAA regulations ruling repair stations. The joint evaluation streamlines the surveillance of the repair station to eliminate redundant criteria and identify differences; the resulting regulations and requirements are used to conduct surveillance on the repair stations either by the FAA or NAA, according to where the repair station is located. The evaluation also determines the ability for the FAA or NAA to carry out surveillance on the other's behalf; in other words there will be surveillance by one qualified overseer instead of two or three while maintaining equivalent levels of safety.

If there's no BASA

But suppose a repair station in a foreign country or within the United States isn't operating under a BASA and its related MIP; what standards does it work under? The repair station is subject to perform work on aeronautical products to FAA standards *and* one or more different NAA standards. The ends are the same — the repair stations must meet the standards of both entities.

What's the benefit of a MIP? It's like going through two security screening stations in a row at the airport; the second station says put your shoes back on but take your socks off first. The rules the repair stations must follow with a MIP result in synchronized safety systems with less cumbersome/costly technical and administrative procedures for the recognition of certificates.

It's difficult to list the BASA countries here, but they're worldwide and the list changes frequently. International agreements are vital; the BASA/MIP is the surest way the FAA has for maintaining safety across the globe. **AMT**

Stephen Carbone is an aviation industry veteran of 28 years. He works at the Boston regional office in the Flight Standards Airworthiness Technical Branch. He holds a master's degree in aviation safety systems.

What's in Your Toolbox?

Part 1: Why should we have this SMS toolbox?

By Majella McDonald

According to International Civil Aviation Organization (ICAO), a safety management system (SMS) is: "… a toolbox that contains the tools that an aviation organization needs in order to be able to control the safety risks of the consequences of the hazards it must face during the delivery of the services for which the organization is in business." (ICAO, 2009 p.7-1)

ICAO goes on further to state that, "It is important to acknowledge that an SMS itself is neither a tool nor a process." (ICAO, 2009 p.7-1) Having determined that you are part of the aviation organization — are you part of the toolbox? The simple answer is — yes!

SMS is a companywide enterprise that includes all departments working together to achieve the same safety and quality goals and objectives.

Imminent FAA mandate for SMS — "We can't afford it right now!"

The FAA regulations on the requirements for aviation SMS are not yet set, but they are fast approaching with the March 2011 extended deadline for comments on the related NPRM. Are you and your organization going to be ready for it? The first step is to understand what it is and what it is not.

First and foremost, a SMS is a companywide enterprise that includes all departments working together to achieve the same safety and quality goals and objectives. The approach may be different between departments as to how this is done, but the aim is to achieve the same goals of safer and more profitable operations throughout the organization.

As is standard for the FAA, it has provided the areas that must be encompassed by a SMS, but it does not prescribe how to implement it in your own organization. Of course, the implementation is the most difficult part. Without the FAA mandate in place for this implementation, current traction and momentum of several SMS in the aviation industry have either faltered or been put on the back burner. Industry downturn has impacted the SMS implementation in all aviation spheres. This is especially true for many fledgling SMS that were being planned in the maintenance field. Nevertheless, this is a very shortsighted perspective on the return on investment that a SMS can provide for the company as a whole.

Some in the aviation industry believe they cannot afford to implement a SMS at this time. However, if questioned more closely, there is no "good" time to do it. Many smaller operators, such as in general aviation, repair stations, and corporate aviation operators, can barely see their way clear to making a profit, so a new regulatory decree right now is not being readily accepted. Some larger operators are dragging their feet as well. How can placing another obviously onerous requirement on the industry at this time possibly be advantageous to business? Here's how.

Benefits of a SMS

If the SMS is implemented correctly, with the right level of commitment from all personnel, along with the framework and policies to support it, we in the industry will benefit personally from it as well as our passengers, clients, and consequently our companies. Doesn't that make business sense? There are other benefits that can also be realized that enhance profitability.

The decrease in insurance claims from less accidents and injuries leads to decreased premiums. The implementation of an effective SMS is a good marketing tool for retaining as well as gaining new clients. This more congruent work environment can

also bring into the organization greater human talent as well as retain those already in place. It provides a better work environment due to increased communication between departments, better understanding of each other department's expectations, and a generally more transparent organization. This can have many other financial benefits such as:

- increased employee morale
- greater job satisfaction
- better retention rates
- retaining greater corporate knowledge
- improved labor relations
- greater organizational ability to adapt to changing markets (due to more people communicating and knowing what is going on)
- providing a data-driven, systemic approach to managing safety (as there are hazard/incident reports reported by front line employees and these are assessed for their potential impact)

The timing for the ICAO ruling on the need for a SMS and the upcoming FAA mandate may not suit the U.S. aviation industry at this point in time. Although upon reflection — when would it? Does change ever occur at a time when we are quite comfortable and ready for it? Not usually.

Other ICAO signatory states such as Canada, Australia, and New Zealand, have fully operational SMS in place and have had for some years. They now have some evidence that they are producing results (CASA, 2009). With this in mind, how long can we resist the necessity of change in safety management in our industry's own business practices?

As this change is inevitable — and it is normal human nature to find change threatening and therefore resist it — we need to understand why we should not only adopt a SMS, but why we should embrace it and move to adopt it sooner rather than later. It is a different way of doing business than what we are currently used to — and we have heard this before too! However, even with all these possible benefits, why do some people still not want to adopt a SMS? First, let's look at why we feel uncomfortable with the looming SMS mandate.

Every person in the organization is a tool in the SMS toolbox.

Another change going … where?

There is much talk about the SMS mandate being a way for the National Aviation Authority — in our case the FAA — to avoid its safety inspection responsibilities and place the responsibility of regulation onto the aviation entities themselves. It is often seen as a form of self-regulation that frees the regulator from the role of oversight. This is not the intent of a SMS. Does it produce this as a spin off? Bluntly put — to a point — yes it does. However, it does not cease the required regulatory oversight or absolve the regulator of its legal responsibility to maintain its ongoing role as the safety oversight body within our industry. Conversely it does not allow the organization to set its own safety levels.

More work for me!

With an integrated and appropriately functioning SMS there are several types of safety and quality assurance mechanisms and measures that will still be in place to ensure the organization is checking its own backyard for the identification of inadequacies, gaps, and its own oversights. These internal risk assessment tools and audits for both safety and quality within the organization have to be systematically managed and applied and conducted by all employees throughout the organization — not just the "auditors" or "safety people."

Every person in the organization is a tool in the SMS toolbox. So what other "tools" do we need for a successful SMS? Now that we know why we should adopt a SMS, we need to know what the "tools" in this toolbox are, and how do we go about implementing them. The second segment of this article will address these aspects. AMT

Part 2: What should be in the toolbox?

Majella McDonald is a human factors expert with more than 20 years of professional experience in the aviation and health industries, in areas of SMS, human factors, accident investigation, and change management planning/implementation. She currently works as a consultant for Baines Simmons Americas and teaches for Embry-Riddle Aeronautical University (ERAU).

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Readers in Action Contest

Deadline for photo entries is May 16; the winner will be featured on the June cover.

Jon Jezo, Publisher

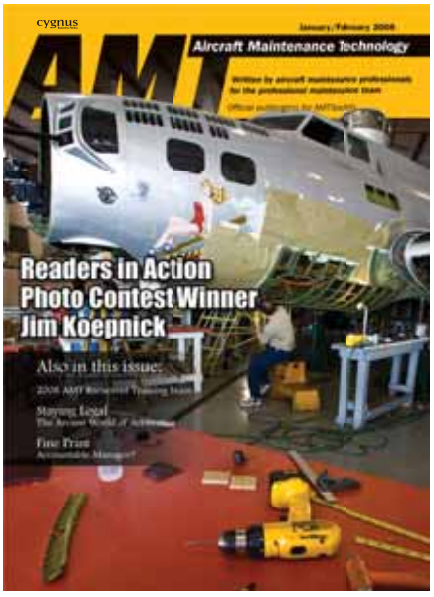
It's that time again, get out your cameras and search through those on-the-job photos, *AMT's* Readers in Action contest is back! *Aircraft Maintenance Technology* has always been focused on the reader: our editorial is targeted on the news, technology, and articles that benefit you, the aircraft maintenance technician regardless what segment you work in. Once again we are having a contest choosing the best photo from our readers for our June cover. The winner will also receive $250.

AMT's Readers in Action contest is back! The winner will receive $250.

For the Readers in Action contest we want photos of readers on the job, in the hangar, working on an aircraft, or in the shop, on the ramp, or in the field (extra points if *AMT* magazine is in the shot).

Let us hear from you. You can send high-res photos to editor@amtonline.com with Readers in Action Contest in the subject line. Or you can mail them to: *Aircraft Maintenance Technology*, Readers in Action Contest, 1233 Janesville Ave., Fort Atkinson, WI 53538. Deadline is May 16. Be sure to include contact information so we can contact you if you win!!

Thanks for reading!
Jon Jezo



Here are photos of past winners, be sure to send your photo in before May 16.

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