Unacceptable’ Safety in Aerial Firefighting Operations

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A blue ribbon commission formed after fatal firefighting aircraft accidents during 2002 found significant problems with aerial firefighting. The commission was a joint effort of the U.S. Department of the Interior’s Bureau of Land Management and the U.S. Department of Agriculture’s Forest Service. Two fatal accidents last year involved catastrophic airframe failures. The full report, "Federal Aerial Firefighting: Assessing Safety and Effectiveness," is available at: www.nifc.gov/blueribbon/BRP_120502.pdf.

Among the findings in the report were that the "safety record of fixed-wing aircraft and helicopters used in wildland fire management is unacceptable."

This finding noted that safety standards for contractor-flown air tankers are lower than standards for government-owned and -flown lead aircraft and smoke-jumper aircraft. "The level of safety for both contractor and government aerial firefighting operations is lower than can be financially justified, and is less than expected for any employer concerned about its employees."

The difference in safety standards, according to the report, is due to assumptions about the airworthiness of the air tanker fleet, based on FAA type certification. But, the report noted, continued airworthiness is the responsibility of the companies that own and operate the tankers.

The report also found that, under the current system of aircraft certification, contracting, and operation, "key elements of the aerial wildland firefighting fleet are unsustainable."

While "private operators, for the most part, have done an admirable job of keeping these aging aircraft flying," the report said, "they are handicapped by receiving little, if any, support from former military operators and the aircraft’s original manufacturer."

Most of the tanker aircraft are former military bombers, transports, and patrol aircraft, retrieved from military "boneyards," stripped of unneeded equipment, fitted with tanks, and operated under FAA Restricted Category airworthiness certificates. "There are few checks and balances," the report noted, "to ensure that the aircraft are airworthy and safe to fly throughout a fire season. Contractors have no financial incentive and are not required to ensure that their aircraft are safe to fly."

Another problem is that there is a strong perception among the aerial firefighting community and the government agencies involved that there is never enough money to do the job properly, and that there never will be sufficient funding. "For the aviation program overall, this has translated to insufficient contract funding to provide adequate knowledge of aircraft condition; insufficient training, inspection, and maintenance; and a deplorable safety record for large air tankers. A culture that emphasizes cost-efficiency has also created an admirable, but hazardous, 'can-do' ethos that pervades firefighting aviation."

The commission criticized the FAA for its role, or lack of input, on operation and maintenance of aging ex-military tankers. The commission may not understand the FAA's actual role after aircraft certification and it seemed surprised that FAA inspectors rarely ever physically inspect an aircraft. The commission also seemed surprised that the owner and operator of the aircraft was responsible for determining airworthiness, although it seemed to acknowledge the operator's role in maintaining airworthiness.

According to the report, "Forest Service and Bureau of Land Management leaders do not have a good understanding of the FAA's certification and oversight role regarding public-use aircraft." It said those officials "have placed an unjustifiable faith in the FAA's oversight of ex-military firefighting air tankers." Which leaves them, contract operators, and aircrews "in the untenable position of having to determine whether an aircraft is safe to fly." In fact, all owners and operators of any type of non-military-operated aircraft are responsible for airworthiness, according to FAA regulations.

The commission stated that because the aircraft's manufacturer does not interact with current operators, there is a lack of knowledge on how to maintain these old aircraft. Compounding this is the inability to

obtain historical records from the original owner, the Department of Defense. "The situation also complicates development of maintenance and structural repair programs needed to ensure that an aircraft flying firefighting missions can be operated safely for an extended lifetime."

Will more money help? Possibly, according to the commission: "In the United States, air tanker operators having sufficient financial resources and engineering expertise might elect to inspect and repair their aircraft more frequently than required under military or civil transport maintenance plans to protect their investments and ensure flight crew safety. But there is no FAA requirement to do so, little or no FAA assistance or oversight, and the Forest Service does not contractually reward such extra measures."

Hartzell's How-To Video

Inexpensive digital video cameras and video CD-ROMs offer companies a great new outlet for disseminating useful information. Hartzell Propeller has taken advantage of this to distribute an excellent video free to mechanics and anyone else interested in learning more about propeller maintenance.

The video features Hartzell's Mark Runge advising a "customer" on a recommendation to service his prop. Runge then reviews the servicing process. The video is full of useful information that is well documented in Hartzell's maintenance manual, but when did you last crack that book?

For example, mechanics may not remember that a leading-edge nick must be blended to 20 times its depth, with the blade remaining within dimensional limits. (While Hartzell recommends polishing it with emery cloth and crocus cloth, we disagree. These are made with iron ore particles, which can be imbedded in the aluminum blade and cause corrosion. A better option is FAA Advisory Circular 43-4's recommendation on page 123 for paper or cloth made with aluminum oxide or garnet.) After the nick is polished, it must be inspected with a 10x magnifying glass and dye penetrant, then the bare area finished with Alodine 1201 and paint.

Runge discusses dynamic balancing, proper lubrication, and post-maintenance static rpm tests, and other subjects–including ones that come up only occasionally, such as lightning strikes. Did you know Hartzell permits 10 hours of operation after a lightning strike, provided an inspection finds no damage? After that, the prop must be torn down and inspected for arcing and superheating of internal components.

Prop failure is a key subject, with photos of failed blades and the damage they cause. Runge discusses Hartzell's overspeed chart, noting the company recommends yearly calibration of tachometers, which can't stay accurate over time.

The video offers a good way to refresh mechanics on the basics of good prop maintenance, since most aren't going to read Hartzell's manual for fun. It's a lot less expensive than sending them to school. (Hartzell does offer training classes.) Staying current is important. "Customers believe what you say," Runge said. "If you give the aircraft owner the impression that propellers don't need maintenance or to be overhauled, you're doing a big disservice to your customers and your profession." To get the video, call 937-778-4379 or 800-942-7767 or e-mail techsupport@hartzellprop.com.

Electronics Class: Good for A&P Technicians

A week at FlightSafety International's New Technology Aircraft Electronics class offers aircraft technicians a comprehensive transition to modern electronics maintenance technology.

Digital avionics aren't new, but more manufacturers of new aircraft are designing systems that are integrated with avionics. As more digital aircraft enter service, technicians are going to have to become familiar with the fundamentals of electronic systems. FlightSafety recognizes this and has been teaching the new technology class for a while. The class now is highly recommended as a prerequisite for technicians

planning to take initial maintenance courses for many aircraft, especially the Gulfstream V. FlightSafety also recommends the class for avionics technicians who need a good electrical/electronics refresher.

I attended the New Technology Aircraft Electronics class at FlightSafety's Savannah, Georgia learning center. Jack Warden, an expert chef, former blimp crewman, Navy avionics expert, and electronics genius, is one of the three instructors who teach the class. Despite the potential for mass confusion when technicians are presented with a review of electricity and electronics fundamentals, Warden skillfully maintained our interest while teaching us old dogs some new tricks.

For myself and the three other technicians in the class, it was a long time since we studied electrical and electronics in A&P school. Warden is fully aware of the woeful lack of electrical knowledge among the A&P population and started us at ground zero–protons and electrons–to make sure we were up to speed before proceeding into the good stuff (digital electronics).

Somehow, Warden's explanations of what should be simple electrical knowledge made a lot more sense to me now. Or maybe I just don't remember much from A&P school 25 years ago. I picked up some great tips, including Warden's technique for lead-acid battery testing using a voltmeter. I also learned the basics of using an oscilloscope and what the scope actually does (measures voltage waves).

Before we started learning about digital avionics, we had to understand digital fundamentals. Warden carefully brought us up to speed on binary, octal, and hexadecimal numbering systems with a great mathematical tool called the radix scale. I wish I'd been taught to use the radix scale in elementary school; I would have had a much better understanding of how enumeration works.

When we dug into digital avionics, we spent a lot of time discussing avionics buses. Most modern airplanes have avionics buses, and even many older airplanes are equipped with new avionics packages that run on digital buses. A digital bus is simply a special cable that connects various avionics boxes so they can communicate with each other. There are many types of buses in aviation, but the key point we learned is that buses can be a weak point in an avionics system because they often incorporate many connectors.

Warden also showed us what digital bus signals look like, with an oscilloscope hooked up to a simulated digital bus on a FlightSafety avionics training device.

While it's unlikely that many A&Ps need to know how to multiply binary numbers–as we learned to do–it is helpful to understand that these numbers are how avionics boxes communicate with each other. When looking in an avionics manual, a mechanic who has been through this FlightSafety class will at least understand why the bus message that represents an airspeed of 425 knots to be displayed on a cockpit LCD might look like this: 110101001. Or the mechanic won't be scratching his or her head when confronted with a hex number such as FFFF.

Some of this information can be seen on maintenance diagnostic systems, but the industry is moving towards plain English translation of trouble codes. Nevertheless, this is how digital systems communicate, and it is helpful to know.

Overall, I found FlightSafety's class to be excellent preparation for anyone who will be working on aircraft with digital electronic systems. Plus, it will help technicians gain important background information prior to attending initial classes on complicated modern aircraft. One of the students in the class was there for that reason, preparing to take the Gulfstream IV initial course because to date his experience was primarily on analog GIIs.–

SAM Inspects Entire Aircraft

If engineers at Honeywell and BBA Diagnostics have their way, automatic non-destructive inspection of an entire aircraft will soon replace the tedious job of manual X-ray and ultrasonic scanning.

Honeywell and BBA Diagnostics (a joint venture of BBA Aviation Services Group and Advanced Power Technologies) have formed a team to develop a new-generation inspection systems. Called structural

anomaly mapping or SAM, the system scans a whole aircraft by robot using laser-guided acoustic and laser sensors.

The great benefit of SAM is that it requires no disassembly of the aircraft. The typical SAM setup will likely consist of an airplane parked inside a hangar overnight, with the SAM programmed to scan with no human in attendance and no need to remove the aircraft from flight status. Elimination of the human inspector removes the human factor from the inspection equation, and Honeywell believes this will greatly enhance the final results.

The result of the SAM test is a 3D digital visualization of the inspection results. After the system has been in use for a while, it will be possible to compare scans of the same aircraft over time to evaluate deterioration and quickly spot new damage. An aircraft could even be compared to similar models in its fleet.

Types of damage detected by SAM include composite delamination, honeycomb damage, and corrosion, according to Bernd Kessler, Honeywell’s vice president and general manager, aviation aftermarket services.

The space required and the cost of SAM probably make it too much for one maintenance company to deploy. What Honeywell envisions is a series of SAM stations at various locations. During an overnight trip, an operator could elect to have a SAM scan done instead of parking outside or paying for a hangar space.

"The coordination of the inspections through the database system across an aircraft fleet," Kessler added, "will ensure that developing problems are detected and addressed sooner, helping our customer reduce the time and cost of maintenance."

The Honeywell/BBA Diagnostics team is working on perfecting the SAM system and validating its accuracy, which is currently up to 80 percent. Rollout for industry use should take place by November.