The Value of Data at Your Fingertips

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S.L. Fuller

Come April 23, 2018, helicopter air ambulance operators must comply with an FAA aviation rule aimed at improving safety in helicopter operations. Part 135 Subpart L says helicopter air medical operations must be equipped with a flight data monitoring system (FDM). But the rule is light on criteria, and compliance can be reached without installing a robust system. Operators must decide how much they want to invest in, and what they want to get out of, their FDM systems.

To comply with the FAA's mandate, the systems must be capable of recording, at a minimum: latitude, longitude, barometric altitude, and date and time of recording, once per second. It must also have sufficient memory to retain the data over four hours of flight time. The FAA also provides details on the electrical power requirements, and other associated minimum equipment aspects of the FDM mandate in Advisory Circular 135-14B (AC-135-14B).

The FAA is leaving any additional parameters, retention and use of data up to the discretion of the operators. The mandate also leaves to the discretion of the operator how frequently each recorded parameter is recorded, bit resolution of each parameter, operational range of each parameter, and

conversion algorithms from digital or analog signal units.

This means that some operators don't need to procure additional equipment to be mandate-compliant. The Bell Helicopter 407GX, for example, features a Garmin G1000 integrated cockpit, and buyers can select a flight deck configuration with options that comply with the FDM equipage mandate. And since compliancy does not require pulling the data off the aircraft, all the boxes are checked upon delivery. But that equipment alone does not pull the data off the aircraft, nor does it analyze it.

For the most part, the air medical community supported the FDM mandate when it was published in 2014. It was released as part of a larger rule, which comprised a series of mandates (including the mandate for radio altimeters, the deadline for which passed in April). The Association of Air Medical Services VP of Government Relations Christopher Eastlee, explained how the support stems from close industry collaboration with the FAA.

"Flight data monitoring systems have been part of the internal industry safety enhancement discussion for a long time, as well as among NTSB and FAA accident investigators. As the industry committed to numerous enhancements, we looked at FDM as part of a comprehensive strategy to address risks associated with air ambulance transport," Eastlee said. "Industry supported the entire helicopter air ambulance final rule. Those rules were borne out of a series of NSTB recommendations and industry experience, and are designed to target multiple safety initiatives — many of which were voluntarily initiated by the majority of participants in the industry prior to the rule's release."

Some air ambulance operators are currently compliant with the FDM mandate and have been compliant for years. However, one of the earliest proponents of the technology was not compelled by any FAA mandates.

The ROI of FDM

Based in Alberta, Canada, Phoenix Heli-Flight's operations manager, Paul Spring, said he became interested in outfitting his helicopters with FDM in 2007. The company started installing units the following year and has since set an example for other operators.

He said his interest back then was not a desire to fly better or to be safer. "I had an individual that I found out — accidentally —was using the helicopter to take his friends flying and teaching them how to fly while I was out of town," he said.

Life Flight Network operates 40 aircraft in the U.S. Northwest.Photo courtesy of Life Flight

As the story goes, the pilot denied doing autorotations while Spring was away, but the accusations were confirmed through conversations with air traffic control.

"So right then I knew that I had an exposure to not using the aircraft properly. I wasn't really thinking safety at that point," Spring said. It was then he became interested in a product from Appareo.

Appareo was one of the earliest manufacturers of FDM equipment. Spring said not long after Appareo received a parts manufacture approval from the FAA for its FDM equipment, Phoenix had its fleet — only a Eurocopter AS350 and EC120 — equipped and started gathering data.

"That's when you learn that anybody can install a piece of equipment or a recording device," Spring said. "Then you get this stream of information coming in that you have to deal with."

Dealing with that stream is not required by the FAA to meet the mandate. But for Phoenix, and many operators like it, analyzing the data is where the return on investment for FDM equipage comes from. Knowing how the aircraft are being used can lead to beneficial changes in training, operations and other applications. Data analysis can generally be done two ways: in-

house or through a vendor.

Phoenix has 10 aircraft, all fitted with FDM equipment, as well as cockpit voice and video recorders. An Airbus Helicopters EC135 is dedicated for its EMS operations. Spring said that aircraft has the most robust FDM system in the fleet. The helicopter came from the manufacturer equipped with an Appareo Vision 1000. However, that system does not tap into the ARINC 429 databus, so Phoenix added a North Flight Data Systems multifunction data acquisition unit. The unit can tap into 180 lines of data for the EC135,

including battery temperatures, engine speeds, altitude, airspeed and other paramaters. Phoenix does its data analysis in house, with one employee dedicating a few days each week to the process.

Appareo also offers a software program called "ALERTS," or "Aircraft Logging and Event Recording for Training and Safety," alongside its Vision 1000. ALERTS allows for automated analysis and can identify undesirable trends and results from mitigation efforts through its reporting. Spring said that North Flight's FASTARS software (Flight Analysis Safety Trends And Reporting System) requires a little more work for the user, but relays more information. The system allows users to build a custom set of operational events to evaluate and provides full graphing and tabular data display. The events are broken down into each phase of flight, and the data stream can be interfaced into other flight operations quality assurance (FOQA) programs. Spring would disagree that it would be a large amount of work for one person to undertake. The amount of analysis work is directly related to the amount of events.

"We're a small company, so the safety person wears more than one hat. [Analyzing the data] is not enough work for a dedicated individual … There's just not that much work involved," Spring said. "It's a mature program with people who know how to fly helicopters."

How Operators Use FDM

One operator is using an outside vendor to analyze its aircraft data. Headquartered in Dallas with bases in North Carolina and Maine, SevenBar Aviation has 15 aircraft in its fleet. Seven of them are rotorcraft: one Leonardo AW119Kx, four AW109Es and two AW109SPs.

“We’ve been able to find a vendor that can help provide us with the [analysis] service without having to do a major investment and purchase analytical software … and hiring an employee to do this specific functions for a relatively small fleet,” said SevenBar Aviation Director of Safety Sean Mulholland. “By working with a vendor, we’re able to bend the cost curve such that we can make it work. And we can get a very high quality product to do more than just ‘fill the square’ where the mandate is concerned, but to actually build a robust and effective … quality assurance function within our SMS.”

SevenBar’s vendor is Truth Data, whose data analysis tool can analyze data from virtually any hardware platform — the company most recently added capability for the Garmin G1000, found in the Bell 407GX. SevenBar’s two 109SPs and 109Kx are equipped with Skytrac FDM solutions, and the four 109Es feature Honeywell’s Sky Connect Tracker II. The Skytrac solution is FAA mandate-compliant. But the Honeywell products need to be upgraded to the Sky Connect Tracker III to be compliant; that process is in progress. SevenBar has not yet started analyzing data, but Mulholland said the company expects to start with a new 109SP that went into service with LifeFlight of Maine just a few months ago. LifeFlight provides air medical services to most of Maine and some parts of neighboring states.

Life Flight Network, which serves the U.S.’s Northwest, operates nearly 40 aircraft, both fixed- and rotary-wing. Like Phoenix, it analyzes flight data in house. But it has one dedicated person doing the job on a daily basis: Jeff Currin, Life Flight Network’s FOQA manager. Life Flight Network was starting to equip aircraft with FDM systems before the FAA’s mandate, and all 21 of its Leonardo AW119Kxs were equipped by June last year. There are a

few different FDM systems within the fleet, and the company said it is looking at new systems to expand capabilities. Most of the helicopters —including AW119Kxs, an AW109E and six Airbus H135s (one is not yet in the FOQA program) — feature the Vision 1000 and are also equipped with the Honeywell Sky Connect Tracker III. Others use systems from North Flight.

Currin said that mechanics download data daily, and he monitors both events and data quality. As with technology in general, flight data is not immune to glitches.

"The rules of 'garbage in, garbage out,' I think, is really important in flight data," Currin said. "The end product is something we want to inform management, inform our training department, inform our pilots about behaviors we see."

FDM data analysis, while it has its benefits, has also been controversial. Some data could identify pilots and could leave them vulnerable to repercussions. This concern magnifies once the conversation moves from exclusively internal use of the data to exporting that data to a public pool, like Aviation Safety Information Analysis & Sharing (ASIAS) for rotorcraft or efforts by U.K.-based global safety association HeliOffShore.

"What we're trying to create in the industry is a cultural revolution to make people understand that sharing de-identified data, where nobody can point a finger at you, into a system that is going to improve safety for all of us is going to be hugely beneficial. For all of us," said Francois Lassale, HeliOffShore operations director, during *R&WI*'s Rotorcraft Business and Technology Summit in September. (Check out the recap of that event.)

Dallas/Fort Worth-based CareFlite has not yet decided how it wants to analyze its FDM data. It operates two Bell Helicopter 429s and five Bell 407GXs. It's currently in the process of installing Honeywell Sky Connect Tracker III on its 407s — the other aircraft are already mandate-compliant. (There is no supplemental type certificate for the product on a 407, so

CareFlite said it would need to obtain a field approval.) Although that part is still to be determined, the service provider's president and CEO, James Swartz, is not worried about de-identifying any data.

"If you fly the aircraft within its parameters, if you start engine and follow the procedures, there's data, and the data doesn't lie. The company isn't interested in looking at the data for the purposes of getting rid of somebody. It looks at the data if it has a reason to look," Swartz said.

Like CareFlite, SevenBar does not have a union or a bargaining unit among its pilots. But it does have the same attitude toward safety regarding identifying data. Mulholland said he came to SevenBar from American Airlines, so he experienced the apprehension and other emotions that occurred when FOQA and other programs were first implemented.

"There's a great deal of trust that needs to be built in order for the line pilot to have a level of comfort," he said regarding data monitoring. "We have used it to effect positive change that has a direct impact on their work life."

Life Flight Network Director of Safety and Risk Management Ben Clayton said that the company has experienced a positive response from its pilots when introducing them to the FDM program. And instances of discipline have been very low.

"What we try to do is do a lot of education with the pilots to make sure that they understand the whole purpose of the program is to make sure that our pilots are flying in a safe manner, in a standardized way and the way that we believe is safe," Clayton said.

Like all equipment mandates, the cost of FAA's FDM mandate has been among the challenges. The FAA estimated in 2014 that installation of FDM equipment would cost $8,000 (80 hours X $100 per hour) and a one-time revenue loss of $7,000 per day during installation. So, the agency estimated the total cost per helicopter to be $22,000. It added that operators might also

incur two, one-time hardware and software license fees of $2,500 and $750, respectively. Operators, like CareFlite and Phoenix, have tried to schedule installation with scheduled maintenance, with the ability to put a spare aircraft into operation.

Though FDM does present other challenges such as the inability to gather weather data, it is something the air medical community agrees is a major benefit to safety in operations. “We’re not going into this for any kind of a insurance savings. We’re not doing it for any reason other than to have it in case we need it for any kind of research to find a problem,” said CareFlite Director of Aircraft Maintenance Larry LaForce. “This data might be valuable to help us eliminate some of those issues that just pop up here and there that you can never duplicate. That’s one thing we’re excited about.” **RWI**