Problem Statement: NTSB AAR-17-01 Improving Safety in Aircraft Acquisition

The National Transportation Safety Board issued a final report on the crash of a medical helicopter in Frisco CO based on their hearing of 28 March 2017 noting in "*On July 3, 2015, about 1339 mountain daylight time, an Airbus Helicopters AS350 B3e helicopter, N390LG, registered to and operated by Air Methods Corporation, lifted off from the Summit Medical Center Heliport, Frisco, Colorado, and then crashed into a parking lot; the impact point was located 360 feet southwest of the ground-based helipad. The pilot was fatally injured, and the two flight nurses were seriously injured. The helicopter was destroyed by impact forces and a postcrash fire. The flight was conducted under the provisions of 14 Code of Federal Regulations Part 135 on a company flight plan. Visual meteorological conditions prevailed at the time of the accident*"

"A surveillance video capturing the helicopter's descent and ground impact showed fuel flowing from the wreckage just after impact and then the onset of a postcrash fire. The postcrash fire consumed or severely damaged most of the helicopter and resulted in extensive thermal injuries to the pilot and one of the flight nurses."[1] The full report, AAR-17-01, is available on the NTSB website and is quoted extensively in this paper.

Relative to this investigation the NTSB issued 10 new safety recommendations and reiterated 2 previous recommendations[2]. Two recommendations were issued to the air medical community to address the problem of a "(*L)ack of readily available information for helicopter operators and customers regarding safety equipment and systems that would enhance a helicopter's crashworthiness."* Two recommendations were issued to the Association of Critical Care Transport (ACCT), working together with the Association of Air Medical Services (AAMS) and the Air Medical Operators Association (AMOA) to implement a community wide effort to develop guidelines and tools for purchasers and leasers of medical helicopters to better assess the safety profiles of potential aircraft. The NTSB looks to this non-regulatory approach as a possible process to accelerate change towards safer systems. [3]

Specifically, the report focused on the challenges of assessing the inclusion of current safety design to legacy certificated aircraft not meeting the most current crash resistant standards for fuel tanks and fuel systems as published in 14 CFR 27.952 (1994) and crash worthy seating as published in F4 CFR 27.562.(b) (1989). As the NTSB notes "(T)he aircraft certification process is complex and might not be fully understood by some helicopter operators and customers (Smallhorn 2012). Specifically, the distinction between the aircraft type certificate date and manufacture date relative to the latest crashworthiness requirements might not be clear to those purchasing or leasing helicopters. For example, helicopter operators and customers might assume that a newly manufactured helicopter meets the latest FAA crashworthiness requirements, but this assumption might not be correct." [4] In this accident, although the accident aircraft was manufactured and issued an airworthiness certificate in March of 2013, the aircraft only needed to meet fuel tank and system and seating crash worthiness requirements effective in December 1977, when the Federal Aviation Administration (FAA) provided initial type certificate design approval for AS350-series helicopters.

As the report noted, "…the accident helicopter did not have, and was not required to be equipped with, a crash-resistant fuel system (CRFS) as specified in the revised Part 27 airworthiness standards to add comprehensive crash resistant fuel system design and test criteria" for newly certificated rotorcraft (59 *Federal Register* 50380) (NARA 1994.81) The revisions included a new regulation, 14 *CFR* 27.952, "Fuel System Crash Resistance." (CRFS) The improved crash resistance standards incorporated fuel system design features "to minimize the hazard of fuel fires to occupants following an otherwise survivable impact." These design features were intended to reduce the risk of a post-crash fire and, for more severe crashes, minimize fuel spillage near ignition sources to improve the evacuation time needed for crew and passengers to escape a post-crash fire. The improved standards, however, are not applicable to newly manufactured helicopters whose certification basis and approval predated the effective date of the revised airworthiness standards.

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[1] AAR-17-10 p.vii

[2] AAR- 17-10 p. 55-57

[3] AAR-17-10 Safety Recommendations A-17-12, 13 pp. 55-56

[4] AAR-17-10 p.41

Similarly, the seating in the aircraft were only required to meet the crash worthiness standards of CFR27.561(b)(3) and 27.562 as published in 1989. The pilot's seat was designed to the requirements of a 1989 amendment to emergency landing standards, while the medical crew seating was only required to meet standards published in 1965. Due to the fire, the report was unable to conclude if the more current crash worthy seating would have improved the survivability of the crash. [5]

Adding to the challenge, although the NTSB had issued five previous recommendations addressing improving CRFS,[6] as of accident date there was no approved modification for installation available from the manufacturer or third party vendors. The NTSB concluded "that, if the helicopter had been equipped with a CRFS, the potential for thermal injuries to the occupants would have been reduced or eliminated." [7]

At the outset, it is essential to recognize that the air medical fleet is safe, using certificated and airworthy aircraft. Further, purchasing or leasing an aircraft inevitably involves decisions balancing mission performance, configuration, equipage, and the weight and power penalties for modifications. [8] In their report findings and associated recommendations, the NTSB identified the challenges in assessing actual required standards and approved supplemental type certificate (STC) safety enhancements in the purchase of a new or used aircraft.[9] For example, adopting the most recent crashworthiness standards may "include increased cost and weight and a resultant reduction in payload and range, which could affect the suitability of the helicopter for its intended use." [10]

In the ongoing effort to improve safety the NTSB notes, the paucity of information and challenges in accessing information as to the actual certification standards and/or crashworthiness enhancements available for any individual aircraft makes developing a comprehensive assessment of that aircraft's status with regard to current standards a daunting task.

To address and answer the recommendations, ACCT, together with AAMS and AMOA, has established a steering group to work across the entire air medical enterprise to develop guidelines to assist programs and operators in making informed aircraft acquisition decisions by increasing the transparency of certification standards and/or available enhancements for each specific aircraft type. Further, the project recognizes the need for flight and medical crew members to have more information and clarity with regard to applicable operational risk mitigation enhancements of the aircraft they climb into each day.

While the initial focus for the project is the specific recommendation from the NTSB, focusing on fuel systems and seating, a secondary goal is to address other occupant protection strategies and safety technologies. Using an interrogatory format, it is possible to build a tool to assist hospital organizations, operators and OEM's to increase awareness and transparency throughout the acquisition process. This is especially important as aircraft acquisitions are often a once in a decade or more exercise for air medical programs and operators, and there is no simple solution to updating the legacy fleet of medical helicopters.

It is our collective goal that the guidelines and tools developed here will accelerate market incentives for aircraft manufacturers and third party vendors to develop approved safety enhancements to new and legacy aircraft.

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[5] Ibid. p. 35-38

[6] Ibid p. 39-40 NTSB A-15-12, A-16-8-11

[7] Ibid. p. 41

[8] Commercial Emergency Medical Service Helicopters Operations. NTSB SS-88/01 Washington DC.

[9] AAR-17/10 d. pg. vii -ix

[10] Boyd DB and Macchiarella ND "Occupant Injury Severity and Accident Causes in Helicopter Emergency Medical Services (1983-2014) Aerospace Medicine and Human Performance January 2016 26-31