



National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation Report

Crash-Resistant Fuel Systems on Airbus Helicopters

Accident Numbers:	CEN15FA164, CEN15MA290
Operator/Flight Number:	Air Methods Corporation
Aircraft and Registration:	Airbus Helicopters EC130 B4, N356AM; Airbus Helicopters AS350 B3e, N390LG
Locations:	St. Louis, Missouri; Frisco, Colorado
Dates:	March 6 and July 3, 2015
Adopted:	March 23, 2016

The National Transportation Safety Board (NTSB) is providing the following information to urge the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) to take action on the safety recommendations in this report. These recommendations address the need for owners and operators of existing AS350 B3e helicopters and similarly designed variants to incorporate a crash-resistant fuel system into their rotorcraft. These recommendations are derived from two 2015 accidents in which the impact forces were survivable for occupants but fatal and serious injuries occurred because of postcrash fires that resulted from an impact-related breach in the fuel tanks. As a result of these investigations, the NTSB is issuing three safety recommendations to the FAA and one safety recommendation to EASA.

Background and Analysis

On March 6, 2015, about 2310 central standard time, an Airbus Helicopters EC130 B4 helicopter, N356AM, operated by Air Methods Corporation, doing business as ARCH, struck the edge of a hospital building and impacted its parking lot near St. Louis, Missouri, during approach to an elevated rooftop helipad. The helicopter was destroyed by impact forces and a postcrash fire. The pilot was the sole occupant and sustained fatal thermal injuries. Night visual meteorological conditions prevailed for the flight conducted under the provisions of 14 *Code of Federal Regulations (CFR)* Part 135. The NTSB's ongoing investigation determined that the accident was immediately survivable in the absence of a postcrash fire.¹

On July 3, 2015, about 1339 mountain daylight time, an Airbus Helicopters AS350 B3e helicopter, N390LG, operated by Air Methods Corporation, partially impacted a parked

¹ More information about this accident, NTSB case number CEN15FA164, is available on the NTSB [website](#).

Note: This report was reissued on April 13, 2017, with corrections to page 5. It was reissued again on September 23, 2019, with a correction to the NTSB case number in footnote 1 to read "CEN15FA164." Earlier versions incorrectly stated the case number as "CEN15MA164."

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recreational vehicle in a parking lot near Summit Medical Center in Frisco, Colorado, after takeoff from a ground-based hospital helipad. The helicopter was destroyed by impact forces and a postcrash fire. Visual meteorological conditions prevailed for the flight conducted under the provisions of 14 *CFR* Part 135. Video footage from a parking lot surveillance camera revealed a postcrash fire initiating a few seconds after ground impact concurrent with large quantities of fuel flowing from the helicopter wreckage. The pilot and two flight nurses survived the initial ground impact. One flight nurse sustained a back injury and the other sustained serious thermal injuries. A medical staff member on the ground near the crash site also sustained thermal injuries while attempting to rescue the pilot from the helicopter wreckage. The pilot ultimately died from his injuries.² The NTSB's investigation of this accident is ongoing.

Neither the AS350 B3e nor the EC130 B4 helicopter was equipped with a crash-resistant fuel system, which if installed, may have prevented or reduced the risk of thermal injuries.

On October 3, 1994, the FAA revised the airworthiness standards for newly certificated rotorcraft to add "comprehensive crash resistant fuel system design and test criteria." The revisions included two new regulations, 14 *CFR* 27.952 and 29.952, "Fuel System Crash Resistance," which state, "to minimize the hazard of fuel fires to occupants following an otherwise survivable impact (crash landing), the fuel systems must incorporate design features of this section."³ However, the fuel systems on newly manufactured rotorcraft with type certificates approved before October 1994, such as the accident helicopters, are not subject to these regulations and, as a result, may pose a hazard to occupants if the systems are breached during a crash.⁴

Between 1994 and 2013, the NTSB investigated at least 135 accidents in the United States involving certificated helicopters of various models that resulted in a postcrash fire. Only three of the accident helicopters that experienced postcrash fire had crash-resistant fuel systems and crashworthy fuel tanks. As of November 2014, the FAA aircraft registry included more than 5,600 helicopters manufactured since 1994. Of those, only about 850 (or 15%) are models with crash-resistant fuel systems that meet the 1994 requirements. These data led to the NTSB's issuance of Safety Recommendation A-15-12 to the FAA, asking that the fuel systems for all newly manufactured rotorcraft be required to meet the crashworthiness requirements of 14 *CFR* 27.952 or 29.952, regardless of the design's original certification date. In its September 28, 2015, response, the FAA agreed with the recommendation and reported that it had started the rulemaking process by sending a tasking statement to the Aviation Rulemaking

² More information about this accident, NTSB case number CEN15MA290, is available on the NTSB [website](#).

³ Title 14 *CFR* Part 27 and Part 29 address the airworthiness standards for normal-category and transport-category rotorcraft, respectively.

⁴ All versions of the AS350 that hold FAA-type design approvals are under Type Certificate Data Sheet H9EU; the first of the AS350 series, the AS350 C, received FAA type certificate design approval on December 20, 1977, and subsequent type designs adhere to the then-prevailing airworthiness standards. The Airbus Helicopters EC130 B4 and EC130 T2 were certified under the same type certificate as AS350-series helicopters due to design similarities.

Advisory Committee.⁵ We are pleased that the FAA is taking preliminary steps to address this safety issue for newly manufactured rotorcraft. However, in-service rotorcraft such as AS350 B3e and similarly designed variants continue to operate with fuel systems that do not meet current crashworthiness requirements.

Approval to Retrofit In-Service Rotorcraft with Crash-Resistant Fuel Systems

Airbus Helicopters has included crash-resistant fuel systems as standard equipment for EC130 T2 helicopters delivered in the United States since the type certificate was approved on July 30, 2012. As of March 2015, Airbus Helicopters decided to do the same for newly manufactured AS350 B3e helicopters delivered in the United States.⁶ The manufacturer is also developing a retrofit kit for existing AS350 B3e and EC130 B4 helicopters already in operation, with completion and availability to owners and operators planned for early 2016.⁷ A retrofit kit for similarly designed variants, including the AS350 B2 and AS350 B3, is also being developed with completion of the AS350 B2 retrofit kit planned for early 2016. The NTSB is pleased that Airbus Helicopters is taking steps to improve the crash-resistance of helicopter fuel tank systems, both in and post production, but is concerned that the FAA's and EASA's approval for retrofit kit installation would not be prioritized because it is outside the scope of airworthiness.

The NTSB concludes that the availability of an approved retrofit kit to install a crash-resistant fuel system into existing AS350 B3e and EC130 B4 helicopters would assist owners and operators in mitigating the demonstrated safety risk of postcrash fires in survivable accidents. Therefore, the NTSB recommends that, once Airbus Helicopters completes development of a retrofit kit to incorporate a crash-resistant fuel system into AS350 B3e and similarly designed variants, the FAA and EASA prioritize its approval to accelerate its availability to operators. The NTSB also recommends that, after a retrofit kit has been developed and approved, the FAA issue a special airworthiness information bulletin (SAIB) informing all owners and operators of AS350 B3e and similarly designed variants of the availability of the retrofit kit and urging that it be installed as soon as practicable. To encourage helicopter owners and operators to retrofit existing helicopters with a crash-resistant fuel system, the SAIB should also discuss the helicopter accidents cited in this report.

Method to Notify Owners and Operators of Available Modifications

Our investigations and discussions with owners and operators at a helicopter safety committee meeting found that, in general, it may be difficult for them to determine if any modifications are available to improve fuel system crash-resistance for their particular helicopter models. In part, such difficulty is due to whether a modification is produced by the helicopter manufacturer or a third-party manufacturer, which would likely affect how comprehensively

⁵ This recommendation is currently classified "Open—Acceptable Response." More information about the accident that prompted the recommendation, NTSB case number CEN15FA003, can be found on the NTSB's [website](#).

⁶ Among the family of Airbus Helicopters models, only the EC130 T2 and the AS350 B3e are currently in production and delivered in the United States.

⁷ Because few AS350 D1, D, and C variants operate in the United States, Airbus Helicopters does not plan to develop a retrofit for these helicopters.

owners and operators are notified of such changes; helicopter manufacturers are likely to have a more complete contact list than third-party manufacturers. Another complicating factor is that while the FAA's database of supplemental type certificates (STC) is publically available, its search function is not easy to use unless users know what they are looking for.⁸ Adding to the difficulty, a modification could be announced via a service bulletin, which would not be included in the STC database.

The NTSB is concerned that owners and operators of other Part 27 and Part 29 helicopter models without a crash-resistant fuel system may not know of the existence of an available retrofit for improving their fuel system crashworthiness. Therefore, the NTSB recommends that the FAA issue an SAIB that is periodically updated to inform all helicopter owners and operators about available modifications to improve fuel system crashworthiness and urge that they be installed as soon as practicable. To encourage helicopter owners and operators to retrofit existing helicopters with a crash-resistant fuel system, the SAIB should also discuss the helicopter accidents cited in this report.

Recommendations

To the Federal Aviation Administration:

Once Airbus Helicopters completes development of a retrofit kit to incorporate a crash-resistant fuel system into AS350 B3e and similarly designed variants, prioritize its approval to accelerate its availability to operators. (A-16-8)

Issue a special airworthiness information bulletin (SAIB) informing all owners and operators of AS350 B3e and similarly designed variants of the availability of a crash-resistant fuel system retrofit kit and urging that it be installed as soon as practicable. To encourage helicopter owners and operators to retrofit existing helicopters with a crash-resistant fuel system, the SAIB should also discuss the helicopter accidents cited in this report. (A-16-9)

Issue a special airworthiness information bulletin that is periodically updated to inform all helicopter owners and operators about available modifications to improve fuel system crashworthiness and urge that they be installed as soon as practicable. To encourage helicopter owners and operators to retrofit existing helicopters with a crash-resistant fuel system, the SAIB should also discuss the helicopter accidents cited in this report. (A-16-10)

To the European Aviation Safety Agency:

Once Airbus Helicopters completes development of a retrofit kit to incorporate a crash-resistant fuel system into AS350 B3e and similarly designed variants, prioritize its approval to accelerate its availability to operators. (A-16-11)

⁸ An STC authorizes alteration of an aircraft component or system that is operated under an approved type certificate.

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