



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: October 20, 2010

In reply refer to: A-10-131

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On April 15, 2008, about 0923 Alaska daylight time, a Eurocopter AS350B2 helicopter, N213EH, experienced a loss of engine power during flight and sustained substantial damage during an emergency descent and impact with terrain about 34 miles east of Chickaloon, Alaska.¹ The commercial pilot and three passengers were fatally injured, and one passenger was seriously injured. The on-demand air taxi flight was conducted under 14 *Code of Federal Regulations* (CFR) Part 135 in visual meteorological conditions.

The NTSB determined that the probable cause of this accident was the loss of engine power due to an overspeed of the helicopter's turbine engine, precipitated by the inadvertent movement of the fuel flow control lever (FFCL) by the [front seat] passenger. Also causal was the manufacturer's design and placement of the FFCL, which made it susceptible to accidental contact and movement by passengers. Contributing to the accident was the pilot's failure to properly secure/stow the passenger's backpack. Likely contributing to the severity of the occupant's injuries was the helicopter operator's failure to properly monitor its satellite flight-following system and to immediately institute a search once the system reported the helicopter was overdue.

As a result of its findings from this investigation, other similar accidents, and reported incidents, the NTSB is concerned that inadvertent movement of the FFCL on certain Eurocopter AS350-series helicopters and other helicopters with similarly designed FFCLs and detent tracks could lead to an engine overspeed event or loss of engine power, which could cause a serious or catastrophic accident if the FFCL movement occurs during a critical point in flight or on the ground.

¹ The brief for this accident, NTSB case number ANC08FA053, is available online at <http://ntsb.gov/ntsb/query.asp>.

The control quadrant of Eurocopter AS350B, AS350BA, AS350B1, and AS350B2 helicopter models is located on the floor between the pilot's seat and the front left seat and is comprised of the FFCL and its detent track, an emergency fuel shutoff lever, and the rotor brake lever (see figure 1).² The FFCL, which is the center lever, controls fuel flow to the engine and operates the main and emergency fuel flow control valves. The FFCL moves in a detent track that has three positions, which include two detents. The first position is the stop (aft) detent, the second position is the flight (forward) detent, and the third position is an emergency-valve-opening-travel position, which is forward of the flight detent and is only used for emergency operation (see figure 2). When the FFCL is in the stop detent, the main and emergency fuel flow control valves are closed. When the FFCL moves from the stop detent to the flight detent, it progressively opens the main fuel flow control valve. When the FFCL is in the flight detent, fuel to the engine is automatically metered based on power demand. When the FFCL moves from the flight detent to the emergency-valve-opening-travel position, the emergency fuel flow control valve progressively opens to supply the engine directly. Placing the FFCL in the emergency-valve-opening-travel position bypasses the automatic metering of the fuel control and introduces additional fuel into the engine. Movement of the FFCL is readily accomplished by moving the lever slightly to the right out of the detents and moving it forward or aft.

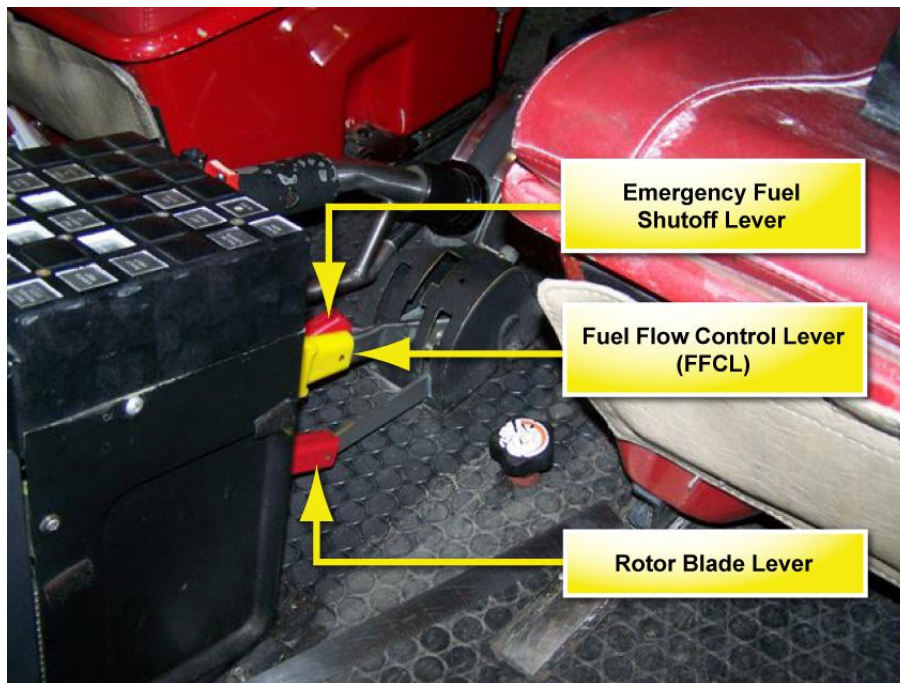


Figure 1. Floor-mounted control quadrant.

² Not all Eurocopter AS350-series helicopters are equipped with FFCLs. The AS350B3 model helicopter is not equipped with an FFCL.

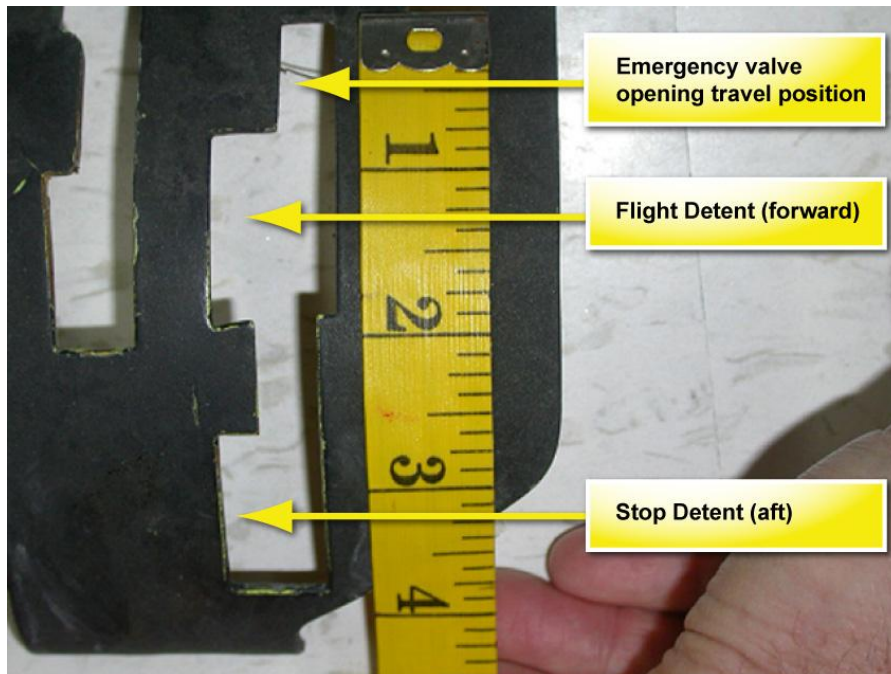


Figure 2. FFCL track and detent/position locations.

The NTSB's investigation of the Chickaloon accident revealed that the FFCL was in the emergency-valve-opening-travel position when the accident occurred. Investigators determined that, due to the close proximity of the passenger's right foot to the FFCL as well as the location of his unstowed backpack in the wreckage, it is likely that either the passenger's right foot or his backpack inadvertently moved the FFCL out of the flight detent and into the emergency-valve-opening-travel position. The movement of the FFCL resulted in an engine overspeed and loss of engine power. Given the rough and uneven terrain in the area and the helicopter's low altitude at the time, a successful autorotation was improbable.

The NTSB is aware of another helicopter accident in which the FFCL was inadvertently moved during flight. On April 4, 1994, a Canadian-registered AS350B experienced a hard landing near High Prairie, Alberta, Canada, after a passenger inadvertently moved the FFCL from the flight detent to the stop detent while trying to adjust a knapsack placed under his right knee.³ The engine suddenly lost all power, and the pilot conducted an autorotation. The helicopter touched down heavily, collapsed the skid gear, and rolled onto its left side. The three occupants were uninjured; the helicopter sustained substantial damage. The Transportation Safety Board (TSB) of Canada determined that the accidental movement of the FFCL resulted in fuel starvation to the engine and a total loss of engine power. The TSB concluded that the FFCL

³ In the report for this accident, the helicopter is identified as an Aerospatiale AS350B. In 1992, the helicopter division of Aerospatiale merged with the German Messerschmitt-Boelkow-Blohm firm to form Eurocopter. For more information about this accident, see *Engine Failure, Hard Landing, Turbowest Helicopters Limited, Aerospatiale AS350B Astar (Helicopter) C=FHBG, High Prairie, Alberta, 62nm NE, 04 April 1994*, Report Number A94W0037 (Gatineau, Quebec, Canada: Transportation Safety Board of Canada, 1994) <<http://www.tsb.gc.ca/eng/rappports%2Dreports/aviation/1994/a94w0037/a94w0037.asp>>.

was not guarded or protected against inadvertent movement and can be moved out of the flight detent easily.⁴

On November 18, 2006, about 0910 eastern standard time, a Eurocopter AS350BA, N72LC, experienced a ground resonance occurrence⁵ at Buckingham Field Airport, Fort Myers, Florida.⁶ A sudden spike in engine torque was observed, and the engine's revolutions per minute began to increase rapidly. When the pilot started the engine and moved the FFCL from the stop detent to the flight detent, he missed the flight detent and unintentionally moved the FFCL all the way forward to the emergency-valve-opening-travel position. The pilot received minor injuries, and the helicopter sustained substantial damage. The flight was operated as a public use flight under 14 CFR Part 91. The NTSB determined that the probable cause of this accident was the pilot's failure to maintain aircraft control during engine start. Contributing to the accident was the pilot's improper advancement of the FFCL. Although the pilot was moving the FFCL forward in this case, he did not intend to move it all the way forward to the emergency-valve-opening-travel position; however, because the FFCL is so easily moved, the pilot missed the flight detent completely.

During its investigation of the Chickaloon accident, the NTSB asked two other U.S. commercial helicopter operators about incidents involving passengers of AS350B2 helicopters who interfered with the floor-mounted engine controls, specifically the FFCL. Both operators stated that they were aware of incidents in which passengers placed items, such as purses or camera bags, on the FFCL, and incidents in which bag straps became entwined on the FFCL and other control levers. They also reported that they were aware of an incident in which a front-seat passenger stepped on the FFCL while turning to look at passengers in the rear seats. In some cases, the FFCL moved out of the detent, and in other cases, the FFCL was interfered with but did not move. According to the operators, these events were not reported because they happened on the ground, were resolved prior to flight, and did not cause damage or injury. These events demonstrate the ease of which pilots, passengers, or unstowed baggage can access or inadvertently move the FFCL to the incorrect position.

The NTSB is concerned that the FFCLs on Eurocopter AS350-series helicopters can be easily and inadvertently moved out of their detents by objects or persons, including the pilot and passengers, in flight or on the ground. If the FFCL is inadvertently moved to the emergency-valve-opening-travel position during flight, the engine can rev up in seconds (as was the case in the Chickaloon accident), which can result in engine overspeed, engine over-temp, engine over-torque, and drive-train damage. According to Eurocopter's chief test pilot, the placement of the FFCL in the emergency-valve-opening-travel position during cruise flight could cause an engine overspeed within seconds and could potentially result in the shedding of free

⁴ On September 22, 1994, the TSB sent an Aviation Safety Information letter to Transport Canada (TC) regarding the possibility of inadvertent manipulation of the FFCL on the AS350B helicopter. According to the TSB report, TC and industry were investigating the feasibility of installing a control quadrant guard to reduce the likelihood of inadvertent FFCL movement. Eurocopter indicated that it studied and proposed a guard to be installed but that, due to a lack of interest by operators, the guard was withdrawn as an option in 2007.

⁵ In a ground resonance occurrence, the helicopter vibrates and rocks forward and back and side to side, leading to a potentially uncontrollable situation.

⁶ The brief for this accident, NTSB case number MIA07TA017, is available online at <<http://ntsb.gov/ntsb/query.asp>>.

turbine blades. The pilot would have to release the collective lever using the left hand and move the FFCL aft to the flight detent to modulate the fuel flow. The adjustment is not instantaneous; there is a lag between the time the input is made and the time the engine responds. If the FFCL is inadvertently moved to the stop detent during flight, the engine can shut off due to fuel starvation, requiring the pilot to restart the engine in flight. In both situations, a successful autorotation would likely not be achieved if the helicopter does not have enough altitude. If the FFCL is inadvertently moved from the stop detent to the emergency-valve-opening-travel position while the helicopter is on the ground (as was the case in the Fort Myers accident), a ground resonance event could occur, which would cause the helicopter to rock forward and back and side to side, making it difficult to control.

The NTSB concludes that the design and location of the FFCL and its detent track in Eurocopter AS350-series helicopters allows for easy access to and inadvertent movement of the FFCL, which could cause a serious or catastrophic accident if the movement occurs at a critical point during flight or on the ground.

Therefore, the National Transportation Safety Board recommends that the European Aviation Safety Agency:

Require Eurocopter to review the design of the fuel flow control lever (FFCL) and/or its detent track on AS350-series helicopters and require modification to ensure that the FFCL is protected to prevent unintentional movement out of its detents and that it does not move easily to an unintended position. (A-10-131)

The National Transportation Safety Board made two recommendations to the Federal Aviation Administration.

In response to the recommendation in this letter, please refer to Safety Recommendation A-10-131. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our secure mailbox. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred with this recommendation.

[Original Signed]

By: Deborah A.P. Hersman
Chairman