



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: February 27, 2007

In reply refer to: A-07-27 through -29

Honorable Marion C. Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 23, 2005, an Aerospatiale AS350BA helicopter, N355NT, operated by Heli-USA Airways, Inc., as a 14 *Code of Federal Regulations* Part 135 sightseeing air tour flight, encountered adverse weather and crashed into the Pacific Ocean several hundred feet off the coast of Kailiu Point, near Haena, Hawaii.¹ Although three of the five passengers died of drowning or drowning-related circumstances,² none of the passengers or the pilot received any serious injuries during the crash sequence. According to the pilot and the two surviving passengers, after the helicopter settled on the water, it rolled to the right and began to sink immediately.

The National Transportation Safety Board determined that the probable cause of the accident was the pilot's decision to continue flight into adverse weather conditions, which resulted in a loss of control due to an encounter with a microburst. Contributing to the accident was inadequate Federal Aviation Administration (FAA) surveillance of Special Federal Aviation Regulation (SFAR) 71 operating restrictions. Contributing to the loss of life in the accident was the lack of helicopter flotation equipment.

The Safety Board has identified safety issues related to helicopter flotation equipment and FAA-approved passenger personal flotation devices (PFDs) that could affect the passengers' safety and survivability when ditching is required. Specifically, this helicopter did not have flotation equipment and sank so quickly that some occupants were submerged before they could even undo their seatbelts. The Board also found evidence that some PFDs may only partially inflate or may not inflate at all when the inflation handles are pulled because the inflation cylinders for one or both chambers are not seated correctly.

¹ More information about this accident, SEA05MA199, is available on the Safety Board's Web site at <www.nts.gov>.

² According to the autopsy reports, two passengers died of drowning, and one died of "cardiac arrest due to near drowning."

Helicopter Flotation Equipment

Because the helicopter was not equipped with floats, the passengers and pilot each wore a waist pouch containing an FAA-approved, quick-donning PFD in accordance with SFAR 71.³ However, during the accident sequence and egress, not all were successful in completing the procedures for donning the PFD, exiting the helicopter, and properly inflating the PFD, even though all were physically capable of doing so. One passenger donned her PFD but drowned inside the helicopter, and a second passenger was pulled from the submerged wreckage by another passenger but later succumbed to “cardiac arrest due to near-drowning.” A third passenger, who was found outside the helicopter and wearing a PFD, also drowned.

In its 1995 special investigation report (SIR) on the safety of the U.S. air tour industry,⁴ the Safety Board pointed out that, although the FAA’s original draft of SFAR 71 called for the use of both PFDs and helicopter flotation systems, the final version allowed Hawaii air tour operators to provide only one or the other. In the SIR, the Board noted that the combined use of PFDs and helicopter flotation equipment would provide the optimum level of safety for air tour passengers in the event of emergency ditching, especially in rough seas. The Board also urged the FAA to consider requiring passengers to don their PFDs during overwater tours and to evaluate the use of helicopter floats for overwater air tour locations other than Hawaii.

In response to the SIR, on October 22, 2003, the FAA issued a notice of proposed rulemaking (NPRM) for national air tour safety standards that stated:

the FAA has determined that equipping certain helicopters with floats for over water operations increases the likelihood of occupant survival in the event of an emergency water ditching. Floats would allow the helicopter to remain on the surface of the water for a longer period of time, thus allowing the occupants time to exit while the helicopter is still on the surface of the water.

In the NPRM, the FAA also stated that it recognized the need for more stringent flotation equipment requirements for commercial air tours and proposed that “single-engine helicopters and certain multi-engine helicopters operated in commercial air tours over water would have to be equipped with fixed or inflatable floats ... unless the flight over water is necessary only for take off or landing.” However, when the FAA issued the final rule on February 8, 2007, the rule stated that helicopters need not be equipped with floats if each occupant is wearing a life preserver while the helicopter is within power-off gliding distance of the shoreline.

In this accident, helicopter floats would have likely kept the helicopter on the water surface longer. Because all of the passengers (including the nonsurvivors) either donned or attempted to don their PFDs and because all likely perceived the immediate need to exit the

³ SFAR 71 states that “no person may conduct an air tour in Hawaii in a single-engine helicopter beyond the shore of any island, regardless of whether the helicopter is within gliding distance of the shore, unless: (a) the helicopter is amphibious or equipped with floats adequate to accomplish a safe emergency ditching and approved flotation gear is easily accessible for each occupant; or (b) each person on board the helicopter is wearing approved flotation gear.” Following the accident, Heli-USA voluntarily began to equip its Hawaii-based helicopters with flotation equipment. By December 2006, Heli-USA had five Hawaii-based helicopters, and all were equipped with floats.

⁴ National Transportation Safety Board, *Safety of the Air Tour Industry in the United States*, Aviation Special Investigation Report NTSB/SIR-95/01 (Washington, DC: NTSB, 1995).

helicopter, the Safety Board concludes all of the passengers would have had the opportunity to don their PFDs and egress the helicopter successfully had the helicopter not sunk so quickly. The Board also notes that the accident helicopter was initially traveling over the shore but ended up over the ocean as the emergency progressed. Further, the ditching emergency was not related to a loss of engine power. Therefore, the Safety Board concludes that, with regard to helicopter flotation equipment, there should be no exceptions for overwater takeoffs and landings and no distinction between single- and multi-engine helicopters. Therefore, the Safety Board believes that the FAA should require that all helicopters used in commercial air tour operations over water, regardless of the amount of time over water, be amphibious or equipped with fixed or inflatable floats.

PFD Inflation Issues

Of the six PFD vests used by the occupants, four were recovered,⁵ and, of these, only one was found to be configured with both chambers inflated.⁶ All of the recovered PFDs were Hoover Industries model FV-35E, manufactured in accordance with Technical Standard Order (TSO)-C13e.⁷ This model PFD features two inflation chambers that a user must inflate separately by pulling each chamber's plastic handle. According to the PFD's design, each chamber is equipped with a pressurized, 16-gram, carbon dioxide cylinder that punctures when the handle is pulled, releasing the pressurized gas into the chamber to inflate it fully within 2 seconds. Each chamber is also equipped with an oral inflation tube into which the user can blow to inflate the chamber.

Testing revealed that three of the recovered PFDs were capable of inflating by means of the cylinders when the handles were pulled, but that one PFD, which had only one chamber inflated, showed evidence that the other chamber did not inflate as designed. Examination of this PFD showed that, although the handle for the uninflated chamber had been pulled, the cylinder was only dimpled in the discharge area, rather than punctured, as would be necessary to release the pressurized gas to inflate the chamber. When a Safety Board investigator reinstalled the cylinder in its housing and then pulled the handle, the chamber inflated. Although each uninflated chamber on the recovered PFDs was equipped for oral inflation by means of an oral inflation tube, oral inflation takes longer than the 2-second inflation provided by the cylinders. Also, one passenger who could not swim tried unsuccessfully to inflate her vest using the handles but was panicked so did not attempt to use the tubes; another passenger subsequently inflated her vest for her by pulling at least one of the inflation handles, and she survived.

Of the three passengers who died, the passenger from the front left seat was found floating facedown in the water and wearing a PFD vest. First responders recalled that the passenger's PFD vest appeared inflated, but they did not know if only one or both chambers were inflated. At some point during recovery of the victim, the PFD was removed from the body and misplaced; therefore, it was not available for examination to determine its actual inflation

⁵ The recovered vests were worn by the three survivors and a passenger whose body was found still belted into the front center seat.

⁶ Before takeoff, the passengers watched a safety briefing video that explained, among other safety topics, how to inflate the PFD vests by pulling the handles.

⁷ At the date of this letter, TSO-C13f is current.

configuration.⁸ A Safety Board investigator performed water-immersion demonstrations with subjects using both the Hoover Industries model FV-35E and the Eastern Aero Marine model KSE-35HC2L8 PFDs.⁹ According to TSO-C13e, which specifies that the PFD must right a wearer who is in a facedown position, the buoyant force needed to meet the TSO is determined with both chambers inflated. According to the demonstrations of the two PFD models, the test subjects found it was not possible to float facedown with both chambers inflated. The subjects also found that each model PFD provided flotation for the wearer with only one chamber inflated. However, the test subjects also found that, with only one chamber inflated, it was possible for them to float facedown if they made no attempts to right themselves.

Although the immersion demonstrations were intended to observe the performance of two models of PFDs in various inflation configurations, the demonstrations further served to highlight the potential widespread nature of incompletely seated cylinders in PFDs: Test subjects were initially unable to inflate one chamber on the Eastern Aero Marine PFD by pulling the handle because the chamber's threaded cylinder was not screwed securely into its housing. This PFD had been recently retired from service after about 1 year of use, per the manufacturer's recommended inspection interval. When the investigator properly seated the cylinder and then pulled the inflation handle, the chamber inflated. After these tests, another Hawaii air tour operator voluntarily examined 13 recently retired-from-service PFDs and reported that 18 of the 26 inflation cylinders were loose in their housings. Because the PFDs must remain sealed in their pouches to meet airworthiness requirements and because only the manufacturer is authorized to perform inspections, it is not possible for the operators to examine the cylinders of in-service PFDs between recommended inspection intervals.

Although there is insufficient evidence to link this issue directly to a drowning death in this accident, the Safety Board is concerned that the number of improperly seated cylinders found within such a small sample size may indicate that similar problems exist elsewhere and could include instances in which both cylinders on one PFD are not secure. If one or both chambers fail to inflate, the wearer could float facedown or not float at all. Although the PFDs are equipped to allow for oral inflation of the chambers, the Board is concerned that, in the case of passengers who cannot swim, the 2-second cylinder inflation would be more preferable than attempting oral inflation and that panicked passengers may forget about the oral inflation option.

The Safety Board concludes that, without a solution to the cause of and how to prevent inflation cylinder unseating, passengers are no longer assured that their flotation devices will perform as designed in the event of an emergency and that further evaluation is needed to determine whether design, maintenance, and/or in-service handling issues are related to the problem. Therefore, the Safety Board believes that the FAA should evaluate the design, maintenance, and in-service handling of PFDs manufactured in compliance with TSO-C13f to

⁸ Because the PFD worn by this passenger was not recovered for examination, it was not possible to conclude whether both chambers could have fully inflated if the handles were pulled. Also, because it is not known at what point in the egress sequence this passenger drowned, it is not possible to conclude whether a fully inflated PFD could have saved this passenger's life.

⁹ The Eastern Aero Marine model KSE-35HC2L8 was also manufactured in accordance with TSO-C13e. The PFDs used for testing were supplied by Heli-USA and were recently retired from service after about 1 year of use. Each PFD manufacturer recommends that the PFDs be returned for inspection at specified intervals. On the recommended annual inspection dates, Heli-USA retired the PFDs from service and replaced them with new ones.

determine the reason that some chambers fail to inflate when the inflation handles are pulled before the PFDs have reached the manufacturer's recommended inspection interval and, on the basis of the results of this evaluation, should ensure that PFDs manufactured in compliance with TSO-C13f remain usable throughout the manufacturer's inspection interval.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that all helicopters used in commercial air tour operations over water, regardless of the amount of time over water, be amphibious or equipped with fixed or inflatable floats. (A-07-27)

Evaluate the design, maintenance, and in-service handling of personal flotation devices (PFDs) manufactured in compliance with Technical Standard Order C13f to determine the reason that some chambers fail to inflate when the inflation handles are pulled before the PFDs have reached the manufacturer's recommended inspection interval. (A-07-28)

On the basis of the results of the evaluation requested by Safety Recommendation A-07-28, ensure that personal flotation devices manufactured in compliance with Technical Standard Order C13f remain usable throughout the manufacturer's inspection interval. (A-07-29)

Please refer to Safety Recommendations A-07-27 through -29 in your reply. If you need additional information, you may call (206) 870-2201.

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred with these recommendations.

[Original Signed]

By: Mark V. Rosenker
Chairman