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Canadian Safety Report: Recent Crash Shows Effectiveness of Egress Safety Recommendations for Wide-body Helicopters

A Transportation Safety Board of Canada study showed that wide-body helicopters carrying large passenger loads were particularly susceptible to egress problems during emergencies. A recent accident suggested that safety measures recommended in 1991 are proving effective in speeding evacuation times and reducing the risk of injury and fire-related fatalities. But the crash also renewed concern about the crashworthiness of helicopter fuel systems.

Editorial Staff Report

The Bell 212 helicopter with 13 people on board was en route to a ski slope in Canada when it struck the ground in poor visibility and rolled onto its side in January 1993.

Although all of the occupants were able to evacuate the helicopter safely and there was no fire, a fuel hose linked to fatal fires in similar accidents was found ruptured. The Transportation Safety Board (TSB) of Canada said in a March 1993 report that while the accident underscored progress that had been made in improving egress from wide-body helicopters, it also renewed concern about the crashworthiness of helicopter fuel systems.

The TSB said the January crash was similar to another accident in 1990 involving a Bell 212, which prompted extensive study of egress and fuel system issues.

“In both accidents, an aluminum fuel line fitting broke,” the TSB said. “In the case of the [1990 crash], it is believed that fuel from the broken fitting fed the post-crash fire in which three of the 14 persons on board died when they were unable to exit the aircraft.”

Following the 1990 accident, the TSB made nine recommendations aimed at improving emergency egress from wide-body helicopters. The recommendations were accepted by Transport Canada (TC), which initiated corrective measures. The TSB said the changes contributed to the injury-free evacuation of the Bell 212 in the January 1993 accident. “The helicopter involved in the [January] accident had been modified by the operator as a result of these initiatives and it is believed this resulted in the successful emergency egress from the helicopter,” the TSB said.



The Bell model 212 twin-turboshaft helicopter first flew in 1968. Production of the 15-seat utility helicopter was transferred to Canada in 1988. The Bell 212 is powered by a Pratt & Whitney Canada PT6T-3B Turbo Twin Pac, comprising two PT6 turboshafts. It has a maximum range of 227 nautical miles (420 kilometers).

Source: *Jane's All the World's Aircraft*

In addition to the egress recommendations, the TSB in 1990 also issued a safety advisory to TC regarding the safety of helicopter fuel systems. In its March 1993 statement, the TSB said that while “steps are being taken to address the crashworthiness of helicopter fuel systems for the long term,” additional interim measures are necessary.

TSB asked TC to promote modification of the Bell 212 fuel system “to enhance the crashworthiness of the aluminum elbow fitting” on the Bell’s fuel line, and to assess the feasibility of incorporating crash-resistant fuel systems in all helicopters manufactured in Canada and in all Canadian-registered helicopters used in operations with a high risk of rollover.

In February 1991, the TSB recommended that TC “assess the feasibility of replacing critical fuel fittings with frangible self-sealing fittings and valves, or more durable (steel) fittings.” It said modifications to protect or relocate the fitting would also lessen its susceptibility to damage in rollovers.

TC is considering adopting a U.S. Federal Aviation Administration notice of proposed rulemaking (NPRM) on crash-resistant fuel systems, including a requirement for self-sealing breakaway fuel fittings.

But the TSB said that although this would be a positive step in increasing safety in new aircraft designs, “existing aircraft [under this NPRM] will continue to operate with fuel systems that are significantly less crash-resistant than the proposed standard.”

The TSB launched a far-reaching investigation of egress problems in wide-body helicopters and fuel system crash-worthiness following the 1990 Bell 212 crash.

The 1990 accident and 70 others that occurred in Canada since 1976 involving wide-body helicopters were examined. In addition to the Bell 212, Bell models 204, 205, 214, 412 and 412ST were also included in the investigation, the TSB said.

“All have a cabin width in excess of two meters (6.6 feet) and are capable of accommodating from nine to 20 persons,” the TSB said. “In 18 of these accidents, the helicopter came to rest on its side, and four of these accidents resulted in post-crash fires. In one case, the fire was extinguished before burning out of control. In the other three accidents involving post-impact fire, the helicopters were consumed by flames.”

The TSB said the Bell accidents were studied because, of all the helicopters engaged in commercial operations in Canada, only Bell-manufactured aircraft had cabin widths greater than two meters.

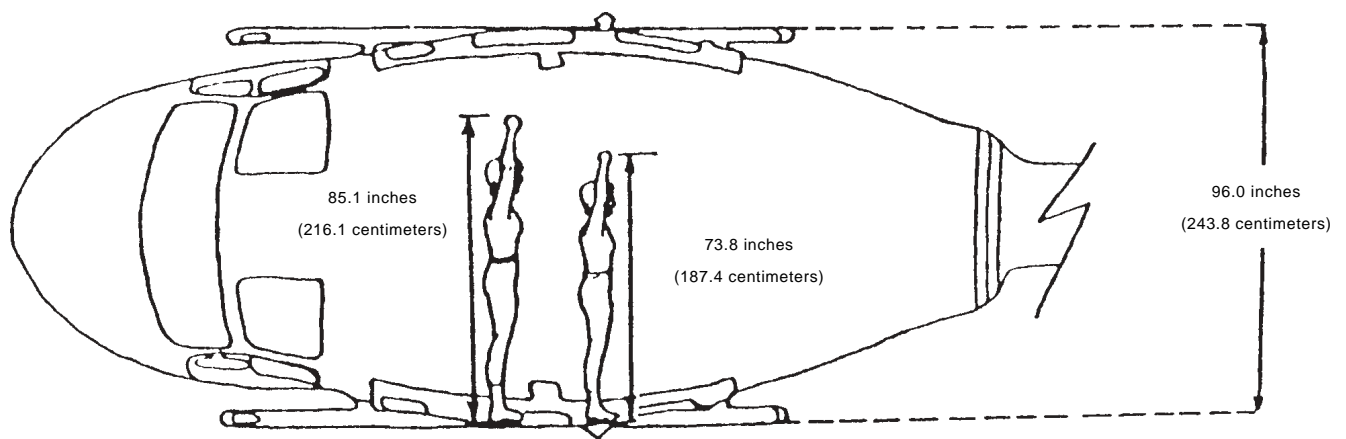
Production of the U.S.-designed Bell 212 was transferred to Canada in 1988.

The TSB noted that in the 1990 Bell 212 accident, “none of the passengers was incapacitated by the impact forces.”

“After striking the ground, the helicopter rolled onto its left side, prohibiting the use of the left side exits,” the TSB said. “The passengers released their seat belts and fell to the left side of the cabin. The Bell 212 passenger compartment is eight feet wide, which made passenger access to the right side emergency exit (now some distance overhead) very difficult (Figure 1, page 3).

“Fortunately, eight of the 11 people who successfully egressed were able to do so through the flight crew compartment and did not have to rely on the right side exit,” the TSB said.

The TSB concluded: “It is apparent that many accidents involving medium helicopters result in a rollover and that the circumstances of such accidents are often conducive to a post-impact fire. In light of the popularity of these aircraft types, particularly in heli-ski operations in which large passenger loads are frequently carried, obstacles to a timely egress constitute a serious safety deficiency.”



When a wide-body helicopter is resting on its side, many passengers may have difficulty reaching emergency exit grips.

Source: Transportation Safety Board of Canada

Figure 1

On the basis of its 1991 findings, the TSB recommended that:

- Measures be taken to improve passenger access to the emergency exits of Bell models 204, 205, 212, 214 and 412 helicopters when the aircraft are resting on their sides.
- TC sponsor modifications to the design standards for egress from wide-body helicopters to ensure that passengers can quickly access an emergency exit when the aircraft is resting on its side. “The design standards for evacuation did not take into account the propensity for wide-body helicopters to rollover, and therefore did not address the difficulties of egressing from a wide-body helicopter when the aircraft is resting on its side.”;
- TC ensure that emergency exit handle covers on all Canadian Bell models 204, 205 and 212 helicopters are examined to confirm that the correct installation hardware is being used and that the handle covers can be removed in an emergency;
- TC sponsor a mandatory functional check of the emergency exit handle cover in the required periodic maintenance schedule in Bell models equipped with emergency exit handle covers. (It was found that some emergency exit handle covers would have been difficult to remove in an emergency);
- TC ensure that emergency exit handles can consistently and easily be accessed and to sponsor design modifications where appropriate;
- Canadian operators of Bell models 205A1 and 212 helicopters engaged in heli-skiing or heli-hiking operations install Bell’s optional push-out window exits. “In consideration of the large number of passengers carried on most heli-ski and heli-hiking flights, the TSB believes that special precautions must be taken in these operations to ensure that all of the occupants have ample opportunity to evacuate the aircraft in the event of an emergency.” [Of the 71 accidents studied by the TSB, 15 (20 percent) occurred during heli-ski operations, with passengers being transported to remote ski locations in Canada’s Pacific Region.];
- Emergency exit activation instructions be modified so that passengers will be able to identify quickly the means by which the emergency exit handle can be activated. Survivors of the 1990 Bell 212 accident reported that the written instructions on the interior of the door were confusing and difficult to understand, the TSB said. In addition, one of the survivors attempted to remove the emergency exit handle cover to escape the aircraft, but did not use the correct procedure. [“As a result, the cover could not be removed,” the TSB said.];
- Adoption of a safety passenger program be considered by operators involved in carrying large passenger loads. A designated safety passenger would receive more detailed instruction on egress procedures and would be positioned near an emergency exit. The TSB said it was concerned that in the event of a rollover of a wide-body helicopter (with a large

passenger load in a remote area), the “absence of a knowledgeable and qualified person to assist inexperienced passengers may delay the evacuation and place the lives of the passengers at risk”; and

- Emphasis be given to pre-flight passenger briefings concerning activation and deployment of emergency exits. “Special care must be taken by operators of these aircraft [with large passenger loads] to ensure that the information relating to emergency egress is communicated to the passengers in an effective manner. The need to facilitate the swift, unaided evacuation of the occupants of these helicopters in an emergency is essential.”

According to the TSB, the helicopter involved in the January rollover accident had been modified by the operator in accordance with many of the TSB’s 1991 recommendations.

“It is believed that this resulted in the successful emergency egress from the helicopter,” the TSB said. “This Bell 212 was equipped with popout windows, conspicuously-painted legs of the bench, ceiling hand-holds and shortened front seat headrests. In addition, the passengers

had received pre-flight briefings that emphasized the use of these features for exiting the aircraft in an emergency.”

In its 1991 report, the TSB said emergency exit instructions needed considerable improvement.

“In many aircraft the instructions, printed ‘Emergency Release Pull Cover Turn Left and Push,’ are located on a red rectangular plastic block recessed in the emergency exit panel. This block ... can be easily mistaken for the ‘cover’ referred to in the instructions. The red color of the block, and the white color of the all-important emergency exit handle cover could confuse occupants in an emergency.

“Further, it is not clear from the instructions that the white plastic cover below the block must be removed with the finger of one hand to expose the emergency exit handle. The word ‘Danger’ printed on the white handle cover may discourage passengers from attempting to manipulate the cover panel even in an emergency.”

The TSB noted that because most passengers in wide-body helicopters will not be accompanied by a flight attendant, “the need for clearly written instructions is critical.” ♦

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