



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A95-03

Performance of escape slides

Background

In February 1995, The Transportation Safety Board of Canada (TSB) made 6 aviation safety recommendations in its Safety Study of Evacuations of Large Passenger Carrying Aircraft. This study examined the Canadian experience with the evacuation of passengers from these aircraft and identified safety deficiencies associated with communications during evacuations, exit operation, passenger preparedness for evacuations, and the presence of fire, smoke, and toxic fumes.

The safety study analyzed the results of investigations into 21 occurrences between 1978 and 1991. These occurrences involved 2444 persons and resulted in 91 fatalities and 78 serious injuries of which 36 fatalities and 8 serious injuries occurred during the evacuation process.

The Board concluded its Safety Study and released *Safety Study of Evacuations of Large Passenger-Carrying Aircraft SA9501* on 22 February 1995.

TSB Recommendation A95-03 (February 1995)

Canadian air carriers train cabin attendants to pull the manual slide deployment handle as a precautionary measure each time an inflatable slide is required. Therefore, should the slide not deploy automatically as designed, manual deployment has already been activated and no time is lost. In addition, cabin attendants are trained to assess slide conditions (angle, inflation, etc.) to determine if the slide can safely be used before commencing evacuation of passengers from that particular exit. Some air carriers train their cabin attendants to brief the first 2 passengers who go down the slide to stay at the bottom of the slide and assist other passengers who are evacuating, as well as to hold the slide steady if it is being buffeted by the wind.

A Transport Canada Airworthiness Standard covers evacuation slides and states that, for every aircraft exit that is more than 6 feet above the ground, there must be a self-supporting slide which deploys automatically when the exit opening mechanism is actuated and which must be fully inflated within 10 seconds. The slide must be of sufficient length such that, if any of the landing gear has collapsed, the slide will reach the ground at an angle which allows for a safe evacuation of the aircraft occupants. In addition, escape slides must be designed to withstand 25 knot winds directed from the most critical angle such that, with the assistance of one person, the slides remain usable throughout an evacuation.

Problems in operating emergency exits and deploying slides delayed many evacuations, potentially compromising the success of the evacuation.

Since 7 of 15 evacuations requiring slides were hindered as a result of problems related to deployment and/or angle of inclination, it appears that the intent of the current Airworthiness Standard is not being achieved. The use of effectively deployed escape slides may be critical to the success of an aircraft evacuation.

Therefore the Board recommends that

The Department of Transport, in concert with industry, re evaluate the performance of escape slides on all large passenger carrying aircraft registered in Canada, to confirm that they can be functionally deployed in accordance with the criteria of the Airworthiness Standard.

TSB Recommendation A95-03

Transport Canada's response to Recommendation A95-03 (May 1995)

The airworthiness standards applicable to emergency exit assist means have been upgraded over the years to address the types of problems presented in the Transportation Safety Board report. More recently, Transport Canada Aviation (TCA) in concert with the Federal Aviation Administration (FAA) and industry recognized the need to further improve performance standards for emergency exit assist means. Issues being addressed by TCA, the FAA and industry include: slide strength, rate testing and slide illumination. A substantial rewrite of Technical Standards Order TSOC69 is in process.

From an operational perspective, TCA standards require flight attendant training programs to include procedures that describe the different aircraft attitudes possible as a result of accidents/incidents (such as gear collapse, off-runway, shift in centre of gravity) and the effect of environmental conditions in evacuations (such as strong winds, terrain, snow/ice). Flight attendants are also trained to manage situations or problems associated with evacuation slides.

TSB assessment of Transport Canada's response to Recommendation A95-03 (June 1995)

TC stated that applicable airworthiness standard have been upgraded over the years. This statement is true; however, the standards do not apply to all existing transport aircraft. Aircraft types certified before the current requirements came into effect do not need to meet the standards. In the response, TC provided no information as to what portion of the Canadian air carrier fleet is not affected nor if action will be undertaken relative to the aircraft types that are not required to meet the standards.

While TC also stated that escape slide performance is currently being addressed by TC and the FAA, slide deployment and angle of inclination, problems highlighted in the occurrence data, are not being addressed. However, TSB staff understands that TC Airworthiness, in conjunction with the CAA, are also examining occurrences where the aircraft attitude has affected slide usage.

Given that the revised airworthiness standard does not apply to the entire air carrier fleet, TC's response to Recommendation A95-03 is assessed as **Satisfactory in Part**.

TSB reassessment of Recommendation A95-03 (November 1996)

Transport Canada is working with the FAA to re-evaluate and re-write TSOC69. Deployment and angle of inclination are not being addressed. The revised airworthiness standard is not applicable to entire air carrier fleet. No action regarding aircraft types that are not required to meet the airworthiness standard.

Therefore, the assessment of Recommendation A95-03 remains **Satisfactory in Part**.

TSB reassessment of Recommendation A95-03 (November 1997)

Transport Canada's proposed solution to re-write TSOC69, does not address the problems of deployment and angle of inclination of slides. The revised airworthiness standard is not applicable to the entire air carrier fleet. No action regarding aircraft types that are not required to meet the airworthiness standard.

Therefore, the assessment of Recommendation A95-03 remains **Satisfactory in Part**.

The deficiency file is assigned a "**Monitor**" status.

TSB reassessment of Recommendation A95-03 (February 2004)

TSOC69c (amended 2001/10/01) has requirements on the length of slides to accommodate for aircraft attitude with gear extended or partially collapsed, and on tolerance to winds up to 25 knots at the most critical angle. Transport Canada feels TSOC69c addresses the issues of this recommendation. However, TC did not confirm that slides, currently in use, conform to the amended TSOC69c.

Therefore, the response to Recommendation A95-03 is assessed as **Satisfactory in Part**.

As such, **Further Action is Unwarranted** with respect to Recommendation A95-03 and the status is changed to **Inactive**.

TSB review of Recommendation A95-03 deficiency file status (April 2015)

The Board requested that A95-03 be reviewed to determine if the deficiency file status was appropriate. After an initial evaluation, it was determined that the safety deficiency addressed by Recommendations A95-03 needed to be reassessed.

A request for further information was sent to Transport Canada and a reassessment will be conducted upon receipt of Transport Canada's response.

Therefore, the assessment remains as **Satisfactory in Part**.

Consequently, the status of Recommendation A95-03 is changed to **Active**.

Transport Canada's response to Recommendation A95-03 (August 2017)

TC agrees in principle with the recommendation.

The Transportation Safety Board (TSB) Study (SA9501) states the following:

A Transport Canada Airworthiness Standard covers evacuation slides and states that, for every aircraft exit that is more than six feet above the ground, there must be a self-supporting slide which deploys automatically when the exit opening mechanism is actuated and which must be fully inflated within 10 seconds. The slide must be of sufficient length such that, if any of the landing gear has collapsed, the slide will reach the ground at an angle which allows for a safe evacuation of the aircraft occupants. In addition, escape slides must be designed to withstand 25-knot winds directed from the most critical angle such that, with the assistance of one person, the slides remain usable throughout an evacuation.

To assist in determining the extent of risk reduction since the recommendation was released, Transport Canada, Civil Aviation (TCCA) consulted the historic Aircraft Register. Relevant statistics are available only to 1999. At that time there were 1264 aircraft weighing over 12,500 pounds in Canada. The TSB Safety Study of Evacuations of large Passenger-Carrying Aircraft found that in seven of fifteen, or 46.6% of occurrences where slides were deployed, "...there were problems related to their deployment or to their angle of inclination."

An unknown percentage of the transport category aircraft in service were operated in cargo-only configurations and would, therefore not require evacuation slides. If we can assume that the observed slide performance deficiencies (46.6%) would apply across the fleet, about 500 aircraft may have been equipped with slides that would not meet the standard expressed in the preamble to Recommendation A95-03.

A review of the 2016 Canadian fleet composition showed that most aircraft used in Canadian commercial airline services (CAR 705) comply with design standards that meet or exceed the study's expectations. This means that the overwhelming majority of air transport passengers in Canada are protected by standards that address the safety deficiency identified in the study. There may be, at most, 18 transport category aircraft in passenger carrying operations in Canada with slides that may not meet or exceed the standard.

All these aircraft have been extensively modified to carry a combination of passengers and cargo. Slides may have been replaced or modified during the conversions, but verification of the slide installations on these aircraft would be a very labour-intensive process. These 18 aircraft all serve northern communities. Replacing these aircraft is difficult because newer types of jet aircraft are not suitable for operations on gravel strips.

TC believes that the risk associated with this recommendation is reduced to acceptable levels.

TSB reassessment of Transport Canada's response to Recommendation A95-03 (February 2018)

TC has taken a number of actions to address the safety deficiency identified in Recommendation A95-03, regarding the performance of escape slides on all large passenger carrying aircraft registered in Canada. To date, these include the following actions:

- In 2001, TC amended TSOC69c to prescribe new requirements on the length and design of emergency evacuation slides in order to safely accommodate for aircraft attitude with the gear extended or partially collapsed. TSOC69c also requires emergency evacuation slides to withstand winds of up to 25 knots at the slide's most critical angle of inclination. These new standards meet or exceed the standards proposed by the Board's *Safety Study of Evacuations of Large Passenger-Carrying Aircraft* (SA9501); and

- In order to verify aircraft compliance with the Airworthiness Standards and the minimum performance requirements prescribed under TSOC69c, TC performed a review of Canadian passenger-carrying aircraft currently in service. Confirmation of compliance could be ascertained for 99% of these aircraft. In the case of the remaining 1% (or 18 aircraft), these have been extensively modified to carry a combination of passengers and cargo. Therefore, the slides may have already been modified to satisfy the requirements of the applicable Airworthiness Standards.

The Board believes that the actions taken by TC, combined with the limited number of Canadian passenger-carrying aircraft for which confirmation of compliance to the Airworthiness Standards could not be ascertained, have substantially reduced the risk associated with the safety deficiency identified in Recommendation A95-03.

Therefore, the response to Recommendation A95-03 is assessed as **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.