



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A95-02

Protective breathing equipment - Passengers

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.

Fire, smoke, and/or toxic fumes were present in 3 of the 4 fatal accidents examined in this study and caused serious injuries to many of the survivors.

The Board concluded its Safety Study and released Safety Study of Evacuations of Large Passenger-Carrying Aircraft SA 9501 on 22 February 1995.

TSB Recommendation A95-02 (February 1995)

In the light of the number of fatalities that occur when fire, smoke, and/or toxic fumes are present, the Board believes that further research is required to determine whether passengers should be given the opportunity to carry appropriate protective breathing equipment.

Therefore the Board recommends that

The Department of Transport re-evaluate research regarding protective breathing equipment (PBE) for passengers with a view to determining the feasibility of the carriage of appropriate protective breathing equipment, on a voluntary basis.

TSB Recommendation A95-02

Transport Canada's response to Recommendation A95-02 (May 1995)

Passenger protective breathing equipment (PPBE) types currently available on the market are filter, chemical reaction producing oxygen and oxygen/compressed air cylinder generated. Depending on the presence or absence of dangerous goods in the PPBEs, they could be subject to the transportation of dangerous goods act, 1992. Current regulations do not permit passengers to carry PPBEs containing dangerous goods into the cabin of an aircraft. The

dangerous goods panel of the International Civil Aviation Organization is currently in the process of reviewing smoke hood (PPBE) specifications to evaluate the types and quantities of dangerous goods present.

In 1987 the British civil aviation authority, in collaboration with three other aviation authorities (including representatives from Transport Canada Aviation), carried out research to assess the life-saving potential of PPBEs. The analysis showed there would be a reduced benefit overall and, in some accidents, additional loss of life was likely due to the delay caused by the donning of smoke hoods which would result in a slower evacuation. Although there is not sufficient benefit to require protective breathing equipment for passengers, a passenger may carry his/her own PPBE onboard if it does not contain dangerous goods.

TSB assessment of Transport Canada's response to Recommendation A95-02 (June 1995)

TC responded that the Dangerous Goods Panel of the International Civil Aviation Organization (on which TC has a representative) were meeting to review smoke hood (PPBE) specifications to evaluate the types and quantities of dangerous goods present. TSB staff has since been advised that the panel made no decision concerning PPBEs since the specifications or standards provided for review did not appear to be applicable and no physical sample of the equipment was supplied. No indication of further action in this area was mentioned.

The TC reply made no indication of an evaluation of other research in relation to PPBEs. Instead, they restated the conclusions of research in which they participated with the UK in 1987. As noted in the TSB Evacuation Study (page 14), members of the international aviation community who continue to promote PPBEs, fault the model on which these conclusions were based.

TC pointed out that passengers may carry their own PPBE onboard Canadian aircraft if it does not contain dangerous goods. From the PPBE currently available, this would currently limit passengers to the use of "filtration type smoke hoods" which are not as effective as smoke hoods having a self-contained source of breathable oxygen. (Of note, Air Canada's in-flight merchandising catalogue currently offers a smokehood with a 20 minute canister of air for \$90 (EVAC-U8); it is not known if TC will permit passengers to take this device into the cabin.)

This response was a reiteration of known facts and no commitment by TC to further address the issue of PPBEs.

Therefore, the response to Recommendation A95-02 is assessed as **Unsatisfactory**.

TSB reassessment of Recommendation A95-02 (November 1996)

The Dangerous Goods panel of ICAO were meeting to review smoke hood (PPBE) specs. No other action specified.

TC made no commitment to re-evaluate research regarding PPBE for passengers.

Therefore, the response to Recommendation A95-02 is assessed as **Unsatisfactory**.

TSB reassessment of Recommendation A95-02 (November 1997)

The Dangerous Goods panel of ICAO were meeting to review smoke hood (PPBE) specs. No other action specified.

TC made no commitment to re-evaluate research regarding PPBE for passengers.

Therefore, the response to Recommendation A95-02 is assessed as **Unsatisfactory**.

TSB reassessment of Recommendation A95-02 (April 1999)

The Dangerous Goods panel of ICAO were meeting to review smoke hood (PPBE) specs. No other action specified.

TC made no commitment to re-evaluate research regarding PPBE for passengers.

Therefore, the response to Recommendation A95-02 is assessed as **Unsatisfactory**.

TSB reassessment of Recommendation A95-02 (February 2004)

No change since previous re-assessment. Life-saving potential of PPBEs has not received positive consensus from international aviation authorities; moreover, TC does not prohibit carriage of PPBEs providing they conform to Carriage of Dangerous Goods Act.

As such, **Further Action is Unwarranted** with respect to Recommendation A95-02 and the status is changed to **Inactive**.

TSB review of Recommendation A95-02 deficiency file status (April 2015)

The Board requested that A95-02 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 A95-02 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 **Unsatisfactory**.

Consequently, the status of Recommendation A95-02 is changed to **Active**.

Transport Canada's response to Recommendation A95-02 (October 2017)

TC agrees in principle with the recommendation.

PPBE types currently available on the market include filter, chemical reaction producing oxygen and oxygen/compressed air cylinder generated. Depending on the presence or absence of dangerous goods in the PPBEs, they could be subject to the *Transportation of Dangerous Goods Act*. Current regulations do not permit passengers to carry PPBEs containing dangerous goods into the cabin of an aircraft.

Concerns continue to exist relating to the effectiveness of PPBE during aircraft evacuation in smoke-filled cabin conditions. These concerns relate primarily to the uncertain response of

passengers donning an unfamiliar piece of equipment in rapidly changing conditions, the risk of increasing the evacuation time by locating and donning the equipment and the potential for impaired aural and visual capabilities inherent in wearing a PPBE.

There are a number of considerations that have precluded Transport Canada from endorsing specific devices for passenger use. Research has indicated that there could be a reduced benefit overall, and in some cases additional loss of life mainly due to hyperventilation, asphyxiation and delays in the evacuation caused by donning of PPBE.

TCCA continues to work together with other international aviation regulatory authorities through the Cabin Safety Research Technical Group (CSRTG) to further research and improve standards pertaining to the suppression and containment of fires.

TC engineering specialists reviewed specification for some Personal Breathing devices. It was discovered that some contain dangerous goods, not allowed on passenger-carrying aircraft. TC has no objection to passengers carrying PBBE, provided they contain no dangerous goods.

Transport Canada has no further activities planned on this recommendation, but will continue to monitor developments in fire and passenger safety.

TSB reassessment of Transport Canada's response to Recommendation A95-02 (March 2018)

Based on TC's research and analysis into the use of passenger protective breathing equipment (PPBE), it has determined that it is not feasible to implement the carriage of PPBEs for the following reasons:

- The carriage of PPBEs on board by passengers is allowed. However, some PPBEs may not comply with national and international dangerous goods regulations; and
- The overall benefit of passengers using PPBEs may be reduced, as evacuation time might be increased due to the time taken in locating and donning the equipment. Other safety concerns, such as impaired aural and visual capabilities, hyperventilation and asphyxiation as a result of donning PPBEs, were also noted.

The Board believes that TC's further research and analysis on the carriage of PPBEs has satisfied the original intent of this recommendation, which was to re-evaluate the feasibility of implementing the use of PPBEs.

Therefore, the Board considers the response to Recommendation A95-02 to be **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.