



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A00-16

Lack of a systemic approach to in-flight firefighting

Background

On 02 September 1998, Swissair Flight 111, a McDonnell Douglas MD-11 aircraft, departed John F. Kennedy Airport in New York, New York, en route to Geneva, Switzerland. Approximately one hour after take-off, the crew diverted the flight to Halifax, Nova Scotia, because of smoke in the cockpit. While the aircraft was manoeuvring in preparation for landing in Halifax, it struck the water near Peggy's Cove, Nova Scotia, fatally injuring all 229 occupants on board. The investigation revealed that the flight crew had lost control of the aircraft as a result of a fire in the aircraft's ceiling area, forward and aft of the cockpit bulkhead.

On 04 December 2000, the Board released interim safety recommendations as part of its investigation () into this occurrence.

TSB Recommendation A00-16 (04 December 2000)

In-flight firefighting "systems" should include all procedures and equipment necessary to prevent, detect, control, and eliminate fires in aircraft. This systems approach would include material flammability standards, accessibility, smoke/fire detection and suppression equipment, emergency procedures and training. All of these components should be examined together and the inter-relationships between individual firefighting measures should be reassessed with a view to developing improved, comprehensive firefighting measures. The Board believes that the most effective in-flight firefighting capability will exist when the various elements of the firefighting system are integrated and complementary.

Therefore, the Board recommended that

appropriate regulatory authorities, in conjunction with the aviation community, review the adequacy of in-flight firefighting as a whole, to ensure that aircraft crews are provided with a system whose elements are complementary and optimized to provide the maximum probability of detecting and suppressing any in-flight fire.

TSB Recommendation A00-16

Responses to Recommendation A00-16 (Transport Canada – 06 March 2001 and Federal Aviation Administration – 18 January 2001)

On 19 December 2000, Transport Canada (TC) sent a letter to the United States Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA). The letter supported the intent of the recommendations, acknowledged that none of the issues can be addressed in isolation, and invited the major civil aviation regulatory authorities to harmonize a strategy for their resolution.

In this letter, TC also proposed to hold a meeting in March 2001 to discuss the recommendations, to identify existing initiatives and groups that may already address some aspects covered by the recommendations, and to establish a team to develop an appropriate action strategy. The FAA responded positively on 19 January 2001 and a positive response is anticipated from the JAA.

TC will keep the TSB apprised of the outcome of the meeting and of its progress towards achieving the goals of these recommendations.

The FAA responded that it has added TSB's recommendations to the FAA's Safety Recommendation Program to ensure that they are assigned to the appropriate program offices for evaluation and action as necessary. The FAA also indicates that it has agreed to meet with TC over this matter and that the Office of Aircraft Certification, specifically the Manager of the Transport Airplane Directorate, has been assigned to lead the FAA team in this regard.

TSB assessment of Transport Canada's response to Recommendation A00-16 (March 2001)

It is apparent that both TC and the FAA agree with the thrust of the deficiencies and are committed, at least in the short term, to examine these issues and map out a course of action. Collectively, these responses are adequate and constitute a logical "first step." Until such time as the details of the proposed action plan are known, it will remain unclear the extent to which the identified deficiencies will be reduced or eliminated. Although the declared initiatives will not yield any immediate substantive change, the planned action, when fully implemented, will substantially reduce or eliminate the safety deficiency.

Therefore, at this time, the response to Recommendation A00-16 is assessed as **Satisfactory Intent**.

Transport Canada's response to Recommendation A00-16 (December 2005)

In its 14 December 2005 letter to the TSB, TC indicates no change from its initial response (dated 06 March 2001) with respect to its action plan in response to the risks identified in Recommendation A00-16.

TSB reassessment of Transport Canada's response to Recommendation A00-16 (July 2006)

In TC's response of 06 March 2001, TC stated its support for Recommendation A00-16 and its intention to coordinate harmonized regulations with the FAA. Although the FAA has yet to introduce regulatory changes, in January 2004, it released Advisory Circular AC 120-80 dealing with in-flight fires. In a letter to the TSB dated 07 April 2004, TC stated that, in the light of

AC 120-80, it intended to review its response to recommendations A00-16 to A00-20. The review was to determine whether the safety action taken by Canadian operators needed to be reinforced by means of safety communication, promotional activity, or by regulatory changes. In its 14 December 2005 letter to the TSB, TC indicates no change from its initial response (dated 06 March 2001) with respect to its A00-16 action plan without mention of the content of its 07 April 2004 letter.

It is the Board's understanding that TC remains committed to its 07 April 2004 response, which, if fully implemented, will reduce the safety deficiency described in Recommendation A00-16.

Therefore, the assessment remains at **Satisfactory Intent**.

Transport Canada's response to Recommendation A00-16 (February 2007)

TC's response indicates that it is participating with other regulatory authorities within the International Aircraft Systems Fire Protection Working Group. The uses of handheld fire fighting equipment in hidden areas as well as infra-red detection devices are being evaluated. The working group is also producing a video to "educate" flight/cabin crew about dealing with in-flight fires.

TC's response does not refer to its commitment made to the TSB in its 07 April 2004 letter.

TSB reassessment of Transport Canada's response to Recommendation A00-16 (July 2007)

TC's latest response highlights some actions taken in cooperation with other regulatory authorities. The initiatives, while recognizing that more should be done to assist in dealing with in-flight fires, are advisory in nature and are not designed to work as a system. Hence the residual risk associated with the lack of a systemic approach to deal with in-flight firefighting will remain. Consequently, these and previously mentioned initiatives, if implemented, will reduce but not substantially reduce the risks in the deficiency identified in Recommendation A00-16.

Therefore, the assessment is assigned **Satisfactory in Part**.

Transport Canada's response to Recommendation A00-16 (March 2008)

Transport Canada states that it is participating with members from the FAA, the UK Civil Aviation Authority and others in the International Aircraft Systems Fire Protection Working Group (IASFPWG) on an ongoing basis. This working group is examining the use of handheld fire fighting equipment in hidden areas as well as infra-red detection devices and in cooperation with TC and the CAA (UK), is developing a video to educate flight/cabin crew about in-flight fires, particularly "hidden" fires, and how to deal with them.

Future rule making activity will be contingent on internationally harmonized requirements.

TSB reassessment of Transport Canada's response to Recommendation A00-16 (August 2008)

The response provides no indication that the various in-flight firefighting initiatives are complementary and optimized to work as a system that would provide the maximum

probability of detecting and suppressing any in-flight fire as stated in Recommendation A00-16. Hence the residual risk associated with the lack of a systemic approach to deal with in-flight firefighting will remain.

Consequently, these and previously mentioned initiatives, if implemented, will reduce but not substantially reduce the risks in the deficiency identified in Recommendation A00-16.

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

FAA's response to Recommendation A00-16 (January 2010)

In January 2010 the FAA provided an update with respect to its activity related to TSB Recommendation A00-16. The FAA states that it has published Advisory Circular (AC) 120-80, entitled In-flight Fires in January 2004 and subsequently released a complementary FAA training video entitled Fighting In-Flight Fires on 01 November 2007. The video is designed to assist in the training of airline cabin flight attendants to successfully fight and extinguish a hidden in-flight fire. It incorporates significant findings from FAA fire safety research and development. There is no information in the response that would indicate that the FAA is planning any additional initiatives related to Recommendation A00-16.

TSB reassessment of the response to Recommendation A00-16 (July 2010)

The Board appreciates the FAA's update. TSB was previously aware of AC 120-80 but not that the FAA had produced and distributed a complementary video. These initiatives, while recognizing that more should be done to assist in dealing with in-flight fires, are advisory in nature and are not designed to work as a system.

The safety analyses which lead to the issuance of Recommendation A00-16 identified a deficiency in existing in-flight firefighting elements in that there is no regulatory requirement that they be designed and implemented to complement each other. While improvements have been made to individual in-flight firefighting elements, e.g. material flammability standards, there is no indication that the elements have been reviewed to ensure that they are complementary and optimized to provide the maximum probability of detecting and suppressing any in-flight fire.

To date, neither the FAA nor the IASFPWG, to which TC in its 06 March 2008 response relinquished leadership on this issue, has indicated any additional initiatives related to Recommendation A00-16. Hence, the lack of a systemic approach to deal with in-flight firefighting remains. Consequently, the Board believes that various initiatives will reduce, but not substantially reduce or eliminate the deficiency identified in Recommendation A00-16.

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

TSB review of Recommendation A00-16 deficiency file status (May 2018)

The Board requested that all recommendations 10 years old or more be reviewed to determine if the deficiency file status was appropriate. After an initial evaluation, it was determined that the safety deficiency addressed by Recommendation A00-16 needed to be reassessed.

A request for further information was sent to Transport Canada (TC) and a reassessment will be conducted upon receipt of TC's response. In the interim, the assessment remains at **Satisfactory in Part**.

Consequently, the status of Recommendation A00-16 is changed to **Active**.

Transport Canada's response to Recommendation A00-16 (May 2019)

TC agrees in principle with the recommendation and has taken steps to reduce the risks associated with the identified safety deficiency.

Commercial and Business Aviation Advisory Circular (CBAAC) 0184 Stowage and Packaging of Survival Equipment and Emergency Flares was published by TC on May 14, 2001. The Circular recommends that operators store survival equipment in non-flammable packaging and containers and indicates that TC would present a Notice of Proposed Amendment (NPA) reflecting this recommendation to the Canadian Aviation Regulation Advisory Council.

In preparing the NPA, however, research indicated that attempting to impose a particular flammability standard for the survival equipment packaging was problematic as no such standard existed that could be referenced in the proposed regulation.

As survival equipment is specifically exempt from having to meet any standards specified in the Airworthiness Manual (AWM), which is where aviation flammability standards and test criteria are specified, there was no clear method to respond to the portion of the recommendation "[TSB Recommendation A00-13] ... that air operators store aircraft survival gear on aircraft in flame-resistant material..." beyond the guidance contained in CBAAC 0184. In 2008, TC communicated to the TSB that no additional work would be carried out on this recommendation since a standard was not available to be employed in a regulation and TC had already raised operator's awareness of the risks associated with this safety deficiency.

TC does not plan to carry out additional work in this area at this time.

TSB reassessment of Transport Canada's response to Recommendation A00-16 (August 2019)

The recommendation focusses on a systems approach to in-flight firefighting, such as material flammability standards, smoke/fire detection and suppression equipment, emergency procedures and training.

Since the publication of Recommendation A00-16, the following actions have been taken to address the safety deficiency identified in Recommendation A00-16, regarding the adequacy of in-flight firefighting as a whole:

- In 2000, Transport Canada (TC) initiated contact with the U.S. Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) to collaborate on a joint strategy to address the safety deficiencies in the recommendations issued as part of Aviation Investigation Report A98H0003, including Recommendation A00-16;
- In 2004, the FAA published Advisory Circular (AC) 120-80, which informed operators about the dangers of in-flight fires, namely those that may not be visible or easily accessed by crew members. This advisory also provided guidance on the procedures for

combatting in-flight fires and training on the appropriate use of cabin fire extinguishers. AC 120-80 was updated by the FAA in 2014 to provide additional guidance;

- In 2007, TC indicated that it was cooperating with the FAA, the United Kingdom Civil Aviation Authority (CAA), and other regulatory authorities participating in the International Aircraft Systems Fire Protection Working Group (IASFPWG), to address the safety deficiencies identified in the recommendations issued as part of Aviation Investigation Report A98H0003, including Recommendation A00-16;
- Also in 2007, the FAA released a training video entitled *Fighting In-Flight Fires*, which was produced in collaboration with TC, the United Kingdom CAA, the French Direction générale de l'Aviation civile (DGAC), and the Brazilian CAA. This video was designed to assist in the training of cabin flight attendants on how to combat hidden in-flight fires; and
- In 2007 and 2008, the FAA conducted research and issued reports DOT/FAA/AR-TN04-33, *A Preliminary Examination of the Effectiveness of Hand-Held Extinguishers Against Hidden Fires in the Cabin Overhead Area of Narrow-Body and Wide-Body Transport Aircraft* (published in July 2007), and DOT/FAA/AR07-58, *Aircraft Cargo Compartment Multisensor Smoke Detection Algorithm Development* (published in February 2008). The FAA also focused on initiatives such as the Enhanced Airworthiness Program for Airplane Systems (EAPAS).

In addition to the actions listed above, improvements have been made to the material flammability standards, with, among other initiatives, the amendment to Chapter 525 of TC's Airworthiness Manual (see TSB reassessment of Transport Canada's response to Recommendation A99-07 [March 2018]). Furthermore, emergency procedures and training, which include the training standards for flight attendants (Flight Attendant Training Standard – TP 12296) and pilots (Commercial and Business Aviation Policy Letter No. 153 – Practical Training – Emergency Procedures Training for Pilots), have been updated.

Through the IASFPWG, industry continues to research and update procedures.

The Board considers that the actions taken to date lead to a complementary system for in-flight firefighting. These actions have substantially reduced the risks associated with the deficiency identified in Recommendation A00-16.

Therefore, the Board considers the response to Recommendation A00-16 to be **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.