



REASSESSMENT OF THE RESPONSE TO AIR TRANSPORTATION SAFETY RECOMMENDATION A00-20

Deficiencies in in-flight firefighting standards

Background

On 2 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 1 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 4 December 2000, the Board released interim safety recommendations as part of its investigation (A98H0003) into this occurrence.

TSB Recommendation A00-20 (December 1999)

The Board believes that the lack of comprehensive in-flight firefighting procedures, and coordinated aircraft crew training to use those procedures, constitutes a safety deficiency.

Therefore, the Board recommended that

Appropriate regulatory authorities review current in-flight firefighting standards including procedures, training, equipment, and accessibility to spaces such as attic areas to ensure that aircraft crews are prepared to respond immediately, effectively and in a coordinated manner to any in-flight fire.

TSB Recommendation A00-20

Responses to Recommendation A00-20 (Transport Canada - March 2001 and Federal Aviation Administration - 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 the responses to Recommendation A00-20 (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, the responses are considered to be **Satisfactory Intent**.

Transport Canada's response to Recommendation A00-20 (December 2005)

In its update of active recommendations dated 14 December 2005, TC indicated that it has reviewed this issue and has determined that the Flight Attendant Training Standard (TP 12296) addresses the training issues as identified in the Swissair Flight 111 investigation report.

TSB reassessment of Transport Canada's response to Recommendation A00-20 (July 2006)

As of 14 December 2005, TC indicated that it has reviewed this issue and determined that the Flight Attendant Training Standard (TP 12296) addresses the training issues as identified in Recommendation A00-20. However, TC's activity update only addresses the training standard for flight attendants. It does not address the training standard for flight crew, the adequacy of existing firefighting equipment or the accessibility to spaces such as attic areas. The actions taken have not substantially reduced or eliminated the safety deficiency.

Therefore, the assessment is now **Satisfactory-in-Part**.

Transport Canada's response to Recommendation A00-20 (February 2007)

In addition to Flight Attendant Training Standard (TP 12296), TC's response received 07 February 2007 indicates that it is cooperating with the FAA, UK CAA and other regulatory authorities in the International Aircraft Systems Fire Protection Working Group to address

deficiencies identified in Recommendation A00-20. Currently, the working group is examining the use of handheld fire fighting equipment in hidden areas as well as infra-red detection devices for use by aircrew. Additionally, the working group is developing a video to complement the FAA's Advisory Circular 120-80 *In-Flight Fires* which discusses the dangers of in-flight fires, with particular emphasis on hidden fires that may not be visible or easily accessed by the crew.

TSB reassessment of Transport Canada's response to Recommendation A00-20 (July 2007)

TC's activity update indicates that its action plan is indeed multi-faceted. In cooperation with other regulatory authorities it continues to identify efficiencies to improve the current in-flight firefighting standards. These initiatives, along with other complementary activities such as TC's Policy Letter 153: *Practical Training – Emergency Procedure Training for Pilots*, if fully implemented, will reduce the deficiency identified in Recommendation A00-20.

Therefore, the assessment is **Satisfactory Intent**.

Transport Canada's response to Recommendation A00-20 (March 2008)

As in its response to TSB, dated 14 December 2005, TC states that the Flight Attendant Training Standard (TP12296) addresses the training issues as identified in the Swiss Air Investigation Report for SR 111 and suggests that the recommendation be closed.

TSB reassessment of Transport Canada's response to Recommendation A00-20 (August 2008)

In its various responses, TC has declared that the training issues raised in Recommendation A00-20 are addressed by its Flight Attendant Training Standard (TP 12296) and Policy Letter 153: *Practical Training – Emergency Procedure Training for Pilots*. Likewise, equipment deficiencies identified in Recommendation A00-20 are being dealt with under the auspices of the International Aircraft Systems Fire Protection Working Group. These initiatives, along with other complementary activities such as TC's Policy Letter 153: *Practical Training – Emergency Procedure Training for Pilots*, if fully implemented, will reduce the deficiency identified in Recommendation A00-20.

Therefore, the assessment is **Satisfactory Intent**.

The FAA's response to Recommendation A00-20 (January 2010)

In January 2010 the FAA provided an update with respect to its activity related to TSB Recommendation A00-20. 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 A00-20.

TSB reassessment of the FAA's response to Recommendation A00-20 (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. However, there is nothing in the response to suggest that the FAA has conducted a review of current in-flight firefighting standards to ensure that aircraft crews are prepared to respond immediately, effectively and in a coordinated manner to any in-flight fire.

The safety analyses which led to the issuance of Recommendation A00-20 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 6 March 2008 response relinquished leadership on this issue, has indicated any additional initiatives related to Recommendation A00-20. 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 A00-20.

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

TSB review of Recommendation A00-20 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 A00-20 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 A00-20 is changed to **Active**.

Transport Canada's response to Recommendation A00-20 (November 2018)

TC agrees with the recommendation.

The Flight Attendant Training Standard (TP12296) addresses the training issues as identified in the Swiss Air Investigation Report for SR 111. Section 4 of the Standard states the following Training Objective:

"The trainee will be able to identify the types of fire, fire detection and fire fighting systems and the established fire fighting procedures."

This objective is met when candidates meet the following enabling objectives.

4.1A General

- 4.1A.1 Identify the threat to safety from in-flight fires.
- 4.1A.2 Identify hazards associated with onboard fires including toxicity of smoke/fumes, flammability of cabin materials, variety of combustible materials.
- 4.1A.3 Identify the impediments to fire fighting onboard aircraft including limited visibility due to smoke/fumes, fire fighting in confined space, difficulty in locating/accessing the source of the fire, limited resources to fight the fire and distance to suitable airport for landing.
- 4.1A.4 Describe experience(s) with fire accidents/incidents. Identify the safety lessons learned as a result.
- 4.1A.5 Describe the legislated requirements regarding fire safety (e.g. onboard smoke detectors, waste receptacle fire extinguishers, fire resistant seat cushions, floor lighting, etc.).
- 4.1A.6 Define fire chemistry, including the elements, which must be present for fire to occur (e.g. fuel, heat, oxygen, chemical reactions).
- 4.1A.7 List the classes of fire which may occur on aircraft: Class A – combustible material fires, Class B – grease/spill fires, Class C – electrical, and Class D – fire involving metals and the possible sources for these fires.
- 4.1A.8 Describe importance of early detection and correct recognition.
- 4.1A.9 Identify the characteristics and behaviour of fire (e.g. what you will see, how the fire will behave) in different cabin environments and fire propagation.
- 4.1A.10 Describe the means of fire/smoke detection (e.g. smell, auditory, visual, tactile).
- 4.1A.11 Describe the chemical properties of each type of fire extinguisher, including hazards to occupants and aircraft systems and how it extinguishes fire.
- 4.1A.12 Describe each piece of fire fighting equipment onboard (including protective breathing equipment, protective clothing) and include the following in the description:
 - a) Purpose;
 - b) Stowage, location, access, retrieval;
 - c) Serviceability;
 - e) Operation;
 - f) Duration;
 - g) Limitations;
 - h) Conditions of use; and

i) Care after use.

4.1B Crew Responsibilities

4.1B.1 Identify the responsibility for crew to maintain situational awareness and investigate immediately whenever an onboard fire situation is suspected and when an onboard fire detection system is activated.

4.1B.2 Identify the importance and responsibility to be prepared to implement appropriate fire fighting procedures.

4.1B.3 Define the specific crew member responsibilities for fire fighting onboard:

- a) Fighting fire;
- b) Back-up equipment/second fire fighter;
- c) Communication; and
- d) Passenger control.

4.1B.4 List fire prevention measures and crew responsibilities for fire prevention including but not limited to:

- a) Practicing and maintaining safe work habits;
- b) Enforcing smoking regulations;
- c) Monitoring cabin, lavatories, and cargo compartments;
- d) Awareness of popped circuit breaker procedures; and
- e) Prompt investigation of fire detection alarms, unusual odours, heat build-up, deformation of aircraft components, etc.

4.1B.5 Describe the importance of crew coordination in fire fighting and identify ways that this may be achieved.

4.1B.6 Describe the importance of crew communication in fire fighting and providing pilot-in-command with accurate information on fire source, location, extent/severity or fire/smoke, fire fighting actions.

4.1C Procedures – Cabin

4.1C.1 Describe the fire fighting procedures for specific types of fires (e.g. galley, oven, lavatory, electrical, upholstery, etc.).

4.1C.2 Describe the techniques and procedures for fighting fires including finding the source of the fire, type of extinguisher to use, additional fire fighting equipment needed, techniques for using extinguishers, complications to fighting types of fires, limitations to fighting fires, post-fire procedures, crew communication, crew coordination procedures and passenger-handling.

4.1C.3 Identify ways to maintain breathing comfort for cabin occupants.

4.1C.4 Define flashover and flash-fire. Describe the cause of each and the conditions under which each is likely to occur.

To support the above stated objectives, Federal Aviation Administration (FAA) and British Civil Aviation Authority (CAA), TC, Direction générale de l'Aviation civile (DGAC) France and the Brazilian Civil Aviation Authority produced a video on in-flight fire fighting. This video can be viewed at:

http://www.fire.tc.faa.gov/2007Conference/files/Training_Videos/ThursPM/Videos/BlakeFirefightingVdeo1.wmv

TC's review of this matter leads us to conclude that the safety action taken addresses the risk associated with this recommendation. The department continues to support international efforts to enhance passenger safety.

TSB reassessment of Transport Canada's response to Recommendation A00-20 (March 2019)

In its response, Transport Canada (TC) indicates that a number of actions have been taken to address the safety deficiency identified in Recommendation A00-20, regarding in-flight firefighting standards. These include the following:

- In 2000, TC initiated contact with the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) to collaborate on a joint strategy to resolve the safety deficiency identified in Recommendation A00-20;
- 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 crewmembers. 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 2005, TC issued Policy Letter 153: *Practical Training – Emergency Procedure Training for Pilots* regarding the initial and recurrent training requirements for commercial air operators. This letter clarified the extent of the practical training that pilots must undertake regarding location and use of fire extinguishers onboard aircraft, and the corresponding emergency procedures that must be followed in the event of an in-flight fire;
- 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, to address deficiencies identified in Recommendation A00-20; and
- In 2007, the FAA released a training video entitled *Fighting In-Flight Fires*, which was published 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 to combat hidden in-flight fires.

In several responses, TC indicated that current training standards for flight attendants (*Flight Attendant Training Standard – TP 12296*) and air crew (*Policy Letter 153*) on how to respond to in-flight fires sufficiently address the training issues raised in Recommendation A00-20.

In addition, the *Canadian Aviation Regulations* (CARs) now contain requirements governing the use, quantity, content and location of hand-held fire extinguishers onboard commercial passenger aircraft (CARs 705.93, 704.83 & 602.60(1)(e)). In aircraft operated under CARs Subpart 705, hand-held fire extinguishers must be conveniently located and readily available for immediate use in the flight deck, the passenger cabin, the cargo compartments that are accessible by crewmembers, and each isolated galley (CARs 705.93). In pressurized aircraft operated under CARs Subpart 705, protective breathing equipment with a 15-minute oxygen supply must also be available within one meter of each hand-held fire extinguisher and be readily available to assist crewmembers in combatting fires (CARs 705.71).

The Board considers that the actions taken in response to A98H0003 now provide crewmembers with adequate emergency procedures, training and equipment to respond immediately, effectively and in a coordinated manner in the event of an in-flight fire. These actions have substantially reduced the risks associated with the deficiency identified in Recommendation A00-20.

Therefore, the response to Recommendation A00-20 is assessed as **Fully Satisfactory**.

This deficiency file is **Closed**.