



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A99-08

Deficient fire test criteria for aircraft materials

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 11 August 1999, the Board released interim safety recommendations as part of its investigation (A98H0003) into this occurrence.

TSB Recommendation A99-08 (August 1999)

On 14 October 1998, the Federal Aviation Administration (FAA) stated that the test criteria used to certify the flammability characteristics of thermal acoustical insulation materials were inadequate, and committed itself to conducting the research necessary to establish a more comprehensive test standard. At the same time, the FAA indicated that, because materials containing polyimide film have performed well in preliminary flammability tests, these materials would be considered compliant under the new regulation. Until adequate flammability test criteria are available, it is not possible to determine whether polyimide film, or other materials, provides adequate protection against fire propagation. Thermal acoustical insulation materials are installed in aircraft as a system, including such related components as tape, fasteners, and breathers. The Board believes that thermal acoustical insulation materials for use in aircraft must be judged against more valid flammability test criteria, not as individual components, but as a system.

Therefore, the Board recommended to Transport Canada (TC), the United States FAA and the European Joint Aviation Authorities (JAA) that:

On an urgent basis, regulatory authorities validate all thermal acoustical insulation materials in use, or intended for use, in applicable aircraft, against test criteria that are more rigorous than those in Appendix F of FAR 25.853, and similar regulations, and that are representative of actual in-service system performance.

TSB Recommendation A99-08

Responses to Recommendation A99-08 (Transport Canada - 02 November 1999 and Federal Aviation Administration - September 1999)

In its response on 02 November 1999, TC recognized that certain types of thermal acoustical insulation material systems exhibit a propensity to propagate fire under certain circumstances. TC states that it is actively cooperating with both the FAA and JAA in developing new test standards. These new standards will qualify the flammability characteristics of thermal acoustical insulation material systems against realistic fire threats under environmental conditions to which they are subjected in service.

TC states that it will proceed with appropriate regulatory action once an internationally harmonized solution is reached. The FAA response of 16 September 1999 indicates that it intends to propose new rulemaking (NPRM) in the near future that would introduce new flammability test requirements for thermal/acoustic insulation cover material. The FAA accepts that there are materials currently in use that will not meet the proposed new standards. However, because these materials do not have the same susceptibility to ignite, the FAA has not identified an unsafe condition that would cause the FAA to take the same action as with MPET.

TSB assessment of responses to Recommendation A99-08 (March 2000)

Both TC's response received 02 November 1999, and the FAA's response dated 16 September 1999 indicate that they are committed to replacing existing test criteria with a more stringent flammability standard for thermal acoustic insulation blanket materials. However, it is unclear the extent to which proposed test criteria will reduce or eliminate the identified deficiency or for that matter whether they will be adopted.

Therefore, the responses are considered to be **Satisfactory Intent**.

Transport Canada's response to Recommendation A99-08 (December 2005)

In its update of active recommendations dated 14 December 2005, TC indicated that an update to Recommendation A99-08 was not available due to scheduling conflicts for some Swissair Recommendation team members. Furthermore, TC indicated that an update will follow as soon as team members can meet and draft updates.

TSB reassessment of the Responses to Recommendation A99-08 (July 2006)

Although the FAA's final rule issued 31 July 2003 has created more rigorous test criteria, has amended the FAA regulations, and has drafted advisory material, no comprehensive validation of existing materials called for in the recommendation has been accomplished by the FAA. TC's harmonization efforts have resulted in proposed changes (NPA 2004-028) to Airworthiness Standard, Section 525.856, which include new flammability requirements that address flame propagation. Although the new test requirements establish a new level of safety, TC has not undertaken a validation of existing materials as recommended in A99-08. As of 23 June 2006, TC has not provided an update with respect to the residual risks associated with A99-08.

It is the Board's understanding that TC remains committed to providing an update to its action plan. Notwithstanding, the confirmed actions taken and planned will reduce but not substantially reduce or eliminate the deficiency.

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

Transport Canada's response to Recommendation A99-08 (February 2007)

TC's response repeats the fact that the FAA has created a more rigorous test criterion, amended its FARs and created advisory material with respect to the design standards of thermal acoustic insulation materials. Additionally, regulations are in the process of being amended that will hold future thermal acoustic insulation materials to this new standard.

TC states that "through testing in-service thermal acoustic insulation materials," the FAA has identified another widely used thermal acoustic insulation cover material that fails the recently adopted flammability test criteria. Subsequently, the FAA has issued a Notice of Proposed Rulemaking (NPRM) that proposes the removal and replacement of this material. TC's response also indicates that an alternate means of compliance is being proposed by industry that would apply a flame retardant to the material in lieu of wholesale replacement.

TSB reassessment of the Responses to Recommendation A99-08 (July 2007)

The adoption of a more rigorous test criterion for the design standards of future thermal acoustic insulation materials reduces the risks associated with the deficiency identified in Recommendation A99-08. However, the risks to aircraft using existing thermal acoustic insulation materials have not been addressed as neither the FAA nor TC has undertaken a validation of existing materials as recommended in Recommendation A99-08. The fact that another widely used thermal acoustic insulation material has exhibited unacceptable in-service performance and is being targeted for wholesale removal by the FAA further supports this aspect of the deficiency identified in Recommendation A99-08. This lack of action leaves many materials at risk and fails to mitigate this risk associated with this facet of the deficiency identified in Recommendation A99-08.

Therefore, in summary, this reassessment remains at **Satisfactory in Part**.

Transport Canada's response to Recommendation A99-08 (March 2008)

In its response of 11 March 2008, TC reviews previously known FAA and TC regulatory actions taken.

In addition, TC states that the FAA, by testing in-service thermal acoustic insulation materials, has identified one additional exceptionally high-risk material (AN-26), which failed the radiant panel test. Consequently, the FAA issued an Airworthiness Directive for its removal and replacement. TC also states that, due to the high cost of replacing thermal acoustic insulation materials, manufacturers and operators are proposing an alternate means of compliance to minimize the flammability risk of AN-26 insulation by the in situ application of a flame retardant.

TC considers this recommendation closed because:

- with the elimination of PET and AN-26 insulations, the identified safety deficiency has been minimized; and
- no further action needs to take place once international harmonization is accomplished.

TSB reassessment of the Responses to Recommendation A99-08 (August 2008)

The Board agrees that the adoption of a more rigorous test criterion for the design standards of future thermal acoustic insulation materials reduces the risks associated with the deficiency identified in Recommendation A99-08. However, the response contains no indication that regulatory authorities have undertaken a comprehensive validation of all thermal acoustic insulation materials in use. The action taken will reduce, but not substantially reduce or eliminate, the deficiency identified in Recommendation A99-08.

Therefore, this reassessment remains at **Satisfactory in Part**.

Review of Recommendation A99-08 deficiency file status (September 2009)

In its latest position statement regarding the deficiency identified in Recommendation A99-08, TC states that its "risk based" action plan has "focussed on high risks materials" and that "testing **all** material is impractical." TC considers this recommendation closed and plans no further action.

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

The Board also concludes that, as no further action is planned, continued reassessment will not likely yield further results.

Review of Recommendation A99-08 deficiency file status (April 2019)

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 A99-08 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 A99-08 is changed to **Active**.

Transport Canada's response to Recommendation A99-08 (May 2019)

TC agrees in principle with the recommendation. This recommendation was classified as "Dormant" in 2008 when TC indicated it planned no further action on this issue since the safety deficiency had been minimized through the elimination of polyethylene terephthalate (PET) and AN-26 insulation and international harmonization in this area would address further risks. The Board accepted this action as partially addressing the safety deficiency and classified TC's response as Satisfactory in Part since a comprehensive review of all materials, as prescribed by the recommendation had not been carried out.

TC recognizes the importance of the subject of thermal acoustical insulation. This is a highly specialized field with very few specialists remaining in the world. TC monitors the work of standards councils and other civil aviation authorities in this specialized field of work and is poised to take action if and when technical breakthroughs occur.

TC will continue to monitor this issue and assess if new information or breakthroughs are pending or available. TC has no additional information to provide at this time.

TSB reassessment of Transport Canada's response to Recommendation A99-08 (March 2020)

In its response, Transport Canada (TC) indicated that it agrees in principle with Recommendation A99-08.

To date, a number of actions have been taken by TC and other regulatory authorities that address the safety deficiency identified in Recommendation A99-08, regarding the validation of all thermal acoustical insulation materials in use, including the following:

- In 2003, TC issued Airworthiness Notice B066 – *Insulation blanket covers and Tapes Metallized Polyethylene Terephthylene (MPET)*, informing Canadian aircraft owners and operators about the fire hazards associated with MPET-covered thermal acoustic insulation material, and recommending measures to eliminate the use of such material in all aircraft types.
- In 2005, the FAA published Advisory Circular (AC) 25.856-I *Thermal/Acoustic Insulation Flame Propagation Test Method Details*.
- In 2008, the FAA published AC 25.856-2A *Installation of Thermal/Acoustic Insulation for Burn through Protection*.

Additionally, new flammability standards were issued by the FAA (14 CFR Part 25.856) in 2003, by TC (*Canadian Aviation Regulations (CARs) Standard 525.856*) in 2004, and by the European Union Aviation Safety Agency (EASA) (CS 25.856) in 2009. These standards require insulation materials to undergo a more stringent flammability test, which includes new flammability requirements that address flame propagation. As a result, aircraft manufactured and/or registered in Canada, the U.S. and Europe are no longer manufactured or repaired with MPET or AN-26 thermal acoustic insulation materials.

Many actions have been taken over the years that have addressed the safety deficiency identified in Recommendation A99-08. The Board believes that through the elimination of MPET and AN-26 thermal acoustic insulation materials, as well as new flammability standards and testing, the risk associated with Recommendation A99-08 has been substantially reduced.

TC will continue to monitor this issue to see if further action may be required. The TSB considers that the residual risk has been reduced sufficiently.

Therefore, the Board considers the response to the recommendation to be **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.