



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A03-01

Thermal acoustic insulation materials: Other thermal acoustic insulation materials at risk

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.

The Board concluded its investigation and released report A98H0003 on 27 March 2003.

TSB Recommendation A03-01 (March 2003)

The risks of in-flight fire associated with metallized polyethylene terephthalate (MPET)-covered insulation blankets have largely been mitigated. However, the investigation determined that there are other thermal acoustic insulation cover materials that, once ignited, exhibit similar flammability characteristics to MPET-covered blankets, and have failed the Federal Aviation Administration's (FAA) recently adopted Radiant Panel Test (RPT). Although these materials exist in many aircraft, as of the final report publication date, no mitigation strategy has been undertaken to address the known associated risks.

Therefore, the TSB recommended that:

Regulatory authorities quantify and mitigate the risks associated with in service thermal acoustic insulation materials that have failed the Radiant Panel Test.

TSB Recommendation A03-01

Transport Canada's response to Recommendation A03-01 (16 June 2003)

In its 16 June 2003 response to Recommendation A03-01, Transport Canada (TC) provided the following comments:

Although TC agrees with the intent of the recommendation, in that action needs to be taken to address unsafe materials, it does not agree that those materials that have failed the RPT are in fact unsafe materials.

- TC agrees that the FAA has identified materials that do not meet the RPT criteria.
- TC contends that the FAA testing was not meant to quantify the performance of existing materials tested.
- TC states that MPET, the only material to be deemed unsafe, "exhibited a propensity to both be ignited from a small ignition source and propagate flames," while other materials are more difficult to ignite and therefore present a lower level of risk.
- TC states that it has developed proposed regulations to implement the RPT on new transport category type designs and future production of existing designs.
- TC states that it intends to work with its "partner" Civil Aviation Authorities (CAA) to identify unsafe materials and will raise this "issue" at the FAA's International Aircraft Materials Fire Test Working Group.

TSB assessment of Transport Canada's response to Recommendation A03-01 (October 2003)

Recommendation A03-01 calls for regulatory authorities to quantify and mitigate the risks associated with those thermal acoustic insulation materials that have failed the RPT. TC states that it agrees with the intent of the recommendation, which it interprets as requiring that action be taken to mitigate the presence of any and all unsafe materials in aircraft manufacture and repair.

TC's response contends that a material's failure to pass the RPT is not, in and of itself, indicative of an unsafe material. Rather, TC argues that MPET, the only thermal acoustic insulation material that has been deemed to be unsafe by the FAA, was so designated because of both its ease of ignition from a small ignition source and propensity to propagate fire. More precisely, the Notices of Proposed Rulemaking (NPRM) issued by the FAA on 04 August 1999, which required the removal of MPET, concluded that it was the MPET's poor performance in both a preliminary radiant panel test, known as the Standard Test Method American Society for Testing and Materials E648, and its tendency to ignite from small ignition sources such as electrical arcing or sparking that singled it out for regulatory action. Based on its development work, the FAA refined this preliminary test and adapted it into what is now known as the RPT, which it concluded in its final report (issued September 2000) to be an effective method for evaluating the in-flight fire resistance qualities of thermal acoustic insulation materials.

Coincidentally, in September 2000, the FAA issued an NPRM proposing that the RPT be adopted as the new certification standard for thermal acoustic insulation materials. The NPRM states that "The tests conducted by the FAA to qualify this standard indicate that some of the materials currently used will pass the new standard." The implication, supported by both the FAA's development work and rulemaking initiatives, is that some materials will not pass the new standard. It is the risks associated with these materials that Recommendation A03-01 is meant to address. If, as TC suggests, ease of ignition from a small ignition source (for example, electrical arc or spark) is on the "critical path" that defines a material as unsafe, and since there is no requirement to perform a separate electrical arc testing on thermal acoustic insulation materials, then it must be concluded that the FAA's RPT incorporates the required elements of the electrical arc testing. If this is not the case, the RPT may not be capable of identifying the next material that would exhibit the same unacceptable flammability characteristics as MPET.

After almost three years of deliberations with the aviation industry, the final rule, adopting the RPT, was issued 31 July 2003. The rule requires that, after 02 September 2005, only those thermal acoustic insulation materials that have passed the RPT will be fit for use in either the manufacture or repair of aircraft. Recommendation A03-01 highlights the remaining unmitigated risk in that before 02 September 2005, materials that have failed the RPT can and are being used in the manufacture and repair of aircraft.

TC's response does not address the need to quantify and mitigate this risk. No action has been taken or proposed that will reduce or eliminate the deficiency.

Therefore, the response is assessed as being **Unsatisfactory**.

Transport Canada's response to Recommendation A03-01 (April 2004)

In response to discussions with the TSB, TC provided the following comments:

- Although TC agrees with the intent of the recommendation, in that action needs to be taken to address unsafe materials, it does not agree that those materials that have failed the RPT are in fact unsafe materials, specifically because some of the materials did pass a range of other flammability tests and have performed satisfactorily in service.
- TC agrees that the FAA has identified materials that do not meet the RPT criteria; however, TC contends that the FAA testing was not meant to quantify the performance of existing materials tested.
- TC states that MPET, the only material to be deemed unsafe, "exhibited a propensity to both be ignited from a small ignition source and propagate flames," while other materials are more difficult to ignite and therefore present a lower level of risk.
- TC states that it has developed proposed regulations to implement the RPT on new transport category type designs and future production of existing designs.
- TC states that it intends to work with its "partner" CAAs to identify unsafe materials and will raise this "issue" at the FAA's International Aircraft Materials Fire Test Working Group.

TSB reassessment of Transport Canada's response to Recommendation A03-01 (June 2004)

Recommendation A03-01 calls for regulatory authorities to quantify and mitigate the risks associated with those thermal acoustic insulation materials that have failed the RPT. TC states that it agrees with the intent of the recommendation, which it interprets as requiring that action be taken to mitigate the presence of any and all unsafe materials in aircraft manufacture and repair.

As they pertain to Recommendation A03-01, TC's letters reiterate the expected impact of the recently adopted regulatory changes, which require that all thermal acoustic insulation materials be subjected to the RPT after 02 September 2005. TC acknowledges that, while some thermal acoustic insulation materials currently in use are known to have failed the RPT, TC remains convinced that some of these materials have passed other flammability tests and have performed satisfactorily in service. TC is relying on Airworthiness Directives that require replacement of

MPET-covered materials, on RPT testing of material for all newly produced aircraft and replacement material used on in-service aircraft, and the identification of materials that demonstrate unsatisfactory in-service performance to mitigate any residual risks. As an example, TC indicates that action by regulators is presently concentrated on a plain Mylar (AN 26), which has demonstrated undesirable flammability characteristics in testing.

Although TC's letters indicate that it is taking action on many aspects of other TSB recommendations associated with in-flight fires, TC will not specifically target materials that have failed the RPT. TC has not provided information that it would identify the materials that failed the RPT. Furthermore, TC has not indicated an intent to determine the extent to which such materials are used in Canadian-registered aircraft. Consequently, no action has been taken or proposed that will reduce or eliminate the deficiency.

The response to TSB Recommendation A03-01 continues to be assessed as being **Unsatisfactory**.

Transport Canada's response to Recommendation A03-01 (December 2005)

In its update of active recommendations dated 14 December 2005, TC indicated that an update to Recommendation A03-01 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 Transport Canada's response to Recommendation A03-01 (July 2006)

As of June 2006, neither the FAA nor TC has undertaken a review to address the deficiency identified in Recommendation A03-01. On 04 April 2005, the FAA identified an in-service insulation blanket cover material that does not meet the new flammability standards (NPRM FAA-2005-20836 refers). It is estimated that this material could exist in as many as 84 Canadian-registered aircraft. TC's letter to the TSB dated 14 December 2005 did not include an update with respect to Recommendation A03-01 but indicated that an update was forthcoming.

Notwithstanding, TC's action will not reduce or eliminate the deficiency; therefore, the assessment remains at **Unsatisfactory**.

Transport Canada's response to Recommendation A03-01 (February 2007)

TC's response reviews previously known regulatory action. The response also states that the FAA has identified one additional high-risk material (AN-26) that fails the RPT. TC states that this insulation material is installed on a significant number of Boeing products operating in Canada and that the FAA has issued a notice of proposed rulemaking calling for its removal and replacement. TC also reports that the industry may be developing an alternate means of compliance to this rulemaking, which proposes to minimize the flammability risk by an in situ application of a flame retardant.

TSB reassessment of Transport Canada's response to Recommendation A03-01 (July 2007)

TC's response does not provide any new information that would suggest that TC, or any other regulator, is actively developing strategies to address the deficiency identified in Recommendation A03-01. In fact, as illustrated by the FAA's AN-26 rulemaking initiative, the

response reveals that both the FAA and TC will rely on in-service flammability performance of individual thermal acoustic insulation material to prompt action rather than initiating a proactive approach as suggested in Recommendation A03-01.

TC's action will not reduce or eliminate the deficiency; therefore, the assessment remains at **Unsatisfactory**.

Transport Canada's response to Recommendation A03-01 (March 2008)

TC's response reviews previously known FAA and TC regulatory action. In addition, TC states that the FAA, by testing in-service thermal acoustic insulation materials, has identified one additional exceptionally high-risk material that failed the RPT. The FAA compared the results of the AN-26 testing with other material test results. As a result, the FAA has taken action to eliminate AN-26 as well as other material if the product cannot be identified.

TC considers this recommendation closed because:

- TC has completed the task and has communicated to the Board in response to the recommendation.
- Appropriate mitigation is in place for the unacceptable risks identified.
- Any further changes in this area will take place as a result of international regulation harmonization.

TSB reassessment of Transport Canada's response to Recommendation A03-01 (August 2008)

TC's response repeats its position that testing to quantify and mitigate the risks associated with insulation materials that have failed the RPT will only be carried out on those materials that exhibit poor in-service performance.

TC's action will not reduce or eliminate the deficiency.

Therefore, the assessment remains at **Unsatisfactory**.

Review of Recommendation A03-01 deficiency file status (September 2009)

In its latest position statement with respect to the deficiency identified in Recommendation A03-01 TC states that, although its solution is dependant upon future knowledge and capabilities development, it considers the recommendation closed based on regulatory initiatives completed with respect to TSB Recommendations A99-07 and A99-08.

Therefore, the assessment remains at **Unsatisfactory**.

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

Review of Recommendation A03-01 deficiency file status (May 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 A03-01 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 **Unsatisfactory**.

Consequently, the status of Recommendation A03-01 is changed to **Active**.

Transport Canada's response to Recommendation A03-01 (May 2019)

TC agrees in principle with the recommendation.

Following the Swissair Flight 111 accident, there was a campaign to replace the thermal acoustic insulation materials through Airworthiness Directives (ADs) that was substantively completed by all countries in an effort to remove metalized Mylar thermal acoustic insulation in aircraft.

A new Advisory Circular for new certification of thermal acoustic insulation material was provided in Advisory Circular (AC) 25.856-I, dated 7/20/2005 "Thermal/Acoustic Insulation Flame Propagation Test Method Details" and in AC 25.856-2A, "Installation of Thermal/Acoustic Insulation for Burn through Protection" dated 7/28/2008. With the new ACs, the method of testing thermal acoustic insulation material has improved airplane fire safety.

TC believes reasonable actions have been taken to address the risks associated with this safety deficiency and has no additional information to provide on this recommendation at this time.

TSB reassessment of Transport Canada's response to Recommendation A03-01 (March 2020)

In its response, Transport Canada (TC) indicated that it agrees in principle with Recommendation A03-01.

Metallized polyethylene terephthalate (MPET) and metallized Mylar (AN-26) thermal acoustic insulation materials, were identified by the U.S. Federal Aviation Administration (FAA), as high-risk materials that failed the Radiant Panel Test (RPT).

To date, a number of actions have been taken by TC and other regulatory authorities that address the safety deficiency identified in Recommendation A03-01, regarding the mitigation of the risks associated with in service thermal acoustic insulation materials that have failed the RPT. These include 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 A03-01. 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 A03-01 has been substantially reduced.

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

Next TSB action

This deficiency file is **Closed**.