Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A03-04

In-flight entertainment network - Supplemental type certificate process

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 A03-04 (March 2003)

Based on its investigation into the circumstances of Swissair's in-flight entertainment network (IFEN) MD-11 modification and other entertainment system designs, the TSB believes that, as currently written, United States Federal Aviation Regulation (FAR) 25.1309 can be interpreted to allow Supplemental Type Certificate (STC) approval of system-to-aircraft integration designs that are not compliant with the original type certification.

Therefore, the TSB recommended that:

> Regulatory authorities require that every system installed through the STC process undergo a level of quantitative analysis to ensure that it is properly integrated with aircraft type-certified procedures, such as emergency load-shedding.
>
> **TSB Recommendation A03-04**

Transport Canada's response to Recommendation A03-04 (June 2003)

In its 16 June 2003 response to Recommendation A03-04, Transport Canada (TC) provided the following comments:

- TC does not agree that a quantitative assessment is always required for every system installed through the STC process;
- TC states that the regulatory requirements are in place to deal with the approval of STCs;
- TC states that it will develop advisory material to emphasize the need to verify that system integration requirements are adequately addressed during the STC process;

- TC states that it will initiate awareness training on this issue for industry delegates and TC certification engineers, focussing on "non-essential, non-required" systems; and
- TC states that it will continue its harmonization efforts related to FAR 25.1309.

TSB assessment of Transport Canada's response to Recommendation A03-04 (October 2003)

TC's response suggests that aspects of Recommendation A03-04, such as the intention of the phrase "a level of quantitative analysis," may not have been fully understood. Although TC disagrees with the premise of Recommendation A03-04, it nevertheless plans to expend resources to develop improved advisory material and initiate awareness training to ensure that STC installations are properly integrated. While these proposed initiatives may have some short-term positive impact, the systemic deficiency raised in Recommendation A03-04 will remain.

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

Transport Canada's response to Recommendation A03-04 (April 2004)

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

- TC does not agree that a quantitative assessment is always required for every system installed through the STC process;
- TC states that Canadian regulatory requirements (Canadian Aviation Regulation [CAR] 525.1309) in place adequately deal with the approval of STCs;
- TC states that it will develop advisory material to emphasize the need to verify that system integration requirements are adequately addressed during the STC process;
- TC states that it will initiate awareness training on this issue for industry delegates and TC certification engineers, focussing on "non-essential, non-required" systems; and
- TC states that it will continue its harmonization efforts related to FAR 25.1309.

TSB reassessment of Transport Canada's response to Recommendation A03-04 (July 2004)

As it pertains to Recommendation A03-04, TC's letters state that, if interpreted properly, CAR 525.1309 is sufficient to preclude the approval of systems that degrade the level of safety achieved at the initial type certification. TC's recent 07 April 2004 letter also describes the differences between how TC implements the provisions of CAR 525.1309 and the FAA's management of FAR 25.1309. Although the two regulations are essentially the same, it appears that TC has taken a more hands-on management approach to aircraft certification standards for the approval of STC system-to-aircraft integration designs. For example, TC differentiates between the level of scrutiny required for "non-required" avionics equipment installed in the cockpit or interfacing with "required" certified aircraft systems and cabin equipment installed for the convenience of the occupants. In the case of the former, depending on the complexity of the interface, a quantitative analysis may be required to ensure that the STC is properly integrated.

TC also explained that its approach to the management and administration of its ministerial delegations emphasizes the standards associated with CAR 525.1309 to the delegates

responsible for ensuring compliance with the requirements as defined in the basis of certification.

TC's current position is that the risk articulated in Recommendation A03-04 can be dealt with by a proactive approach to managing the STC process and a change in the regulations. While these initiatives may reduce the deficiency, the fact that TC will continue to allow a qualitative analysis in some cases implies that a level of undefended risk will remain.

Therefore, the response to TSB Recommendation A03-04 is assigned as **Satisfactory in Part**.

Transport Canada's response to Recommendation A03-04 (December 2005)

Although this remains an active recommendation, Recommendation A03-04, due to an administrative error, was not part of the list of active recommendations sent by the TSB to TC on 01 September 2005. Consequently, an updated response to this recommendation was not in TC's update on 14 December 2005.

TSB reassessment of Transport Canada's response to Recommendation A03-04 (August 2006)

TC's planned action or the action taken will reduce but not substantially reduce or eliminate the deficiency.

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

Transport Canada's response to Recommendation A03-04 (February 2007)

Although included in TSB's request for activity update dated 03 October 2006, TC's response dated 07 February 2007 did not contain an update with respect to this active recommendation.

TSB reassessment of Transport Canada's response to Recommendation A03-04 (July 2007)

It is the Board's understanding that TC remains committed to providing an update to its original action plan, which, if fully implemented, will substantially reduce or eliminate the deficiencies as described in Recommendation A03-04.

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

Transport Canada's response to Recommendation A03-04 (March 2008)

TC's responses dated 06 and 11 March 2008 did not contain an update with respect to Recommendation A03-04.

TSB reassessment of Transport Canada's response to Recommendation A03-04 (August 2008)

Because TC has not indicated otherwise, the Board believes that TC remains committed to providing an update to its original action plan. Although the initiatives contained in the action plan may reduce the deficiency, the fact that TC will continue to allow a qualitative analysis in some cases implies that a level of undefended risk will remain. The planned action will reduce

but not substantially reduce or eliminate the deficiencies as described in Recommendation A03-04.

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

Review of Recommendation A03-04 deficiency file status (September 2009)

In its latest position statement with respect to the deficiency identified in Recommendation A03-04 TC declares that although its solution is heavily dependant on recurrent training, based on regulatory initiatives completed and in progress, it considers the recommendation closed.

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

The Board also concludes that, as no further action is planned by TC to address any residual risk, continued reassessment will not likely yield further results.

Review of Recommendation A03-04 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 A03-04 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 A03-04 is changed to **Active**.

Transport Canada's response to Recommendation A03-04 (May 2019)

TC agrees in principle with the recommendation.

The regulatory requirements in place require a systematic and comprehensive assessment for the approval of STCs, including those for stand-alone installations or those that may involve integration with the basic aircraft systems. This structured and qualitative approach includes design and installation evaluation and may also include Failure Mode and Effects Analysis and/or Fault Tree Analysis. This is required to verify that the level of safety of the original aircraft design is not degraded by the modifications and that there is no hazard introduced by the STC.

TC's approach to integrating STC's has resulted in a previous assessment of the response to this recommendation by the Board as being Satisfactory in Part. The TSB has recognized that the risk associated with the safety deficiency has been reduced, but maintains that the fact that TC will allow a qualitative analysis in some cases implies that some risk remains.

TC has maintained, since this recommendation was issued, that a quantitative analysis is not required for every system installed through the STC process. This recommendation has been assigned a "Dormant" status since 2009.

No additional work is planned in this area.

TSB reassessment of Transport Canada's response to Recommendation A03-04 (March 2020)

In its response, Transport Canada (TC) indicated that it agrees in principle with Recommendation A03-04, and explained the assessment process for the approval of Supplemental Type Certificates (STCs).

TC has not provided any new details with respect to actions taken since its original response in 2003.

When the recommendation was originally issued, the TSB believed that, as written at the time, U.S. *Federal Aviation Regulation* (FAR) 25.1309 could be interpreted to allow STC approval of system-to-aircraft integration designs that are not compliant with the original type certification. Specifically, air transportation safety investigation A98H0003 had identified a deficiency that allowed the in-flight entertainment network (IFEN) STC system-to-aircraft integration design to be approved without confirmation that it was compliant with the aircraft's original type certificate.

Since the recommendation has been issued, TC has published many advisory circulars (ACs) regarding STCs and type designs. The following is a list of publications to date:

- AC 500-16, *Establishing the Certification Basis of Changed Aeronautical Products* (December 2004);
- AC 500-022, *In-Flight Entertainment Systems* (November 2006);
- AC 521-002, *Type Certification Requirements of Aircraft, Engines and Propellers* (October 2011);
- AC 521-004, *Changes to the Type Design of an Aeronautical Product* (March 2012);
- AC 521-005, *Supplemental Type Certificates* (March 2012).

The U.S. Federal Aviation Administration (FAA) has also published documentation on the certification basis of changed aeronautical products.

Recommendation A03-04 highlights the necessity of proper integration with aircraft type-certified procedures, specifically emergency load-shedding, when installing a system with an STC. AC 500-022, *In-Flight Entertainment Systems*, was issued to provide guidance regarding design and installation assessments with respect to STC applications for in-flight entertainment (IFE) systems to ensure that the modified aircraft continues to meet its certification basis. This AC also clarified that IFE system installations are to receive power from busses that do not supply systems required for safe flight and landing, and that a means to remove the power to the IFE system is required.

TC has maintained, since the recommendation was issued, that it does not agree that a quantitative assessement is required for every system installed through the STC process.

By allowing a qualitative analysis, this implies that in some cases, a level of undefended risk could remain. However, with the steps taken by TC with the STC approval process, as well as the advisory material published on this topic, the Board believes that the actions taken have reduced the risk associated with the safety deficiency identified in Recommendation A03-04 sufficiently that it can now be closed.

Therefore, the response to Recommendation A03-04 is assessed to be **Satisfactory in Part**.

Next TSB action

This deficiency file is **Closed**.