



## Reassessment of the response to TSB Recommendation A07-06

### Runway end safety area (RESA) requirements

#### Background

On 02 August 2005, the Air France Airbus A340-313 aircraft (registration F-GLZQ, serial number 0289) departed Paris, France, at 1153 Coordinated Universal Time (UTC) as Air France Flight 358 on a scheduled flight to Toronto, Ontario, with 297 passengers and 12 crew members on board. Before departure, the flight crew members obtained their arrival weather forecast, which included the possibility of thunderstorms. On final approach, they were advised that the crew of an aircraft landing ahead of them had reported poor braking action, and Air France Flight 358's aircraft weather radar was displaying heavy precipitation encroaching on the runway from the northwest. At about 200 feet above the runway threshold, while on the instrument landing system approach to Runway 24L with autopilot and autothrust disconnected, the aircraft deviated above the glideslope and the groundspeed began to increase. The aircraft crossed the runway threshold about 40 feet above the glideslope.

During the flare, the aircraft travelled through an area of heavy rain, and visual contact with the runway environment was significantly reduced (UC). The aircraft touched down about 3800 feet down the 9000-foot runway (UA); it was not able to stop on the runway and departed the far end at a groundspeed of about 80 knots. The aircraft stopped in a ravine at 2002 UTC (1602 eastern daylight time) and caught fire. All passengers and crew members were able to evacuate the aircraft before the fire reached the escape routes. A total of 2 crew members and 10 passengers were seriously injured during the crash and the ensuing evacuation.

The Board concluded its investigation and released report A05H0002 on 12 December 2007.

#### TSB Recommendation A07-06 (December 2007)

The aircraft departed the end of the runway at about 80 knots, and traveled over a distance of just over 300 m before coming to rest in the Etobicoke ravine. The overrun area for Runway 24L was compliant with Transport Canada's (TC) current document TP 312E, *Aerodrome Standards and Recommended Practices*, in that it was designed with a strip 60 m beyond the end of the runway, free of non-frangible obstacles and graded in order to reduce the risk of damage to aircraft during an overrun situation. However, it did not meet the present International Civil Aviation Organization (ICAO) standard of 150 m from the end of the runway.

It must also be noted that the 1999 ICAO revision incorporated a recommended practice of a runway end safety area (RESA) length of 780 feet (240 m).

Although there is no RESA required or published for Runway 24L, no non-frangible objects existed along the path followed by the occurrence aircraft until a distance 150 m from the end of the runway. This established a de facto RESA that exceeded the standard currently stipulated in TP 312E by 90 m. Regardless, the investigation established that the terrain beyond this point largely contributed to the damage incurred by the aircraft and the injuries to the crew and passengers.

There exist other Code 4 runways in Canada for which similar conditions exist. Such runways, while compliant with TP 312E, include hostile terrain beyond the 60 m overrun area required by the standard. The Board believes that all such runways could benefit from a RESA built in accordance with the ICAO Annex 14 recommended practice or the Federal Aviation Administration's (FAA) runway safety area (RSA) standard. This safety action would remove all non-frangible objects and create a surface graded so as to reduce the risk of damage to an aircraft up to a distance 300 m beyond the end of the runway.

The Board is aware that requiring a 300 m RESA may affect many existing Code 4 runways that are located where natural obstacles, local development, and/or environmental constraints make the construction of a RESA of this length impracticable. In such cases, the Board believes that there exists a requirement for an alternate means of compliance, such as the use of an engineered material arresting system to provide a level of safety that is equivalent to a 300 m RESA.

Therefore, the Board recommended that

the Department of Transport require all Code 4 runways to have a 300 m runway end safety area (RESA) or a means of stopping aircraft that provides an equivalent level of safety.

#### **TSB Recommendation A07-06**

#### **Transport Canada's response to Recommendation A07-06 (February 2008)**

In its response to this recommendation, TC states that, it is currently working with industry experts to review airport certification standards.

The review of TP312, *Aerodrome Standards and Recommended Practices*, has resulted in a recommendation to harmonize the Canadian standards with the current RESA standards beyond the runway strip end contained in Annex 14 - Aerodromes of ICAO. The result of this review will be subject to the Canadian Aviation Regulation Advisory Council (CARAC) regulatory consultation process.

### **TSB assessment of Transport Canada's response to Recommendation A07-06 (September 2008)**

In its response, TC does not address the specific content of the recommendation, namely to: "require all Code 4 runways to have a 300 m runway end safety area (RESA) or a means of stopping aircraft that provides an equivalent level of safety". Rather, it proposes to harmonize TP 312 with the ICAO Annex 14 RESA standard, which only requires a RESA 150 m in length. Furthermore, where construction of a RESA of any length is impracticable, TC's response is silent.

Therefore, TC's response to Recommendation A07-06 is assessed as **Unsatisfactory**.

### **Transport Canada's updated response to Recommendation A07-06 (April 2009)**

In its updated response, TC acknowledges that the RESA requirement specified in Recommendation A07-06 is for a total of 300 m, which consists of a runway strip of 60 m at the end of runways plus 240 m of RESA measured from the strip end and that current TP 312E, Aerodrome Standards and Recommended Practices, only call for a requirement for a runway strip of 60 m at the end of all Code 3 and 4 instrument runways.

TC restates that regulatory amendments through CARAC activity are in development to harmonize with the current ICAO standard for a 90 m RESA measured from the strip end of Code 3 and 4 runways. At the end of the CARAC process, Canada will therefore have a total RESA requirement of 150 m (that is, 60 m plus 90 m). TC further states that provision to permit the use of systems such as engineered material arrestor systems will be included in the amended Canadian standard. Stakeholder information sessions on the draft standards are planned for late 2009 followed by formal consultation through the CARAC process. The estimated date of completion is 2011.

Additionally, TC comments that ICAO is actively studying the possibility of increasing the total RESA requirement from 150 m to 300 m, and Canada is fully participating in these discussions.

### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (May 2009)**

The Board is pleased to note that a provision to permit the use of systems such as engineered material arrestor systems will be included in the new Canadian standard. However, TC's recent update to its initial response outlines an action plan that is not sufficiently advanced to reduce the risks to transportation safety as described in Recommendation A07-06.

Firstly, the Board is concerned that, although TC is aware that the FAA requires a 300 m (1000 feet) runway safety area (RSA) as a standard and acknowledges that a 300 m RESA is being considered as the ICAO standard, this latest response describes a CARAC proposal that would merely meet the present ICAO standard of 150 m. The Board is disappointed that TC chooses to harmonize with the present ICAO standard instead of aggressively working to harmonize with the FAA's 300 m RSA requirement.

Secondly, it is well known that the regulatory change process can be prolonged. The Board is convinced that TC's present plan, to incrementally increase the RESA requirements from 60 m to 150 m, will unnecessarily lengthen the time taken to implement a known safety enhancement.

Finally, this TC response does not clearly specify whether the CARAC activity will result in a regulatory change that would require all existing Code 4 runways to be retrofitted as opposed to only newly built Code 4 runways being required to meet the amended standard. A response to this query states that: "no grandfather clause is being contemplated, and the RESA requirement will apply to all existing and future runways. The CARAC process will determine what the coming into force date of any new RESA requirement will be, which will, of course, be more problematic for existing runways than for future runways."

Because TC's planned action will reduce, but will not substantially reduce or eliminate, the deficiency raised in Board Recommendation A07-06, the response is assessed as **Satisfactory in Part**.

#### **Transport Canada's response to Recommendation A07-06 (February 2010)**

TC's latest update in response to Recommendation A07-06 repeats its intention to harmonize with the Standards of ICAO Annex 14, which require a RESA of 150m in length. Additionally, Notice of Proposed Amendment development and industry consultation via the CARAC process is planned for 2010. TC also states that TP 312 is undergoing a legal review with the goal of dismantling it and incorporating its rules of conduct as part of existing regulations, standards, and advisory material.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (July 2010)**

The issue of landing accidents and runway overruns is on the Board's Watchlist. TC's latest update repeats its stated intention to harmonize RESA requirements with the existing ICAO standard of 150 m and not with ICAO's Recommended Practice of 300 m. The fact that TC's planned action goes only part-way to resolve this safety issue, coupled with the lengthy rulemaking process, means the safety deficiency remains at many Canadian airports. The Board believes that any necessary legal review of TP 312 should not lengthen the time taken to implement a required safety enhancement.

Because TC's planned action will reduce, but will not substantially reduce or eliminate, the deficiency raised in Board Recommendation A07-06, the response is assessed as **Satisfactory in Part**.

#### **Transport Canada's response to Recommendation A07-06 (January 2011)**

Transport Canada has drafted proposed regulatory amendments that meet ICAO's requirement to have a RESA of 150m in length. The proposed amendments were presented at a November 2010 CARAC meeting. Members have since submitted their comments and concerns to the CARAC Secretariat. Comments that included analysis of data for the past 20 years were

presented to the CARC in January 2011. It was determined by CARC that TC has sufficient information to make a safety case to move forward with the NPA requiring a 150 M RESA. The data does not support an extension of the RESA to 300M. The next step is to conduct an impact assessment, which would include a cost-benefit analysis.

Additionally, TC intends to arrange a meeting with TSB to brief on its data analysis related to the RESA issue.

### **Transport Canada's response to Recommendation A07-06 (April 2011)**

As part of its action plan to address the TSB Watchlist on Landing Accidents and Runway Overruns, TC has committed to conducting a risk assessment to determine the safety benefits of requiring a 150 m and a 300 m RESA. This assessment is being done in phases.

TC has reviewed/analyzed cost benefit information recently obtained from domestic airports with respect to a RESA of 150 m. The cost benefit analysis supports a RESA of 150 m. TC will now conduct a risk assessment to determine the safety effectiveness of requiring a 300 m RESA versus a 150 m RESA. This risk assessment will involve conducting an aggregate risk assessment of runway ends.

In order to ensure harmonization with the TP 312 5th Edition Project and with the regulatory changes tabled at the CARAC, this risk assessment will focus on those runways with lengths of 1200 m or greater or with lengths less than 1200 m where the runway is certified as precision or non-precision. Approval of the Terms of Reference for the risk assessment team, nomination of the team members and commencement of the risk assessment itself will occur in June 2011.

In light of the analysis above, TC has drafted proposed regulatory amendments that meet the ICAO's requirement to have a RESA of 150 m. Where the site lacks suitable land area to comply with the RESA specifications, the provision of an Engineered Material Arresting System or an adjustment to the declared distances were also introduced as acceptable alternatives.

The proposed amendments were presented and consulted at a CARAC meeting held from 15 to 17 November 2010. TC received many comments from stakeholders as a result of this consultation. In light of these comments, an analysis of data for the past 20 years was subsequently conducted on RESA events.

The comments received and the data analyses were presented to the CARC on 12 January 2011. At its subsequent meeting on 23 March 2011, the CARC determined that TC now has sufficient information to make a safety case, supported by a cost benefit analysis, to move forward with regulatory changes requiring a 150 m RESA.

The NPA originally submitted in November 2010, will be modified to accommodate the concerns of stakeholders where it is feasible to do so. Pending the results of the risk assessment of a 300 m RESA, the revised NPA will be tabled for consideration at the September 2011 CARAC meeting.

A regulatory review of the airport standards document, TP 312, 4th Edition has been underway for several years now. This review proposes a complete departure from the existing establishment of runway codes, which focuses on safety standards based on the amount of runway that exists (i.e., a code 4 runway has to be capable of supporting large aircraft operations even though only small aircraft operate from it). The proposed 5th Edition instead focuses on the establishment of safety standards based on the operational usage of the runway (e.g. a runway supporting Transport Category aircraft operations will be required to meet a higher standard than one supporting single engine traffic operations). This methodology has been well received by Canadian stakeholders and is also receiving favourable international attention.

As well, the proposed 5th Edition contains provisions for additional visual aids that could assist pilots in their assessment of landing distance remaining, which will aid considerably in the prevention of runway overruns.

Due to the magnitude of the review and other commitments, it is anticipated that the document will now be ready for industry consultation in 2012/2013. The timeframe has been adjusted to incorporate further amendments that may be required as a result of the risk assessment.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (May 2011)**

The critical safety issue of landing accidents and runway overruns remains on the Board's Watchlist.

TC's initiative to date is based on its preliminary analysis that reveals approximately 90% of all overruns end with the aircraft coming to rest within 150 m of the runway end. In its view, TC's decision to move toward compliance with ICAO's existing 150 m standard would mitigate the majority of future occurrences. Therefore, a new Canadian Aviation Regulation is proposed that would require certain runways to have a RESA of 90 m in addition to the current Canadian requirement of a 60 m strip beyond the runway end. Additionally, where the site lacks land area to comply with the new RESA specifications, TC's NPA allows for a means of stopping aircraft that provides an equivalent level of safety, as contained in Recommendation A07-06, or an adjustment to the declared distance.

The new edition of TP 312 is expected to replace the existing coding system for runways based on length with a focus on operational usage. This change in approach will group runways 1200 m or greater with those less than 1200 m if the runway is certified as precision or non-precision. The regulatory changes to expand the RESA will likely be couched to reflect this re-categorization.

In the spring of 2010, TC committed to individual risk assessments for each of the Code 4 runways in Canada within a year; this has the potential to address the safety deficiency identified by the TSB, leading to Recommendation A07-06. TC now proposes to conduct a risk assessment and cost-benefit analysis to determine the safety effectiveness of requiring a 300 m RESA. This approach will involve conducting an **aggregate** risk assessment, rather than an

assessment of individual runway ends. Pending the results of this risk assessment, and consideration of concerns of stakeholders, a revised NPA will be tabled at the September 2011 CARAC meeting.

The Board is encouraged that TC plans to comply with the current 150 m international standard. However, the Board is disappointed that TC has not committed to implement the internationally recommended 300 m RESA which has been adopted by other countries, notably the United States. Furthermore, the Board is also concerned that TC has not followed through on its previously stated plan to assess the individual risk at Code 4 runways and require that, where there is an unacceptable risk, it be managed on a case by case basis. TC's proposal to conduct an aggregate risk assessment may not identify or effectively mitigate risks due to hostile terrain beyond the planned 150 m RESA at some Canadian airports.

Given the limited progress since the Board's last assessment, TC's proposal to require only the current international standard of 150 m rather than the recommended RESA of 300 m, and TC's plan to conduct an aggregate risk assessment (in lieu of site specific assessments), the Board has assessed TC's response as **Satisfactory in Part**.

#### **Transport Canada's response to Recommendation A07-06 (May and September 2011)**

##### **May 2011 Input**

TCCA has reviewed/analyzed cost benefit information recently obtained from domestic airports with respect to Runway End Safety Area (RESA) of 150 m. The cost benefit analysis supports a RESA of 150 m. TCCA will now conduct a risk assessment to determine the safety benefits of requiring a 300 m RESA vice a 150 m RESA.

The Notice of Proposed Amendment (NPA) originally submitted in November 2010, will be modified to accommodate the concerns of stakeholders where it is feasible to do so. Pending the results of the risk assessment of a 300 m RESA, the revised NPA will be tabled for consideration at the September 2011, CARAC meeting.

Additional details and information relating to this recommendation may be found in a letter to the TSB Board Dated May 02, 2011 RDIMS # 6680356

##### **September 2011 update**

NPA 2010-012 on RESA will be presented at the Sept. 2011 CARAC Technical Committee meeting.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2012)**

TC's latest update states that a revised version of NPA 2010-012, originally scheduled for CARAC review in November 2010, was to be deferred until the September 2011 CARAC Technical Committee Meeting in order to address stakeholders' concerns.

Additionally, the response does not update TSB on the status of its 300 m RESA risk assessment initiative announced in May of 2011. As TC has previously stated “*Pending the results of the risk assessment of a 300 m RESA, the revised NPA will be tabled for consideration at the September 2011, CARAC meeting.*” it may be assumed that its 300 m RESA risk assessment was completed prior to submission of the revised version of NPA 2010-012 to the September 2011 CARAC Technical Committee Meeting

While TC has not shared the details of either its 300 m RESA risk assessment or the stakeholders’ concerns, a review of the revised version of NPA 2010-012, obtained from TC’s NPA webpage, reveals that the RESA minimum length requirement remains at 150 m.

Noteworthy revisions are as follows:

- Section 302.551 would now require a 150 m RESA for a runway greater than 1200 m or less than 1200 m and the runway type is non-precision or precision; and that is utilized by scheduled passenger-carrying operations of an air carrier operating aircraft designed for more than 9 passenger seats as determined by the aircraft type certificate; and
- Section 302.552 is included and states, “This part does not apply to airports located north of the 60th degree parallel that only serve air carrier operations utilizing small aircraft.”<sup>1</sup>

The lack of information about TC’s 300 m RESA risk assessment is disappointing. Additionally, as the September 2011 CARAC Technical Committee Meeting decision record has yet to be promulgated, it is not known whether or not the revised version of NPA 2010-012 was approved.

While revised NPA 2010-012 appears to be progressing through the CARAC process, if fully implemented, it will reduce but not eliminate the deficiency as described in Recommendation A07-06.

The response is considered **Satisfactory in Part**.

#### **Transport Canada’s response to Recommendation A07-06 (December 2012)**

Transport Canada is planning a modified approach to RESA by collaborating with industry stakeholders to undertake a risk assessment in fiscal year 2013-2014 to determine the applicability criteria for RESA at Canadian airports.

The initial objective of the risk assessment (300 m vs 150 m) has been amended to identify how long and where a RESA should be applied from a safety and financial (cost benefit) perspective.

Advisory circulars concerning RESA construction maintenance; runway arresting systems (EMAS) will be issued by the end of 2012.

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<sup>1</sup> Canadian Aviation Regulations defines a “small aircraft” as an aeroplane having a maximum permissible take-off weight of 5700 kg (12 566 pounds) or less, or a helicopter having a maximum permissible take-off weight of 2730 kg (6 018 pounds) or less.



### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2013)**

The TSB flagged this issue in 2007. In 2010 and again in 2012, the issue of landing accidents and runway overruns was included on the TSB Watchlist as one of the highest transportation risks facing Canadians.

TC states that in FY 2013-2014 it plans a risk assessment to establish RESA criteria at Canadian airports. The stated objective for this risk assessment is to collaborate with industry to establish a RESA length on a case-by-case basis. Other than the broad criteria of safety and cost, no details are provided as to how a RESA length would be established for code 4 runways as stated in Recommendation A07-06. Presumably the results of this risk assessment would affect the current version of NPA 2010-012, which is currently deferred as a result of the CARC meeting dated 12 January 2011.

This change in approach will result in further delays and a protracted period of time in which Canada is not in compliance with international standards.

As the proposed risk assessment may address RESA requirements for Code 4 runways, if fully implemented, it will reduce but not eliminate the deficiency as described in Recommendation A07-06.

The response is considered **Satisfactory in Part**.

### **Transport Canada's response to Recommendation A07-06 (November 2013)**

The contract for an independent risk assessment is out for tender and is expected to be awarded in 2013. The independent risk assessment will help identify which airports and which runways will be required to have a 150m RESA.

Advisory Circulars concerning RESA Construction Maintenance and Runway Arresting Systems have been issued. (AC 300-007 EMAS and AC 305-015 Runway End Safety Area Bearing Strength Requirements)

### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (April 2014)**

Since its last update, TC has launched several initiatives related to RESA.

Early in the 2<sup>nd</sup> quarter of 2013 TC issued 2 RESA-related Advisory Circulars (AC 300-007 *EMAS* and AC 302-015 *Runway End Safety Area Bearing Strength Requirements*). A consequence of TC's NPA 2010-012 activities, the intention of this guidance material is to assist airport operators with the planning, design, establishment and maintenance of RESAs at Canadian aerodromes in anticipation of regulatory change to RESA requirements.

To better define Canada's RESA needs, on 5 July 2013, TC issued a Request for Proposal (T8080-120164) entitled *Risk Assessment for Runway End Safety Area at Canadian Airports*. The purpose of this work is to conduct an independent risk assessment on the implementation of the current ICAO RESA standard (90 m beyond runway strip end of 60 m) in Canada. The scope of work for this risk assessment makes no mention of a 300 m RESA for Code 4 runways as described in Recommendation A07-06. Rather it is limited to the following:

Provide recommendations that establish and define the criteria to determine where the international standard (150m RESA) should apply at Canadian airports.

TC states in the request for proposal that it intends to use the results of this independent risk assessment to establish the application criteria for a RESA in Canada. In accordance with the terms of the request for proposal, a final report should be delivered in the August/September 2014 timeframe.

Concurrently, on 12 December 2013, TC issued a draft TP 312 5<sup>th</sup> edition as part of the CARAC review process. This draft is based on NPA 2010-012 activities and, subject to several conditions, proposes to amend TP 312 RESA requirements to align it with the ICAO standard. For example: an aerodrome operator would only need to provide a RESA where the runway length is:

- (a) 1200 m or greater; or
- (b) less than 1200 m and the runway type is non-precision or precision; and
- (c) the runway is utilized by scheduled passenger-carrying operations of an air carrier operating aircraft designed for more than 9 passenger seats as determined by the aircraft type certificate.

The Board is very concerned that current TC RESA initiatives seem to have abandoned any discussion of a 300 m RESA option for Code 4 runways. Rather it appears that TC's response to Recommendation A07-06 has transitioned from its 2011 position to "...conduct a risk assessment to determine the safety benefits of requiring a 300 m RESA vice a 150 m RESA." through its 2012 approach to "...identify how long and where a RESA should be applied from a safety and financial (cost benefit) perspective. "to its current direction that appears to be focussed solely on implementing the ICAO standard of a 150 m RESA.

Given that the proposed action goes only part-way to addressing the safety deficiency by examining a 150 m RESA in lieu of 300 m, TC's response is considered **Satisfactory in Part**.

#### **Transport Canada's response to Recommendation A07-06 (January 2015)**

Transport Canada agrees with the intent of the recommendation.

The contract for an independent risk assessment was awarded in December 2013, and Transport Canada anticipates receiving the completed Risk Assessment early in 2015. Transport Canada will implement the ICAO Standard at higher risk airports across the country.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2015)**

Transport Canada's update indicates that it will not receive the results of its independent risk assessment entitled *Risk Assessment for Runway End Safety Area at Canadian Airports* (T8080-120164) until early 2015.

The final statement in Transport Canada's update appears to dispel any expectation that the independent risk assessment's final report will contain a discussion about the possibility of 300 m RESAs at Code 4 runways. Rather the response previews that the cornerstone of Transport Canada's action plan, in response to the yet to be released independent risk assessment's final report, is to implement the existing ICAO Standard (150 m RESA) at higher risk airports.

As runway overruns remain part of the TSB's 2014 Watchlist item entitled "Approach and Landing Accidents", Transport Canada's apparent abandonment of any consideration into the safety benefits of 300 m RESA at Code 4 runways is of concern.

Given that Transport Canada's implementation of changes to RESA requirements at Canadian airports is further delayed and such changes are unlikely to include 300 m RESAs at Code 4 runways, Transport Canada's response is assessed as **Unsatisfactory**.

#### **Transport Canada's response to Recommendation A07-06 (November 2015)**

Transport Canada agrees with the intent of the recommendation.

In early 2014, TC commissioned an independent risk assessment (RA) to establish implementation criteria for RESAs across all airport types in Canada. The risk assessment has been completed. On the basis of that RA, TC is in the process of developing options for the implementation of RESA. TC will then undertake a full cost/benefit analysis along with additional stakeholder consultation, before proceeding with drafting an updated Notice of Proposed Amendment (NPA) and revised regulatory language.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2016)**

Transport Canada (TC) has not included any information in its latest update to address TSB's March 2015 concern that TC's independent risk assessment (RA) entitled *Risk Assessment for Runway End Safety Area at Canadian Airports* (T8080-120164) would not include a study of 300 m RESAs on Code 4 runways.

Furthermore, TC's update does not provide any details of the risk assessment's findings merely stating that the RA is complete. Without such particulars it is impossible to assess whether or not TC's stated plan, to implement changes to RESA regulatory requirements, will include options that specifically address the deficiency identified in Recommendation A07-06.

Consequently, as TC implements its plan to develop options, undertakes a cost/benefit analysis, consults with stakeholders, and drafts an NPA, it is still not known whether these efforts will include a discussion about the possibility of 300 m RESAs on Code 4 runways.

Given that Transport Canada's latest update provides no precise information, action plan or timeline to provide for 300 m RESAs on Code 4 runways at Canadian airports, Transport Canada's response is assessed as **Unsatisfactory**.

### **Transport Canada's response to Recommendation A07-06 (January 2017)**

TC agrees in principle with this recommendation. Transport Canada has developed options for the scope of application and the implementation of RESA at Canadian Airports. Public consultation on these options were initiated by NPA 2016-007 on May 12, 2016. Transport Canada is currently assessing the comments received before formalizing the regulatory proposal on RESA. Transport Canada expects to complete the analysis and determine the regulatory scope and timelines by June 2017. Following that decision, a briefing with the Transportation Safety Board will be scheduled to outline scope and timelines.

### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2017)**

TC's update states that it has developed options for the scope of application and implementation of RESA at Canadian airports, and has engaged in public consultation in May 2016, through its NPA 2016-007. TC is currently analysing the responses received, and is expecting to complete the analysis and determine the regulatory scope and timelines by June 2017.

A review of NPA 2016-007 provides some insight into TC's current position with respect to the RESA requirement at Canadian airports. The objective of NPA 2016-007 reads as follows:

The primary objective of these proposed amendments is to increase the safety at Canadian certified airports by introducing a requirement of 150 m RESA based on air traffic volume and a risk-based approach.

In the NPA's analysis section, it is clear that TC has rejected the approach stated in Recommendation A07-06, that Code 4 runways in Canada would benefit from 300 m RESAs. Rather, TC's risk analysis concludes that a 150 m RESA (or a comparable arresting system) on all runways at airports where passenger volumes warrant, is a better approach.

The NPA seeks comments on four application options, which would require 150 m RESAs at an increasing number of affected airports, depending on passenger volume. According to TC, these

options would reduce passenger risk exposure for between 91% and 97% of commercial air travellers in Canada.

While it appears that TC has abandoned any consideration for 300 m RESAs on Code 4 runways, it is not clear by how much its alternative approach, if implemented, would reduce the deficiency raised in Recommendation A07-06.

The Board is very concerned by these ongoing delays and has included runway excursions on its 2016 Watchlist. Runway overrun occurrences continue to happen and the lack of timely action exposes commercial air travellers in Canada to unnecessary risks until these regulatory amendments are in effect.

Therefore, the response to Recommendation A07-06 is assessed as **Satisfactory in Part**.

#### **Transport Canada's response to Recommendation A07-06 (June 2018)**

TC agrees in principle with the recommendation.

TC plans to publish a Notice of Proposed Amendment in the summer of 2018, which will substantially address the risks identified by the TSB.

#### **Update from TC (July 2018)**

- Pre-publication in *Canada Gazette* Part I is now planned for late 2018;
- Publication in *Canada Gazette* Part II in late 2019 / early 2020; and
- Airports would be required to comply by 2022/23.

Airports that meet the 325,000 passengers threshold as of the publication in CGII would be granted with a 24 months delay from publication in CGII to comply with RESA. Should the publication in CGII be delayed, the compliance timeline will be delayed accordingly.

#### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2019)**

To date, Transport Canada (TC) has taken the following actions to address the safety deficiency identified in Recommendation A07-06, regarding the requirement for all Code 4 runways to have a 300 m runway end safety area (RESA) or a means of stopping aircraft that provides an equivalent level of safety:

- In 2013, 2 advisory circulars (AC) were published :
  - AC 300-007 – Engineered Materials Arresting Systems for Aircraft Overruns, and
  - AC 302-015 – Runway End Safety Area Bearing Strength Requirements;
- In 2013, the 5<sup>th</sup> edition of the *Aerodrome Standards and Recommended Practices* (TP 312) was published, aligning Canadian standards with the 150 m RESA International Civil Aviation Organization (ICAO) standards;

- In early 2014, TC commissioned an independent risk assessment (RA) to establish implementation criteria for RESAs across all airport types in Canada. The RA was completed in 2015; and
- Proposed regulatory amendments were planned to be published in the *Canada Gazette*, Part I in the summer of 2018, followed by late 2018. However, at the time of this reassessment, the regulatory amendments had yet to be published.

This recommendation was issued over 11 years ago. The Board is concerned with the protracted delays in addressing the safety deficiency identified in Recommendation A07-06. Additionally, the Board is disappointed that TC is not pursuing the ICAO recommended 300 m RESA for Code 4 runways. The proposed regulatory changes, as currently written, will reduce the hazards associated with an overrun; however, not to the level that would be afforded by a 300 m RESA.

Therefore, the response to Recommendation A07-06 is assessed as **Satisfactory in Part**.

#### Transport Canada's response to Recommendation A07-06 (October 2019)

TC agrees in principle with this recommendation.

TC is developing proposed Runway End Safety Area (RESA) amendments to the *CARs*. Stakeholders have been consulted throughout the development of the proposed RESA amendments, including through Notices of Proposed Amendment; the last of which was published in May 2016.<sup>2</sup>

In order to maximize the benefits of RESA for the vast majority of air travelers and crews, the proposed amendments would mandate that Canada's busiest airports must provide a 150 m RESA at both ends of runways serving scheduled commercial passenger-carrying flights. Canadian airports with an annual passenger threshold of at least 325,000 would be subject to the proposed amendments. By addressing the construction of RESA to cover traffic instead of runway length this 150 m provides enough distance to contain 90% of runway excursions. This proposed approach would increase the safety of the traveling public and crews without imposing excessive costs to the aviation industry. It is expected that the proposed requirements would initially apply to 28 airports, and to an additional 9 airports in the next 20 years (as other airports reach the 325,000 passenger threshold), for a total of 37 airports. Overall, the proposed approach would represent 95% a passenger coverage by 2038 while aligning the Canadian regulations with the ICAO standard.

The pre-publication of the proposed amendments in the *Canada Gazette*, Part I is now planned for late 2019. The publication of the final amendment in *Canada Gazette*, Part II is planned for late 2020.

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<sup>2</sup> Canadian Aviation Regulation Advisory Council (CARAC), Notice of Proposed Amendment (NPA) on Runway End Safety Areas (RESA). CARAC Activity Reporting Notice #: 2016-007, at <https://wwwapps.tc.gc.ca/saf-sec-sur/2/npa-apm/npaapmr.aspx?id=2924&lang=eng> (last accessed 19 March 2021).

### Update to Transport Canada's response to Recommendation A07-06 (February 2021)

The Regulations amending the *Canadian Aviation Regulations* (Parts I, III and VI — Runway end safety areas RESA)) were published in the *Canada Gazette*, Part I, on March 7, 2020. TC is aiming to publish these amendments in the *Canada Gazette*, Part II in May 2021.

### TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2021)

In its responses, Transport Canada (TC) indicated that it agrees in principle with Recommendation A07-06.

In March 2020, TC proposed regulations that would, among other things:

- Require a 150 m Runway End Safety Area (RESA) at airports with over 325 000 commercial passengers annually;
- Require the use of an arresting system on runways where the 150 m RESA cannot be implemented; and
- Be limited to runways serving commercial passenger services.

According to TC, these regulations, once implemented, will increase runway overrun protection to passengers from 75% of passenger traffic in 2017 to 95% by 2038. However, these regulations focus only on the risk to a majority of, but not all, passengers and do not consider non-passenger air traffic or the terrain at the end of all runways. Also, the TSB believes that the proposed regulations may not fully meet the International Civil Aviation Organization (ICAO) standard, which requires a 150 m RESA for all runways 1200 m in length and longer, and provisions for other types of runways.

The proposed amendments were published in the *Canada Gazette*, Part I, in March 2020. TC is aiming to publish these amendments in the *Canada Gazette*, Part II in May 2021.

The proposed regulatory changes, as currently written, will reduce the risks associated with an overrun; however, not to the level that would be afforded by the ICAO recommended 300 m RESA. At a minimum, the Board believes that the proposed regulations must meet the ICAO standard.

Therefore, the response to Recommendation A07-06 is assessed as **Satisfactory in Part**.

### Transport Canada's response to Recommendation A07-06 (September 2021)

Transport Canada (TC) agrees in principle with the recommendation.

Since the recommendation was issued in 2007, while pursuing changes to the regulations, TC worked with industry experts in 2008 to review airport standards (TP312 Aerodrome

Standards and Recommended Practices<sup>3</sup>) and in 2013 issued two Advisory Circulars (AC) concerning Runway End Safety Area (RESA) Construction Maintenance and Runway Arresting Systems (AC 300-007 EMAS<sup>4</sup> and AC 302-015 Runway End Safety Area Bearing Strength Requirements<sup>5</sup>).

In early 2014, TC commissioned an independent risk assessment (RA) to establish implementation criteria for RESAs across all airport types in Canada. Based on the recommendations of the RA, TC favoured the adoption of RESA requirements based on passenger volumes and went forward to issue a Notice of Proposed Amendment (NPA) 2016-007 that would amend *Canadian Aviation Regulations* (Parts I, III and VI — Runway end safety areas - RESA). The amended regulations were published in the *Canada Gazette*, Part I, on March 7, 2020.<sup>6</sup>

In our last update in February 2021, the Department mentioned aiming to plan these amendments in the *Canada Gazette*, Part II in May 2021. Work is still underway for the final publication and TC will notify the TSB when a publication date is available.

### **TSB reassessment of Transport Canada's response to Recommendation A07-06 (March 2022)**

In its latest response, Transport Canada (TC) indicated that it agrees in principle with Recommendation A07-06. The *Regulations Amending the Canadian Aviation Regulations (Parts I, III and VI – RESA): SOR/2021-269*<sup>7</sup> were published in the *Canada Gazette*, Part II in January 2022. According to TC, these regulations will increase runway overrun protection to passengers from 75% of passenger traffic in 2017 to 95% by 2038. However, these regulations focus only on the risk to a majority of, but not all, passengers and do not consider non-passenger air traffic or the terrain at the end of all runways.

The Board believes that the regulations do not fully meet the International Civil Aviation Organization's (ICAO) standard, which requires a 150 m runway end safety area (RESA) for all runways 1200 m in length and longer, and provisions for other types of runways. Additionally,

<sup>3</sup> Transport Canada (2015). TP 312 –*Aerodromes Standards and Recommended Practices*. Available at: <https://tc.canada.ca/en/aviation/publications/aerodromes-standards-recommended-practices-tp-312>

<sup>4</sup> Transport Canada (2017). Advisory Circular (AC) 300-007 -*Engineered Materials Arresting Systems for Aircraft Overruns*. Available at: <https://tc.canada.ca/en/aviation/reference-centre/advisory-circulars/advisory-circular-ac-no-300-007>

<sup>5</sup> Transport Canada (2013). Advisory Circular (AC) 302-015 - *Runway End Safety Area Bearing Strength Requirements*. Available at: <https://tc.canada.ca/en/aviation/reference-centre/advisory-circulars/advisory-circular-ac-no-302-015>

<sup>6</sup> Government of Canada (2020). *Canada Gazette*, Part I, Volume 154, Number 10: *Regulations Amending the Canadian Aviation Regulations (Parts I, III and VI— RESA)*. Available at: <https://www.gazette.gc.ca/rp-pr/p1/2020/2020-03-07/html/reg3-eng.html>

<sup>7</sup> Government of Canada (2022). *Canada Gazette*, Part II, Volume 156, Number 1 : *Regulations Amending the Canadian Aviation Regulations (Parts I, III and VI— RESA)*. Available at: <https://www.gazette.gc.ca/rp-pr/p2/2022/2022-01-05/html/sor-dors269-eng.html>



TC has not yet provided an assessment of the residual risk represented by the gap between TC's regulations and the ICAO standard.

Furthermore, while the regulatory changes will reduce the risks associated with an overrun, they will not reduce the risks to the level that would be afforded by the ICAO-recommended 300 m RESA.

Therefore, the response to Recommendation A07-06 is assessed as **Satisfactory in Part**.

#### **Next TSB action**

The TSB will seek additional information from TC regarding residual risk represented by the gap between TC's regulations and the ICAO standard.

This deficiency file is **Active**.