



## REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A07-01

### Risks in approaches into convective weather

#### Background

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. The aircraft touched down about 3800 feet down the 9000-foot runway; 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 A07-01 (December 2007)

Aircraft penetration of thunderstorms on approach occurs throughout the industry and has contributed to a number of accidents worldwide. Many operators, including Air France, do not provide their crews with specific criteria, such as distance-based guidelines, for the avoidance of convective weather during final approach and landing.

Environment Canada advises that thunderstorms can present significant risks to the safe operation of an aircraft. These risks include the following:

- low ceiling and poor visibility due to intense precipitation below the thunderstorm cloud, which often seriously limits visibility from the cockpit;
- rapid changes in surface pressure that can lead to altitude errors;

- lightning, which increases in frequency proportionally to the storm's intensity and which also affects visibility;
- hail, both within and outside the cloud;
- icing, particularly in the upper part of a mature cell;
- rapid changes in wind speed and direction, which may quickly and suddenly exceed an aircraft's crosswind or other limits;
- potentially damaging wind gusts;
- downdrafts due to microbursts;
- contaminated runway surfaces in rain and/or hail;
- turbulence; and
- difficulty in conducting a missed approach safely.

Therefore, there is a need for clear standards for the avoidance of convective weather during approach and landing. This will reduce the ambiguity involved in decision making in the face of a rapidly changing weather phenomenon, and the likelihood that factors such as operational pressures, stress, or fatigue will adversely affect a crew's decision to conduct an approach.

Therefore, the Board recommended that:

the Department of Transport establish clear standards limiting approaches and landings in convective weather for all air transport operators at Canadian airports.

**TSB Recommendation A07-01**

### **Transport Canada's response to Recommendation A07-01 (February 2008)**

In its response, Transport Canada states it will consider this recommendation in consultation with other international aviation authorities with a view to harmonizing any regulatory initiatives that may result from this recommendation. In addition, Transport Canada is preparing an Issue Paper on this subject, to be presented at the next International Civil Aviation Organization (ICAO) Standard and Recommended Procedures working group meeting in Montreal, scheduled for summer 2008.

In the short term, Transport Canada will consider issuing an Advisory Circular (AC) that will discuss the hazards associated with flight operations in or near convective weather conditions. This AC would recommend that Canadian air operators include specific procedures in their company operations manual that would guide flight crewmembers in alerting the crew of the current weather and associated hazards, as well as to provide guidance in decision-making when faced with flight through or landing in such weather conditions.

### **TSB assessment of Transport Canada's response to Recommendation A07-01 (July 2008)**

Although Transport Canada does not specifically state that it fully supports this recommendation, it intends to conduct consultations with international authorities to harmonize an action plan. In addition, it is preparing an Issue Paper, to be presented at the upcoming International Civil Aviation Organization (ICAO) Standard and Recommended Procedures working group meeting. Transport Canada is also considering issuing an Advisory

Circular (AC) to Canadian air operators that will discuss the hazards associated with flight operations in or near convective weather conditions.

This response is a positive indication that Transport Canada believes that more needs to be done, both internationally as well as on the home front, to reduce the risk identified in this recommendation. However, the Board is concerned that in the short term, and until more stringent standards are established in this country, the risk will remain. A recent B-737 serious incident at the Ottawa airport, as well as many accidents around the world since the Air France accident, at times with a high casualty result, is a grim reminder of this fact.

Therefore, Transport Canada's response to Recommendation A07-01 is assessed as **Satisfactory Intent**.

### **Transport Canada's response to Recommendation A07-01 (February 2010)**

TC's response states that it published Advisory Circular 705-005 entitled Approach and Landing During Convective Weather Conditions on 5 March 2009. It indicates that the target audience is 705 air operators.

Additionally, the 3/2009 issue of TC's Aviation Safety Letter contained an article entitled *Flight in the Vicinity of Convective Weather*. The response indicates that it was a general information article targeted at both the industry as a whole and general aviation.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (July 2010)**

The issue of landing accidents and runway overruns is on the Board's Watchlist. TC's response indicates it has taken positive steps to raise awareness amongst Canadian operators and pilots with respect to the subject of approaches and landings in convective weather. However, its current response does not provide any evidence of consultations with other regulatory authorities or any follow through on the commitment to raise the issue at the 2009 ICAO Standard and Recommended Procedures working group meeting. The Board is concerned that until TC establishes clear standards to mitigate the risks identified in Recommendation A07-01, the risk will remain.

TC's action taken to date will not substantially reduce or eliminate the safety deficiency. Therefore the Board assesses TC's response as **Satisfactory in Part**.

### **Transport Canada's response to Recommendation A07-01 (January 2011)**

TC's response states that an Issue Paper was presented by TC to the ICAO Operations Panel meeting of the working group in Montreal on November 3, 2010.

Panel members emphasized that while the issue of convective weather was of importance, the move to a "limit" for all aircraft operations at Canadian airports would have significant implications on safety beyond the borders of Canada. It was agreed that the issue was worthy of consideration by ICAO but Canada should not act alone in developing a strategy to address the issue.

It was agreed that the ICAO Secretariat would place the issue on its work plan to be dealt with at a future date. However, given the volume of work currently being undertaken by the Panel, any revisit of this issue could be two years or more away.

**TSB reassessment of Transport Canada’s response to Recommendation A07-01 (March 2011)**

The previous action by TC to raise the awareness of Canadian operators regarding flight in convective weather partially addressed the safety deficiency highlighted by the Recommendation A07-01. TC has initiated international discussion on the issue, but the time schedule in dealing with the issue through the ICAO Operations Panel will delay the mitigation of the safety deficiency.

Therefore, the Board assesses TC’s response as **Satisfactory in Part**.

**Transport Canada’s response to Recommendation A07-01 (September 2011)**

**May 2011**

No change.

**September 2011**

A cross reference is to be made on recommendations residing in CRM (A09-02, A07-03, A07-05, A00-06).

**TSB reassessment of Transport Canada’s response to Recommendation A07-01 (March 2012)**

The Board remains very concerned that until TC establishes clear standards to mitigate the risks identified in Recommendation A07-01, the risk will remain.

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

**Transport Canada’s response to Recommendation A07-01 (December 2012)**

TSB Recommendation A07-01 will not be addressed by the development of a contemporary CRM training standard.

In response to Rec. A07-01, TCCA presented an issue paper to ICAO in November 2010, 1) it was agreed that Canada should not act alone in developing a strategy to address the issue, 2) the ICAO Secretariat agreed to place the issue on the work plan to be dealt with at a future date. TCCA will support ICAO in this initiative as a long term plan; however, we do not expect activity to begin within the next 2 years.

TC has initiated contact with international counterparts to explore opportunities for harmonization and participate internationally in the advancement of these standards.

In the interim, the Standards Branch will evaluate the effectiveness of an Advisory Circular issued some years ago which provides guidance on the hazards associated with flight operations in or near convective weather conditions.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (March 2013)**

The Board again highlights the slow progress in establishing standards to mitigate the risks identified in Recommendation A07-01. On 21 January 2011, TC had indicated that, given the volume of work currently being undertaken by the ICAO Operations Panel, any revisit of this issue could be 2 years or more away. On 4 December 2012, 22 months later, TC reiterates that it will support ICAO in this initiative as a long-term plan; however, it does not expect activity to begin within the next 2 years. While TC did present an issue paper to the ICAO Operations Panel in November 2010, and has indicated that it will support ICAO in developing a strategy to address the issue, to this date it appears that no clear timeline has been established for this project. Until improved standards are in place, the risks will remain.

The response remains as **Satisfactory in Part**.

### **Transport Canada's response to Recommendation A07-01 (November 2013)**

In 2009, Transport Canada published Advisory Circular 705-005: Approach and Landing in Convective Weather Conditions, which provides information about limitations for approaches and landings in adverse weather conditions. The Department will continue to evaluate the content of Advisory Circular 705-005 as new information becomes available.

No additional regulatory or advisory material is planned at this time.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (April 2014)**

Transport Canada's previous action of publishing Advisory Circular 705-005 only partially addressed TSB Recommendation A07-01. The TSB is disappointed that no further action is planned by TC, and that without improved standards, the risks identified in Recommendation A07-01 will remain.

The response remains as **Satisfactory in Part**.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (March 2017)**

In light of a recent occurrence<sup>1</sup>, the Board has reactivated this recommendation and will be requesting an update from TC in order to complete a reassessment in the coming months.

### **Transport Canada's response to Recommendation A07-01 (May 2017)**

Transport Canada (TC) officials have considered the re-activation and do not agree with this approach to dealing with the risks associated with approaches and landings in convective weather.

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<sup>1</sup> TSB Investigation A14Q0155

As previously communicated to the Board, the Federal Aviation Administration (FAA) assembled a consortium of aviation specialists from Boeing, United Airlines, McDonnell Douglas, Lockheed Martin, Aviation Weather Associates, and Heliwell to study windshear.

These experts and the FAA concluded that:

unfortunately, there are no universal quantitative windshear avoidance criteria that provide unambiguous go/no-go decision guidelines. There is no assured detection and warning system in operation which can measure windshear intensity along a specific flight path.

This conclusion was published in FAA Advisory Circular No. 00-54, Pilot Windshear Guide, 11/25/88. TC agrees with the FAA and has published safety educational and promotional material to inform the industry of the risks associated with approaches and landings in convective weather. TC has also raised the issue to the International Civil Aviation Organization (ICAO). The ICAO Secretariat agreed to place the issue on its work plan. ICAO also agreed that Canada should not act alone on this issue.

TC will monitor scientific and technological developments related to it and will support international harmonization efforts when the issue gains active status at ICAO. However, in the short term, TC has no plans to redirect resources from higher priority safety concerns.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (July 2017)**

In its response, TC states that it agrees with the conclusion published in the FAA Advisory Circular No. 00-54, dated from 1988, that there are no universal quantitative windshear avoidance criteria that provide unambiguous go/no-go decision guidelines, and that there is no assured detection and warning system in operation which can measure windshear intensity along a specific flight path. TC states that it will monitor scientific and technological developments and will support international harmonization efforts when the issue gains active status at ICAO. However, in the short term, TC has no plans to redirect resources from higher priority safety concerns.

Although the TSB agrees with the FAA Advisory Circular No. 00-54, windshear is not the only risk associated with approaches and landings in convective weather. Other risks include:

- low ceiling and poor visibility due to intense precipitation below the thunderstorm cloud, which often seriously limits visibility from the cockpit;
- rapid changes in surface pressure that can lead to altitude errors;
- lightning, which increases in frequency proportionally to the storm's intensity and which also affects visibility;
- hail, both within and outside the cloud;
- rapid changes in wind speed and direction, which may quickly and suddenly exceed an aircraft's crosswind or other limits;
- potentially damaging wind gusts;
- downdrafts due to microbursts;
- contaminated runway surfaces in rain and/or hail;
- turbulence; and
- difficulty in conducting a missed approach safely.

In addressing Recommendation A07-01, TC should take into consideration all risks associated with approaches and landings in convective weather.

TC's previous action of publishing Advisory Circular 705-005 only partially addressed TSB Recommendation A07-01. While TC did present an issue paper to the ICAO Operations Panel in November 2010, and the ICAO Secretariat agreed to place the issue on its work plan, to this date, it appears that no clear timeline has been established for this project.

The TSB is disappointed by the slow progress in establishing standards to mitigate the risks identified in Recommendation A07-01, and that no further action is planned by TC. Until improved standards are in place, the risks identified by Recommendation A07-01 will remain.

Therefore, the Board considers TC's response to Recommendation A07-01 to be **Satisfactory in Part**.

### **Transport Canada's response to Recommendation A07-01 (November 2018)**

TC agrees with the intent of the recommendation.

However, the scientific [*sic*] and technology regarding convective weather has not advanced. As a result, TC will evaluate what action is possible when scientific and technological developments in area of limiting approaches and landings in convective weather become available.

### **TSB reassessment of Transport Canada's response to Recommendation A07-01 (March 2019)**

In its response, Transport Canada (TC) states that it agrees with the intent of the recommendation and will evaluate what action is possible when scientific and technological developments in the area of limiting approaches and landings in convective weather become available.

While TC did present an issue paper to the International Civil Aviation Organization (ICAO) Operations Panel in November 2010, and the ICAO Secretariat agreed to place the issue on its work plan, to date, no timeline has been established for this project. The TSB believes that, although an agreement was made with ICAO that Canada should not act alone in developing a strategy to address the issue, the intent of the agreement was likely to encourage other ICAO members to help Canada find a solution, and not for Canada to stop working on the issue until it is added to the ICAO Standards and Recommended Procedures working group agenda.

As stated in the July 2017 reassessment, the TSB agrees with Federal Aviation Administration (FAA) Advisory Circular No. 00-54; however, windshear is not the only risk associated with approaches and landings in convective weather. The TSB believes TC should take into consideration all the risks associated with approaches and landings in convective weather and start working on establishing clear standards limiting approaches and landings in convective weather.

This recommendation was issued over 11 years ago. The Board is concerned with the protracted delays in addressing the safety deficiency identified in Recommendation A07-01. Until all the

risks associated with approaches and landings in convective weather are taken into consideration and clear standards limiting approaches and landings in convective weather for all air transport operators at Canadian airports are in place, the risks associated with the safety deficiency identified in Recommendation A07-01 remain.

Therefore, the response to Recommendation A07-01 is assessed as **Unsatisfactory**.

### **Next TSB action**

The TSB will continue to assess the risks identified in Recommendation A07-01 through the investigation of other occurrences, and will ask TC to reconsider its position in light of all risks associated with approaches and landings in convective weather.

This deficiency file is **Active**.